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with a peppery flavour, they are best used sparingly[159]. Another source suggests that the shoots should not be eaten[9]. Flowers - sweet. Used in salads or as a garnish[183]. Young seedpods - cooked. Steamed[183]. The seed contains 28% of a drying oil[114]. It is edible and a very good source of gamma-linolenic acid[141], an essential fatty acid that is not found in many plant sources and has numerous vital functions in the body. The seed, however, is very small and difficult to harvest, it has to be done by hand[160]. Overall yields are low, making the oil very expensive to produce.

tcanta Cosmetic Dye Miscellany OilThe oil from the seed is added to skin preparations and cosmetics. It is often combined with vitamin E to prevent oxidation[238]. A yellow dye is obtained from the flowers[7]. A finely ground powder made from the flowering stems is used cosmetically in face-masks to counteract reddened skins[7].

dwatta Anticholesterolemic Antipruritic Astringent Eczema Hypotensive Miscellany SedativeThe bark and the leaves are astringent and sedative[4, 21]. They have proved of use in the treatment of gastro-intestinal disorders of a functional origin, whooping cough and asthma[4]. A syrup made from the flowers is also an effective treatment for whooping cough[7]. The bark is stripped from the flowering stem and dried for later use, the leaves are also harvested and dried at this time[4]. Evening primrose oil has become a well-known food supplement since the 1980's. Research suggests that the oil is potentially very valuable in the treatment of multiple sclerosis, pre-menstrual tension, hyperactivity etc[66]. It is also taken internally in the treatment of eczema, acne, brittle nails, rheumatoid arthritis and alcohol-related liver damage[238]. Regular consumption of the oil helps to reduce blood cholesterol levels and lower the blood pressure[21, 66]. The seed is a good source of gamma-linolenic acid, an unsaturated fatty acid which assists the production of hormone-like substances[222, 238]. This process is commonly blocked in the body, causing disorders that affect the uterine muscles, nervous system and metabolism[238]. The poulticed root is applied to piles and bruises[222]. A tea made from the roots is used in the treatment of obesity and bowel pains[222].

nrakta Eastern N. America - Labrador, south to Florida and Texas. Naturalized in Britain. ksacta Dunes, roadsides, railway banks and waste places in Britain[17], often in sandy soils[4].

propta Seed - sow in situ from late spring to early summer[200].

nwatta Prefers a dryish well-drained sandy loam and a warm sunny position[1, 4, 200], though it is tolerant of most soils[4]. Heavy clay soils may induce winter rots[200]. Grows well on very poor soils[160, 238]. Established plants are drought resistant[160]. Formerly cultivated for its edible roots, the evening primrose is being increasingly cultivated for the oil contained in its seed which contains certain essential fatty acids and is a very valuable addition to the diet[66]. See the notes on medicinal uses for more details. The flowers open in the evening and are strongly scented with a delicious sweet perfume[245], attracting pollinating moths[4]. The seeds are a good food source for birds[200]. Plants usually self-sow freely if they are growing in a suitable position, they can naturalize in the wild garden[4, K]. In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is fleshy. Thick or swollen - fibrous or tap root [2-1].

5.2.69 *Crataegus columbiana*

Columbian Hawthorn

4 tlin 8 cyuc 2 kcak 0 tcan 2 dwat 5 m hkuc
hmimhtuc cyutli hgattcuphja7n hwicli hrasj|utnyikfrip hpa7tli flatprik|wsslip hpa7tmwatli xre7t hjonli

drutta *Crataegus columbiana* is a deciduous Tree growing to 5 m (16ft 5in). See above for USDA hardiness. It

is hardy to UK zone 5 and is not frost tender. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[161, 166]. A very pleasant flavour, it is slightly mealy but juicy and can be eaten in quantity as a dessert fruit[K]. It is also used in making pies, preserves etc and can be dried for later use[161, 177]. The fruit is up to 11mm in diameter and is borne in small clusters[K]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta Western N. America - British Columbia to California, east to Idaho and Oregon. ksacta Meadows and near streams in Idaho[71].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. This species is closely related to *C. douglasii*[71].

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woods[43, 235].

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5.2.67 Quercus stellata

Post Oak

4 tlin 8 cyuc 3 kcac 0 tcan 2 dwat 20 m hkuc
hmmihtut cyutli hgattcup hwicli jlutnyik hpa7tli flatprikliwis hpa7tmwatli hjonli

drutta Quercus stellata is a deciduous Tree growing to 20 m (65ft 7in) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from April to May, and the seeds ripen in October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. Suitable for: medium (loamy) and heavy (clay) soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

kcaakta Edible Parts: SeedEdible Uses: CoffeeSeed - raw or cooked[61, 63, 105]. A sweet taste[159]. The seed is up to 25mm long and 18mm wide[82, 200], it can be dried, ground into a powder and used as a thickening in stews etc or mixed with cereals for making bread. The seed from some trees might contain bitter tannins, these can be leached out by thoroughly washing the seed in running water though many minerals will also be lost. Either the whole seed can be used or the seed can be dried and ground it into a powder. It can take several days or even weeks to properly leach whole seeds, one method was to wrap them in a cloth bag and place them in a stream. Leaching the powder is quicker. A simple taste test can tell when the tannin has been leached. The traditional method of preparing the seed was to bury it in boggy ground overwinter. The germinating seed was dug up in the spring when it would have lost most of its astringency. The roasted seed is a coffee substitute[177, 257].

tcanta Disinfectant Repellent Lamm WoodA mulch of the leaves repels slugs, grubs etc, though fresh leaves should not be used as these can inhibit plant growth[20]. Oak galls

are excrecences that are sometimes produced in great numbers on the tree and are caused by the activity of the larvae of different insects. The insects live inside these galls, obtaining their nutrient therein. When the insect pupates and leaves, the gall can be used as a rich source of tannin, that can also be used as a dyestuff[4]. Wood - very heavy, hard, close grained, very durable in contact with the soil but difficult to cure. It weighs about 52lb per cubic foot. It is largely used for fencing, lumber, furniture and fuel[46, 61, 82, 149, 159, 171, 227].

dwatta Antiaphonic Astringent Disinfectant Dysentery Emetic Febrifuge TonicThe bark is astringent, disinfectant, emetic, febrifuge and tonic[257]. An infusion is used in the treatment of chronic dysentery, indigestion, asthma, lost voice and intermittent fevers[257]. The bark can be chewed to treat mouth sores[257]. An infusion of the bark can be used as a wash on sore and chapped skin[257]. Any galls produced on the tree are strongly astringent and can be used in the treatment of haemorrhages, chronic diarrhoea, dysentery etc[4].

nrakta South-eastern N. America - Massachusetts to New York, Iowa, Florida and Texas. ksacta Rocky or sandy ridges and outcrops, also in dry woodlands in a variety of soils including gravelly, sandy, poor upland soils and heavy moist loamy soils, where it reaches its greatest height[229].

propta Seed - it quickly loses viability if it is allowed to dry out. It can be stored moist and cool overwinter but is best sown as soon as it is ripe in an outdoor seed bed, though it must be protected from mice, squirrels etc. Small quantities of seed can be sown in deep pots in a cold frame. Plants produce a deep taproot and need to be planted out into their permanent positions as soon as possible, in fact seed sown in situ will produce the best trees[11]. Trees should not be left in a nursery bed for more than 2 growing seasons without being moved or they will transplant very badly.

nwatta Prefers a good deep fertile loam which can be on the stiff side[1, 11]. Young plants tolerate reasonable levels of side shade[200]. Tolerates moderate exposure, surviving well but being somewhat stunted[200]. Prefers warmer summers than are usually experienced in Britain, trees often grow poorly in this country and fail to properly ripen their wood resulting in frost damage overwinter[200]. A slow-growing drought resistant tree, it takes 20 - 30 years before it produces seed[229]. It then usually produces a good crop of seeds every 2 - 4 years[229]. The tree flowers on new growth produced in spring, the seed ripening in its first year[200, 229]. Intolerant of root disturbance, trees should be planted in their permanent positions whilst young[11]. Hybridizes freely with other members of the genus[200]. Plants in this genus are notably resistant to honey fungus[200].

5.2.68 Oenothera biennis

Evening Primrose, Sun Drop, Common evening primrose

4 tlin 8 cyuc 3 kcac 3 tcan 5 dwat 1.2 m hkuc
htut cyutli hgatkuyctcup hwicli hyishrasjlut hpa7tli flatprikliwis hpa7tmwatli fyifxre7t hjonli

drutta Oenothera biennis is a BIENNIAL growing to 1.2 m (4ft). See above for USDA hardiness. It is hardy to UK zone 4 and is not frost tender. It is in flower from June to September, and the seeds ripen from August to October. The species is hermaphrodite (has both male and female organs) and is pollinated by Lepidoptera (Moths and Butterflies), bees. The plant is self-fertile. It is noted for attracting wildlife. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

pcista Lowers the threshold for epileptic fits (avoid). Caution if on anticoagulants. Combining with phenothiazines (allopathic medication) can trigger seizures. Adverse effects: may cause headaches and nausea on an empty stomach. Diarrhoea with high doses. Seizures in schizophrenic patients on phenothiazines (allergy antihistamines) [301].

kcaakta Edible Parts: Flowers Leaves Oil Root Seed-podEdible Uses: OilRoot - cooked. Boiled and eaten like salsify[4, 12, 27, 33, 66]. Fleshy, sweet and succulent[74]. Wholesome and nutritious[2]. A peppery taste[159]. The taste somewhat resembles salsify or parsnips[183]. Young shoots - raw or cooked[2, 12, 52, 85, 183]. Mucilaginous,

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1 Introduction

This is a book of plant information harvested from pfaf.org the goal is for future generations to have access to this valuable plant information. This book does Not contain any plant identification material, so you will need to use other references for actually identifying the plant. This book does contain information on how to grow the plants and their edible and other uses.

The plants are sorted by nitrogen-fixing ability, edibility, plant height, other uses, medicinal uses, and latin name. They start with nitrogen fixers because those are typically the easiest to establish pioneer plants.

Instructions for food forest design are in separate books. But basic idea is to have thorny plants on the border as a form of fence to keep out predators and animals that want to raid your food forest, with the shortest plants closest to the border, then gradually getting taller plants as you go in. For example starting with thorny herbacious, then row of thorny shrub, the row of thorny trees. Afterwards can put in several rows of your staple crop, which typically is a variety of nut, acorn and bean producing tall trees. Then can put in a long rotation coppice of hardwood lumber trees you find useful, then a row or more of fruit trees, then a short rotation coppice to use for firewood, then some rows of berry, bean and nut shrubs, with the closest circle near the community being vegetables and perennials that take more care than the others.

You need about a hectare of land (2.5 acres) per person if you have 6 months growing season (where average temperature is above 10C), at least half of which should be dedicated to food, the other half can be to lumber, but can also be food trees that are occasionally used as lumber. A general formula is 6/monthsGrowingSeason to see how many hectares you need. This assumes you have at least 600mm of rainfall per year, and only works if you have more than 3 months growing season, as very little you can grow in less than that.

If you live in a dry area, especially one prone to flash floods, then it is imperative that you spend you dry season

digging swales and vernal pools, that will collect the rain water during the flash floods and keep it in place so that it enters the ground, then you can grow things downhill of your vernal pools and swales. It is generally more important that they be extensive than deep. You want to ideally catch every drop, so that none of it leaves your property.

By contrast if you live in a very wet area with more than enough water, then you want to have ditches to help the water leave the property and not waterlog your soil.

If you have a slope exceeding 30 degrees then you will want to reinforce with terraces any water catchment areas such as vernal pools or ponds, also can use terraces for growing tubers or anything that requires digging to plant or harvest, otherwise your soil is liable to wash away. You may wish to use terraces with smaller slopes as well if you are doing soil tilling or digging. In a food forest permaculture system generally you want to minimize soil disturbance and focus on getting your food from fruits, leaves, bark or other above ground sources.

In a medium wetness area you can use either method to create various microclimates for different kinds of plants.

In either case you want to start with about 1 in three plants being a nitrogen fixer (bwon), as it will help your food forest grow faster.

Summaries are given in the Cosmic Language (KsomPyash). Long descriptions are in English.

1.1 Pronunciation guide

a /a/, b /b/, c /ʃ/ "sh", d /d/, e /e/, f /f/, g /g/, h /h/, i /i/, j /j/ "zh", k /k/, l /l/, m /m/, n /n/, o /o/, p /p/, q /ŋ/ "ng", r /r/, s /s/, t /t/, u /u/, v /v/, w /w/, x /x/, y /j/ "gh", y /j/, z /z/, ʒ /j/ (low tone), 6 /ə/ "uh", 7 /ʌ/ (high tone).

1.2 vocabulary

tlin /tlin/ cold hardiness, cyuc /ʃu/ heat hardiness, kcac /kʌk/ food (rating), tcan /tʃan/ other (uses rating), dwat /dwat/ medicinal (rating), hkuc /hku/ (adult) height, hsi2n /hsiJn/ (adult) width, ksan /ksan/ least (minimum).

pcim /pjim/ full (shade), hmim /hmim/ medium (shade), htut /htut/ no (shade), cyut /ʃut/ shade, li /li/ realis-mood (end of sentence), ta /ta/ topic-case.

hgat /hɡat/ drought (tolerant), kyuc /kju/ dry, tcup /tʃup/ damp, hja7n /hʒa7n/ wet, hs6s /hsos/ puddle, hwic /hwij/ water (requirement).

hyis /hjij/ self (soil), hras /hras/ sandy, jlut /ʒlut/ loamy, nyik /njik/ mud (silt/clay loam), frip /frip/ pottery (heavy clay), hpa7t /hpa7t/ topsoil.

frus /frus/ corrosive (very acid), flat /flat/ acid, prik /prik/ passive (neutral), lwis /lwis/ alkaline, slip /slip/ slippery (very alkaline), hsom /hsom/ salt (saline), hpa7tmwat /hpa7tmwat/ topsoil taste.

fyif /fjif/ self (fertile), xre7t /xre7t/, nyanhjen /njanhʒen/ male-female (dioecious, distinct male and female plants), hjon /hʒon/ sex.

hmuc /hmu/ purpose, pcis /pʃis/ danger, trot /trot/ temperature, prop /prop/ fertile, tcan /tʃan/ other, hyum /hjum/ uses, dwat /dwat/ medicine, drut /drut/ description, kcec /kʃe/ region, tfo2n /tfoJn/ nitrogen-fixing, xlutkfam /xlut,kfam/ plant quantity, bwon /bwon/ bean, mran /mran/ corn/grain non-nitrogen-fixing plant, nrak /nrak/ continent (of origin), ksac /ksa/ circumstances/habitat.

4 hmucrotkceec, hgat hmuchwic, 3 ksankcak, jlut hmuchpa7t, prik hmuchpa7tmwat, 111 xiutkfam.

2 1 tlin

2.0.1 Pinus cembra sibirica

Siberian Pine

1 tlin 6 cyuc 4 ckac 3 tcan 2 dwat 30 m hkuc

htut cyutli hgatykuctop hwicli hyishrasjlut hpa7tli flatprik hpa7tmwatli dyat hjonli

drutta Pinus cembra sibirica is an evergreen Tree growing to 30 m (98ft 5in) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 1. It is in leaf all year, in flower from May to June, and the seeds ripen in September. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. The plant is not self-fertile. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

pcista The wood, sawdust and resins from various species of pine can cause dermatitis in sensitive people[222].

ckaakta Edible Parts: Oil SeedEdible Uses: Condiment OilSeed - raw or cooked[1, 2, 4, 34, 177, 183]. An important local food source in Siberia and China[81], the oil-rich seed has a delicious flavour with a slight taste of turpentine. A reasonable size, it is about 10mm x 8 mm[200]. A vanillin flavouring is obtained as a by-product of other resins that are released from the pulpwood[200]. Carbon Farming - Staple Crop: protein-oil.

tcanta Dye Herbicide Oil WoodA tan or green dye is obtained from the needles[168]. The needles contain a substance called terpene, this is released when rain washes over the needles and it has a negative effect on the germination of some plants, including wheat[201]. Turpentine is obtained from the leaves[46, 61]. Oleo-resins are present in the tissues of all species of pines, but these are often not present in sufficient quantity to make their extraction economically worthwhile[64]. The resins are obtained by tapping the trunk, or by destructive distillation of the wood[4, 64]. In general, trees from warmer areas of distribution give the higher yields[64]. Turpentine consists of an average of 20% of the oleo-resin[64] and is separated by distillation[4, 64]. Turpentine has a wide range of uses including as a solvent for waxes etc, for making varnish, medicinal etc[4]. Rosin is the substance left after turpentine is removed. This is used by violinists on their bows and also in making sealing wax, varnish etc[4]. Pitch can also be obtained from the resin and is used for waterproofing, as a wood preservative etc. Wood - soft, easily worked. The timber is used for construction, furniture, turnery etc[46, 61, 100].

dwatta The turpentine obtained from the resin of all pine trees is antiseptic, diuretic, rubefacient and vermifuge[4]. It is a valuable remedy used internally in the treatment of kidney and bladder complaints and is used both internally and as a rub and steam bath in the treatment of rheumatic affections[4]. It is also very beneficial to the respiratory system and so is useful in treating diseases of the mucous membranes and respiratory complaints such as coughs, colds, influenza and TB[4]. Externally it is a very beneficial treatment for a variety of skin complaints, wounds, sores, burns, boils etc and is used in the form of liniment plasters, poultices, herbal steam baths and inhalers[4].

nrakta E. Asia - Siberia to China. ksacta Wet situations[81]. Mountains, river basins; 800-2400 m. Hei-longjiang (Tuqiang), Nei Mongol, Xinjiang (Kazakstan, Mongolia, E Russia)[266].

propta It is best to sow the seed in individual pots in a cold frame as soon as it is ripe if this is possible otherwise in late winter. A short stratification of 6 weeks at 4°c can improve the germination of stored seed[80]. Plant seedlings out into their permanent positions as soon as possible and protect them for their first winter or two[11]. Plants have a very sparse root system and the sooner they are planted into their permanent positions the better they will grow[K]. Trees should be planted into their permanent positions when they are quite small, between 30 and 90cm[200]. We actually plant them out when they are about 5 - 10cm tall. So long

as they are given a very good weed-excluding mulch they establish very well[K]. Larger trees will check badly and hardly put on any growth for several years. This also badly affects root development and wind resistance[200]. Cuttings. This method only works when taken from very young trees less than 10 years old. Use single leaf fascicles with the base of the short shoot. Disbudding the shoots some weeks before taking the cuttings can help. Cuttings are normally slow to grow away[81].

nwatta Management: Standard Minor Global Crop Staple Crop: Protein-oilThrives in a light well-drained sandy or gravelly loam[1, 11]. Dislikes poorly drained moorland soils[1] - this report conflicts with the plants reported natural habitat of wet soils[81, K]. Established plants tolerate drought[200]. Plants are slow growing in cultivation[81]. Leaf secretions inhibit the germination of seeds, thereby inhibiting the growth of other plants below the tree[18]. Plants are strongly outbreeding, self-fertilized seed usually grows poorly[200]. They hybridize freely with other members of this genus[200]. The cones do not open, seed is extracted by breaking up the soft scales of the cone[200]. This plant is seen as a distinct species by some botanists, differing from *P. cembra* in its larger cones and by having 3 resin canals instead of one in each leaf[200]. Plants in this genus are notably susceptible to honey fungus[200]. Climate: boreal to warm temperate. Humidity: semi-arid to humid. Trees can live for 500 years. One tree can yield 1,000-1,500 cones in a year. Each cone contains 80-140 seeds. Seeds take 2 years to ripen. Carbon farming - Cultivation: minor global crop. Management: standard. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2]. An evergreen. The root pattern is a tap root similar to a carrot going directly down [1-2].

2.0.2 Pinus contorta

Beach Pine, Lodgepole pine, Bolander beach pine, Beach pine, Sierra lodgepole pine, Yukon pine, Shor 1 tlin 7 cyuc 3 ckac 0 tcan 2 dwat 15 m hkuc htut cyutli hgatykuctuphja7n hwicli hyishrasjlut hpa7tli flat-prik hpa7tmwatli dyat hjonli

drutta Pinus contorta is an evergreen Tree growing to 15 m (49ft) by 8 m (26ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 7. It is in leaf all year; in flower in May, and the seeds ripen from January to February. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. The plant is not self-fertile. Suitable for: light (sandy) and medium (loamy) soils and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils. It cannot grow in the shade. It prefers dry moist or wet soil and can tolerate drought. The plant can tolerate maritime exposure.

pcista The wood, sawdust and resins from various species of pine can cause dermatitis in sensitive people[222].

ckaakta Edible Parts: Inner bark Sap SeedEdible Uses: Condiment GumInner bark - raw or cooked[2, 94, 105, 161, 257]. It can be used fresh or dried. It is mashed into a pulp and made into cakes then baked[94]. Harvested in early spring, the taste is not unpleasant, but it develops a strong taste of turpentine as the season advances[2]. The inner bark is ready to harvest when the male cones are producing pollen[257]. A famine food, it is only used when all else fails. Sap - collected in spring and used as a drink[161, 177]. Seed - raw or cooked[257]. A gum is made from the pitch obtained from the trunk. It is allowed to harden and used for chewing[257]. A vanillin flavouring is obtained as a by-product of other resins that are released from the pulpwood[200].

tcanta Adhesive Dye Fuel Gum Herbicide Pitch String Waterproofing WoodA tan or green dye is obtained from the needles[168]. The roots have been braided by the N. American Indians to make a rope[226]. The needles contain a substance called terpene, this is released when rain washes over the needles and it has a negative effect on the germination of some plants, including wheat[201]. A pitch obtained from this tree is used for waterproofing canoes, baskets, shoes etc and as a glue[64, 99, 226, 257]. It has also been used to preserve wood, baskets etc[257]. The pitch is not

there is a huge range of cultivars of widely diverse habits[11, 81]. At least some forms tolerate maritime exposure[186], there is a thriving colony in an exposed position at Land's End in Cornwall[81]. Seed takes 2 - 3 years to ripen on the plant[11]. Plants are usually very slow growing, often only a few centimetres a year[186]. Resists honey fungus[88]. Plants are sometimes attacked by a rust, this fungus has an aecidial stage on hawthorn (*Crataegus* spp.)[1]. Dioecious. Male and female plants must be grown if seed is required. In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is flat with shallow roots spreading near the soil surface [2-1].

5.2.65 Juniperus monosperma

One-Seed Juniper

4 tlin 8 cyuc 3 ckac 3 tcan 2 dwat m hkuc

htut cyutli hgatykuctop hwicli hrasjlutnyik hpa7tli flatprik-wisslip hpa7tmwatli nyanhjen hjonli

drutta Juniperus monosperma is an evergreen Tree growing to 18 m (59ft 1in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 4. It is in leaf all year; in flower in April, and the seeds ripen in October. The species is dioecious (individual flowers are either male or female, but only one sex is to be found on any one plant so both male and female plants must be grown if seed is required), and is pollinated by Wind. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

ckaakta Edible Parts: FruitEdible Uses: GumFruit - raw or cooked. Soft, juicy and pulpy[81, 85, 105], but with a thin flesh[82]. It can be dried and ground into a powder and then be baked[82, 227], or can be used as a seasoning in stews etc[161, 257]. The fruits were only used when other foods were in short supply[257]. The cones are about 5 - 8mm in diameter and ripen in their first year[200]. Inner bark - raw or cooked[257]. It was chewed in times of food shortage for the little nourishment it supplied[257]. The gum is chewed as a delicacy[161, 257]. No further details are given.

tcanta Beads Dye Fibre Fuel Gum Lighting Mordant Tinder WoodThin strips of the fibrous bark are used for making sleeping mats etc[82, 227]. It has also been used as a lining in shoes to absorb moisture and to keep the feet warmer[257]. When rubbed fine, the bark can be used to make children's clothing[257]. The bark is employed as a tinder and is also made into a slow match or can be shredded, bound into bundles and used as a torch to give light in the house[216, 257]. The crushed bark was twisted into a rope, tied at intervals with yucca (*Yucca* species), and wrapped into a coil. The free end was set on fire and kept smouldering by blowing on it at intervals. Fire could be carried in this fashion for several hours[257]. The dried seeds have been used as beads or as the 'rattle' in rattles[216, 257]. A green dye is obtained from the bark and berries[229, 257]. A yellow dye is obtained from the whole plant[257]. Ashes from the whole plant have been used as a mordant to fix the colour of dyes[257]. Wood - moderately hard, somewhat heavy, slightly fragrant. When seasoned properly it is very durable and is used mainly for fencing and fuel[82, 227, 229]. As a fuel it burns steadily and evenly[257].

dwatta Antiphlogistic Birthing aid Diuretic Dysentery Refrigue Laxative Odontalgic Pectoral Poultice StomachicOne-seed juniper was commonly employed medicinally by a number of native North American Indian tribes, who used it to treat a variety of complaints[257]. It is little, if at all, used in modern herbalism. The leaves are refrigerue, laxative and pectoral[216]. An infusion is used in the treatment of stomach complaints, constipation, coughs and colds[216]. An infusion was also used by pregnant women prior to childbirth in order to relax the muscles[257]. A poultice of the heated twigs can be bound over a bruise or sprain in order to reduce the swelling[257]. An infusion of the staminate cones has been used as a stomach tonic and in the treatment of dysentery[257]. The chewed bark has been applied externally to help heal spider bites[257]. It is also highly prized as a dressing on burns[257]. The fruits

are strongly diuretic[257]. A gum from the plant has been used as a temporary filling in a decayed tooth[257].

nrakta South-western N. America - along the Rocky Mountains from Wyoming to Mexico. ksacta Dry rocky or sandy soils, 1000 - 2300 metres[229].

propta The seed requires a period of cold stratification. The seed has a hard seedcoat and can be very slow to germinate, requiring a cold period followed by a warm period and then another cold spell, each of 2 - 3 months duration[78, 81]. Soaking the seed for 3 - 6 seconds in boiling water may speed up the germination process[11]. The seed is best sown as soon as it is ripe in a cold frame. Some might germinate in the following spring, though most will take another year. Another possibility is to harvest the seed 'green' (when the embryo has fully formed but before the seedcoat has hardened). The seedlings can be potted up into individual pots when they are large enough to handle. Grow on in pots until large enough, then plant out in early summer. When stored dry, the seed can remain viable for several years[1]. Cuttings of mature wood, 5 - 10cm with a heel, September/October in a cold frame. Plant out in the following autumn[1, 78]. Layering in September/October. Takes 12 months[78].

nwatta Succeeds in dry soils. Succeeds in most soils, including chalk, if they are well drained[1, 11, 200], preferring a neutral or slightly alkaline soil[11]. Trees are fairly fast growing for a Juniper, and are also long-lived in their native habitats[227]. They grow better in dry areas with hot summers, western Britain is generally to cool and wet for this species to thrive[200]. Plants are resistant to honey fungus[88]. This species is closely related to *J. occidentalis*[11]. The seed matures in 1 year[200]. Some fruit is produced most years, but heavy crops only occur every 2 - 3 years[229]. Dioecious. Male and female plants must be grown if seed is required. In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is flat with shallow roots spreading near the soil surface [2-1].

5.2.66 Crataegus intricata

Copenhagen hawthorn

4 tlin 8 cyuc 3 ckac 3 tcan 2 dwat 3 m hkuc

hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikprik hpa7tli flatprikwisslip hpa7tmwatli xre7t hjonli

drutta Crataegus intricata is a deciduous Shrub growing to 3 m (9ft 10in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower in May, and the seeds ripen in September. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

ckaakta Edible Parts: FruitEdible Uses: Fruit - raw, cooked or dried for later use[2, 105, 161]. Hard dry flesh[43]. Fruit we have eaten from this tree is mealy and fairly soft, with a pleasant sweet flavour[K]. It ripens in early September in southern Britain[K]. The fruit is up to 14mm in diameter and is borne in small clusters[229]. The skin is slightly hairy[235]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardio tonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta Eastern N. America - Maine to Georgia, west to Michigan and Oklahoma. ksacta Thickets and open rocky

kcakta Edible Parts: Oil SeedEdible Uses: OilSeed - raw or cooked[2, 22, 46, 105]. Rich in oil. As nice a flavour as C. avellana, the common hazel nut[146, 158]. The seed ripens in mid to late autumn and will probably need to be protected from squirrels[K]. When kept in a cool place, and not shelled, the seed should store for at least 12 months[K]. An edible oil is obtained from the seed.

tcanta Oil WoodWood - firm, durable, moderately hard. Used for furniture, turnery etc[74, 158].

dwatta TonicThe seeds are tonic[240].

nrakta S.E. Europe to W. Asia. ksacta Shady mixed forests, 1000 - 1800 metres in E. Asia[74]. Found at altitudes up to 3000 metres in the Himalayas where it is found mainly on northerly aspects and in shady places[146, 158].

propta Seed - best sown as soon as it is harvested in autumn in a cold frame[164]. Germinates in late winter or spring. Stored seed should be pre-soaked in warm water for 48 hours and then given 2 weeks warm followed by 3 - 4 months cold stratification[164]. Germinates in 1 - 6 months at 20°C[164]. When large enough to handle, prick the seedlings out into individual pots and grow them on in a cold frame or sheltered place outdoors for their first winter. Plant them out into their permanent positions in late spring or early summer[K]. Layering in autumn. Easy, it takes about 6 months[78, 200].

nwatta Management: Standard Regional Crop Stable Crop: Protein-oilLandscape Uses:Firewood, Specimen, Street tree. An easily grown plant, it succeeds in most soils, but is in general more productive of seeds when grown on soils of moderate fertility[11, 200]. It does less well in rich heavy soils or poor ones[11, 63]. Does well in a loamy soil[11]. Very suitable for an alkaline soil[11], but it dislikes very acid soils[17]. Tolerates a pH in the range 5.3 to 7.3. Once established, this is a very drought resistant tree[183]. It does not produce suckers[183]. Plants are fairly wind tolerant[1, 11]. A very ornamental tree[1]. Members of this genus bear transplanting well and can be easily moved even when relatively large[11]. The Turkish hazel is occasionally cultivated for its edible seed[46, 61, 158]. This species is also useful in hybridizing with C. avellana in order to develop superior fruiting cultivars[183]. Special Features:Not North American native, Inconspicuous flowers or blooms. The plant is heat tolerant in zones 7 through 5. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2]. The root pattern is flat with shallow roots forming a plate near the soil surface [1-2].

5.2.64 Juniperus communis nana

Juniper

4 tlin 10 cduc 3 kcak 4 tcan 3 dwat 0.5 m hkuc hmimhtut cyuti hgatkuyctcup hwicli hyishras]lutnytkifrip hpa7tli frusflatprikwiwsslip hpa7tmwatli nyanhjen hjonli

drutta Juniperus communis nana is an evergreen Shrub growing to 0.5 m (1ft 8in) by 1 m (3ft 3in) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 2 and is not frost tender. It is in leaf all year; in flower from May to June, and the seeds ripen in October. The species is dioecious (individual flowers are either male or female, but only one sex is to be found on any one plant so both male and female plants must be grown if seed is required), and is pollinated by Wind. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay and nutritionally poor soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid and very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

pcista Although the fruit of this plant is quite often used medicinally and as a flavouring in various foods and drinks, large doses of the fruit can cause renal damage. Juniper should not be used internally in any quantities by pregnant women[65, 165].

kcakta Edible Parts: FruitEdible Uses: Coffee Condiment TeaFruit - raw or cooked[2, 5, 9, 15]. It is usually dried [12]. The fruit is often used as a flavouring in sauerkraut, stuffings, vegetable pates etc, and is an essential ingredient of gin[183]. The aromatic fruit is used as a pepper substitute according to one report[183]. An essential oil is sometimes distilled from the fruit to be used as a flavouring[183]. Average yields are around 1%[7]. The cones are about 4 - 8mm in diameter and take 2 years to mature[200]. Some caution is advised when using the fruit, see the notes above on toxicity. The roasted seed is a coffee substitute[177]. A tea is made by boiling the leaves and stems[161]. A tea made from the berries has a spicy gin-like flavour[183].

tcanta Fibre Fuel Hair Incense Repellent Resin Strewing TinderA decoction of the branches is used as an anti-dandruff shampoo[172]. Yields the resin 'Sandarac', used in the production of a white varnish[74]. The stems were at one time used as a strewing herb[14]. The whole plant can be burnt as an incense and fumigant[66, 102, 146]. It makes a good insect repellent[102, 172]. The bark is used as cordage[61] and as a tinder[172]. An excellent fuel wood[66]. Many forms of this species are good ground cover plants for sunny situations[208].

dwatta Antiseptic Aromatic Carminative Diaphoretic Diuretic Rubefacient Stomachic Tonic UrinaryJuniper fruits are commonly used in herbal medicine, as a household remedy, and also in some commercial preparations. They are especially useful in the treatment of digestive disorders plus kidney and bladder problems[4]. The fully ripe fruits are strongly antiseptic, aromatic, carminative, diaphoretic, strongly diuretic, rubefacient, stomachic and tonic[4, 7, 9, 21, 46, 165, 240, 254]. They are used in the treatment of cystitis, digestive problems, chronic arthritis, gout and rheumatic conditions[254]. They can be eaten raw or used in a tea[222], but some caution is advised since large doses can irritate the urinary passage[4]. Externally, it is applied as a diluted essential oil, having a slightly warming effect upon the skin and is thought to promote the removal of waste products from underlying tissues[254]. It is, therefore, helpful when applied to arthritic joints etc[254]. The fruits should not be used internally by pregnant women since this can cause an abortion[9]. The fruits also increase menstrual bleeding so should not be used by women with heavy periods[254]. When made into an ointment, they are applied to exposed wounds and prevent irritation by flies[4]. The essential oil is used in aromatherapy. Its keyword is 'Toxin elimination'[210].

nrakta Northern temperate zone, incl Britain, south to the mountains of N. Africa, Himalayas and California ksacta Rocks and moors on mountains and lowland bogs in N. Wales, N. England and Scotland[17].

propta The seed requires a period of cold stratification. The seed has a hard seedcoat and can be very slow to germinate, requiring a cold period followed by a warm period and then another cold spell, each of 2 - 3 months duration[78, 81]. Soaking the seed for 3 - 6 seconds in boiling water may speed up the germination process[11]. The seed is best sown as soon as it is ripe in a cold frame. Some might germinate in the following spring, though most will take another year. Another possibility is to harvest the seed 'green' (when the embryo has fully formed but before the seedcoat has hardened). The seedlings can be potted up into individual pots when they are large enough to handle. Grow on in pots until large enough, then plant out in early summer. When stored dry, the seed can remain viable for several years[1]. Cuttings of mature wood, 5 - 10cm with a heel, September/October in a cold frame. Plant out in the following autumn[1, 78]. Layering in September/October. Takes 12 months[78].

nwatta Succeeds in hot dry soils and in poor soils. Succeeds in most soils so long as they are well drained[186], preferring a neutral or slightly alkaline soil. Does well in chalky soils[1]. Grows well in heavy clay soils. Tolerates a pH range from 4 to 8[186]. Succeeds in light woodland but dislikes heavy shade[186]. Established plants are very tolerant of drought[186]. Although the fully dormant plant is cold-tolerant throughout Britain, the young growth in spring can be damaged by late frosts. A very polymorphic species,

a commercially important crop[64]. Oleo-resins are present in the tissues of all species of pines, but these are often not present in sufficient quantity to make their extraction economically worthwhile[64]. The resins are obtained by tapping the trunk, or by destructive distillation of the wood[4, 64]. In general, trees from warmer areas of distribution give the higher yields[64]. Turpentine consists of an average of 20% of the oleo-resin[64] and is separated by distillation[4, 64]. Turpentine has a wide range of uses including as a solvent for waxes etc, for making varnish, medicinal etc[4]. Rosin is the substance left after turpentine is removed. This is used by violinists on their bows and also in making sealing wax, varnish etc[4]. Pitch can also be obtained from the resin and is used for waterproofing, as a wood preservative etc. Wood - straight but coarse-grained, light, hard, strong, brittle[60, 82]. It varies from light and soft to hard and heavy[229]. Easily worked, it is used for general construction, posts, poles, pulp etc[60, 82, 99, 171, 226, 229]. It makes a good fuel, burning well even when green because it is rich in pitch[99, 226].

dwatta Antiseptic Blood purifier Cathartic Diuretic Pectoral Poulitice Salve TB Tonic VD VulneraryBeach pine was widely employed medicinally by several native North American Indian tribes who used it especially for its antiseptic and healing properties on wounds, infections etc, and also for its beneficial effects upon the chest and lungs[257]. It is little, if at all, used in modern herbalism. The turpentine obtained from the resin of all pine trees is antiseptic, diuretic, rubefacient, vermifuge and vulnerary[4, 257]. It is a valuable remedy when taken internally in the treatment of kidney and bladder complaints and can be used both internally and externally in the treatment of rheumatic affections[4, 257]. It is also used in treating diseases of the mucous membranes and respiratory complaints[4, 257]. Externally it is used in the form of liniment plasters and poultices in treating a range of skin complaints, wounds, boils etc[4, 257]. A decoction of the young shoots has been used in the treatment of stomach pains[257]. The young buds have been chewed in the treatment of a sore throat[257]. The inner bark has been eaten as a blood purifier, diuretic and cathartic[257]. A decoction has been used as a tonic and in the treatment of coughs, colds, consumption and gonorrhoea[257].

nrakta Western N. America - Alaska to California. ksacta Coastal dunes and sphagnum covered bogs to montane dry or moist areas[60, 82]. Trees growing inland are much larger than those growing near the coast[60].

propta It is best to sow the seed in individual pots in a cold frame as soon as it is ripe if this is possible otherwise in late winter. A short stratification of 6 weeks at 4°C can improve the germination of stored seed[80]. Plant seedlings out into their permanent positions as soon as possible and protect them for their first winter or two[11]. Plants have a very sparse root system and the sooner they are planted into their permanent positions the better they will grow[K]. Trees should be planted into their permanent positions when they are quite small, between 30 and 90cm[200]. We actually plant them out when they are about 5 - 10cm tall. So long as they are given a very good weed-excluding mulch they establish very well[K]. Larger trees will check badly and hardly put on any growth for several years. This also badly affects root development and wind resistance[200]. Cuttings. This method only works when taken from very young trees less than 10 years old. Use single leaf fascicles with the base of the short shoot. Disbudding the shoots some weeks before taking the cuttings can help. Cuttings are normally slow to grow away[81].

nwatta Landscape Uses:Alpine garden, Screen, Seashore, Specimen, Woodland garden. Thrives in a light well-drained sandy or gravelly loam[1, 11]. Dislikes poorly drained moorland soils[1]. Tolerates water-logged soils[81]. Succeeds in exposed maritime positions[49, 81]. Established plants tolerate drought[200]. The coastal form of this species is a very fast growing tree, especially when young, with new growth of 1 metre or more per year[185]. The forms from coastal Washington and Oregon do best in Britain. The subspecies P. contorta latifolia is normally slower growing than the species type though it is sometimes faster in some inland sites at higher altitudes[185]. New growth takes place from mid-April until early July[185]. Trees are long-lived, with specimens 600 years old recorded[229]. Extensively cultivated for timber in N. Europe[50, 200], this is an aggressive colonizing species that can form huge pure stands

following a forest fire or clear-felling an area for timber[226]. Trees can be shrubby in habit when they are grown on poor sites[200]. Leaf secretions inhibit the germination of seeds, thereby reducing the amount of plants that can grow below the tree[18]. There are some named forms, selected for their ornamental value[188]. Plants are strongly outbreeding, self-fertilized seed usually grows poorly[200]. They hybridize freely with other members of this genus[200]. This species hybridises in the wild with P. banksiana where their ranges overlap[226]. Trees come into flower at an early age, usually between 6 and 10 years[229]. Good seed crops are produced every 1 - 3 years[229]. The cones are 2 - 5cm long[82], they open and shed their seed whilst still attached to the tree[226], though many of the cones will remain unopened on the tree, preserving the vitality of the seeds until they are stimulated to open by excessively hot weather or a forest fire[82, 229]. Plants in this genus are notably susceptible to honey fungus[200]. Special Features: North American native.

3 2 tlin

3.1 bwon

3.1.1 Caragana arborescens

Siberian Pea Tree, Siberian peashrub tfo2n 2 tlin 7 cyuc 5 kcak 4 tcan 1 dwat 6 m hkuc htut cyuti hgatkuyctcup hwicli hyishras]lut hpa7tli flatprikwiwsslip hpa7tmwatli xre7t hjonli

drutta Caragana arborescens is a deciduous Shrub growing to 6 m (19ft) by 4 m (13ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 2 and is not frost tender. It is in flower in May, and the seeds ripen in September. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. It can fix Nitrogen. It is noted for attracting wildlife. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista Reports that this plant contains toxins have not been substantiated[65]. The occurrence of cystine in the seeds is doubtful[65].

kcakta Edible Parts: Oil Seed SeedpodEdible Uses: OilSeed - cooked[2, 105]. Small but produced in abundance[11], there are 4 - 6 seeds per pod[202]. A bland flavour, it is best used in spicy dishes[183]. The raw seed has a mild pea-like flavour, though we are not sure if it should be eaten in quantity when raw[K]. The seed contains 12.4% of a fatty oil and up to 36% protein[183, 269], it has been recommended as an emergency food for humans[65]. More than just an emergency food, this species has the potential to become a staple crop in areas with continental climates[K]. Young pods - cooked and used as a vegetable[46, 61, 105, 177, 183, 269].

tcanta Companion Dye Fibre Hedge Hedge Oil Shelterbelt Soil stabilizationA fibre obtained from the bark is used for making cordage[46, 61, 74, 269]. A blue dye is obtained from the leaves[74, 269]. The seed contains 12.4% of a fatty oil[74]. The plant can be grown as a hedge[160]. It is quite wind-resistant and can also be planted in a shelterbelt[200]. The plant has an extensive root system and can be used for erosion control, especially on marginal land[160]. Because of its nitrogen-fixing capacity, it is valued as a soil-improving plant[269].

dwatta Cancer EmmenagogueThe whole plant, known as ning tiao, is used in the treatment of cancer of the breast, and the orifice to the womb, and for dysmenorrhoea and other gynaecological problems[269].

nrakta E. Asia - Siberia to Mongolia. Occasionally naturalized in Europe in France[50]. ksacta River banks, pebbles, sands, open forests and forest edges, gully slopes and stony slopes[74].

propta Seed - best sown as soon as it is ripe in a cold frame[200]. It usually germinates in 2 weeks[K]. Stored seed should be pre-soaked for 24 hours in warm water then sown

in a cold frame[78, 113, 200]. If the seed has not swollen then scarify it and re-soak for another 12 hours before sowing[138]. Germination usually takes place within 2 - 3 weeks at 20°C[138]. Good percentage[11]. As soon as they are large enough to handle, prick the seedlings out into individual pots and grow them on in a greenhouse for at least their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. There are approximately 40,000 seeds per kilo[269]. Cuttings of half-ripe wood, 7 - 10cm with a heel, July/August in a frame[113]. Layering in spring.

nwatta Agroforestry Services: Living fence Agroforestry Services: Nitrogen Agroforestry Services: Windbreak Industrial Crop: Biomass Management: Coppice Management: Standard Minor Global Crop Staple Crop: ProteinSucceeds in most well-drained soils, preferring full sun and a light sandy dry or well-drained soil[1, 11, 200]. Tolerates very alkaline soils[202]. Plants do not require a rich soil[1, 11, 108], succeeding on marginal land[160]. Established plants are drought resistant[160]. Fast growing[188]. Dormant plants are hardy to about -30°C[184], they prefer a continental climate and do not grow so well in areas that do not have very cold winters[200]. They grow and fruit very well in the eastern half of the country, even in northern areas, though they do not do so well in the wetter west[K]. The young growth in spring, even on mature plants, is frost-tender and so it is best to grow the plants in a position sheltered from the early morning sun[K]. The Siberian pea shrub has an excellent potential to become a staple food crop. The seed is nutritious and wholesome, although rather small it is often very freely borne and is easily harvested[K]. This species has also been recommended as a nitrogen-fixing windbreak and ground cover plant that binds the soil and produces fibre and dye stuffs[218]. *C. boissii* and *C. fruticosa* are closely related to this species[182] and can probably be used similarly[K]. A very ornamental plant, some named forms have been developed for their ornamental value[182]. 'Nana' is a very compact dwarf form[183] that grows slowly[11]. 'Pendula' has stiffly pendent branches but is otherwise the same as the type species[11]. A good bee plant[74]. Plants in this genus are notably resistant to honey fungus[200]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[200]. The plant is heat tolerant in zones 8 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is multistemmed with multiple stems from the crown [1-2].

3.1.2 *Elaeagnus angustifolia*

Oleaster, Russian olive
fto2n 2 tlin 7 cyuc 4 kcaak 4 tcan 2 dwat 7 m hkuc
htu2 cyuti hgatkycupc hwicli hyishrasjlutnyik hpa7tli flat-prikwiwsliphsom hpa7tmwatl xre7t hjonli

drutta *Elaeagnus angustifolia* is a deciduous Shrub growing to 7 m (23ft) by 7 m (23ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 2 and is not frost tender. It is in flower in June, and the seeds ripen from September to October. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline and saline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

koakta Edible Parts: Fruit SeedEdible Uses: GumFruit - raw or cooked as a seasoning in soups[1, 2, 3, 100, 146, 74]. Dry, sweet and mealy[11, 145, 183]. The fruit can also be made into jellies or sherbets[183]. The fruit must be fully ripe before it can be enjoyed raw, if even slightly under-ripe it will be quite astringent[K]. The oval fruit is about 10mm long[200] and contains a single large seed[K]. Seed - raw or cooked. It can be eaten with the fruit though the seed case is rather fibrous[K].

tcanta Companion Essential Fodder Fuel Gum Hedge Hedge WoodPlants can be grown as a hedge in exposed positions[29], tolerating maritime exposure[200]. It is fairly fast-growing and very tolerant of pruning, but is rather open in habit and does not form a dense screen[K]. Because the plant fixes atmospheric nitrogen, it makes a hedge that enriches the soil rather than depriving it of nutrients[K]. An essential oil obtained from the flowers is used in perfumery[74]. A gum from the plant is used in the textile industry in calico printing[74]. Wood - hard, fine-grained. Used for posts, beams, domestic items[74, 100], it is also much used for carving[245]. The wood is an excellent fuel[74, 146].

dwatta Cancer Febrifuge PectoralThe oil from the seeds is used with syrup as an electuary in the treatment of catarrh and bronchial affections[240]. The juice of the flowers has been used in the treatment of malignant fevers[240]. The fruit of many members of this genus is a very rich source of vitamins and minerals, especially in vitamins A, C and E, flavanoids and other bio-active compounds. It is also a fairly good source of essential fatty acids, which is fairly unusual for a fruit. It is being investigated as a food that is capable of reducing the incidence of cancer and also as a means of halting or reversing the growth of cancers[214].

nrakta Europe to W. Asia, extending as far north as latitude 55° in Russia. ksacta By streams and along river banks to 3000 metres in Turkey[93].

propta Seed - best sown as soon as it is ripe in a cold frame[78]. It should germinate in late winter or early spring, though it may take 18 months[K]. Stored seed can be very slow to germinate, often taking more than 18 months. A warm stratification for 4 weeks followed by 12 weeks cold stratification can help[98]. The seed usually (eventually) germinates quite well[78]. Prick out the seedlings into individual pots as soon as they are large enough to handle and plant out when they are at least 15cm tall. Cuttings of half-ripe wood, 7 - 10cm with a heel, July/August in a frame. Difficult[113]. Cuttings of mature wood of the current year's growth, 10 - 12cm with a heel, October/November in a frame[200]. The cuttings are rather slow and difficult to root, leave them for 12 months[113]. Layering in September/October. Takes 12 months[78]. Root cuttings in the winter[200].

nwatta Agroforestry Services: Nitrogen Agroforestry Services: Windbreak Fodder: Bank Industrial Crop: Biomass Management: Coppice Management: Coppice Management: Standard Minor Global CropLandscape Uses:Screen, Specimen. An easily grown plant, it succeeds in most soils that are well-drained[200], though it dislikes shallow chalk soils[98]. Prefers a light sandy soil that is only moderately fertile[11], succeeding in poor soils and dry soils[11, 200]. Requires a position in full sun, growing very well in hot dry positions[182]. Plants are very drought and wind resistant[1, 166, 200], they tolerate conditions of considerable salinity and alkalinity[227]. A very hardy plant, tolerating temperatures down to about -40°C[184]. However, plants prefer a continental climate[49] and are apt to be cut back in severe winters in Britain because the summer is often not warm enough to have fully ripened the wood[1]. A very variable species[214]. This species is often cultivated in N. Europe for its edible fruits, there are many named varieties and some of these are thornless[214]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[160, 200]. An excellent companion plant, when grown in orchards it can increase yields from the fruit trees by up to 10%. Plants are very tolerant of pruning, they usually resprout freely even when cut right back to the ground. This species is notably resistant to honey fungus[88, 200]. The flowers are sweetly and heavily scented[184]. Special Features: Attractive foliage, Not North American native, Invasive, Naturalizing, Fragrant flowers, Inconspic-

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Plants are hardy to at least -18°C[202]. This sub-species has larger fruits than the type[11]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

5.2.62 *Castanea mollissima*

Chinese Chestnut
4 tlin 8 cyuc 3 kcaak 3 tcan 2 dwat m hkuc
hmimhtut cyuti hgatkycupc hwicli hyishrasjlutnyik hpa7tli flatprik hpa7tmwatl hjonli

drutta *Castanea mollissima* is a deciduous Tree growing to 25 m (82ft 0in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 4. It is in flower in July, and the seeds ripen in October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought.

kcakta Edible Parts: SeedEdible Uses: Seed - raw or cooked[46, 61, 63, 105]. Eaten raw, there is a distinct astringency, especially if the fleshy inner skin beneath the outer shell of the seed is not removed[K]. When cooked, however, and especially when baked, the seed becomes much sweeter and has a floury texture[K]. It then makes an excellent food and can be used as a staple food in much the same way as potatoes or cereals[K]. The skin (or pellicle) of the seed is easily peeled[183]. The seed is low in fats and oils but high in carbohydrates[183]. A nutritional analysis is available[218].

tcanta Fuel Tannin WoodThe bark, leaves, wood and seed husks all contain tannin. Wood - hard, strong, light. Used for fence posts etc[11]. Coppiced for fuel.

dwatta Antidote Astringent Dysentery StomachicThe burrs (seed cases?) are rich in tannin and are astringent and stomachic[147, 218]. A decoction is used in the treatment of diarrhoea, uncontrollable nose bleed, dysentery, regurgitation and profound thirst[147]. The flowers are used in the treatment of scrofula[218]. The stem bark is used to treat

poisoned wounds whilst the stem sap is used to treat lacquer poisoning[218].

nrakta E. Asia - China. ksacta Woods and forests to 2500 metres[109]. Mountain slopes from near sea level to 2,800 metres[266].

propta Seed - where possible sow the seed as soon as it is ripe in a cold frame or in a seed bed outdoors[78]. The seed must be protected from mice and squirrels. The seed has a short viability and must not be allowed to become dry. It can be stored in a cool place, such as the salad compartment of a fridge, for a few months if it is kept moist, but check regularly for signs of germination. The seed should germinate in late winter or early spring. If sown in an outdoor seedbed, the plants can be left in situ for 1 - 2 years before planting them out in their permanent positions. If grown in pots, the plants can be put out into their permanent positions in the summer or autumn, making sure to give them some protection from the cold in their first winter[K].

nwatta Industrial Crop: Biomass Industrial Crop: Tannin Management: Standard Minor Global Crop Other Systems: Strip intercrop Staple Crop: Balanced carbPrefers a good well-drained slightly acid loam but succeeds in dry soils[1, 11, 200]. Once established, it is very drought tolerant[1, 11, 200]. Very tolerant of highly acid, infertile dry sands[200]. Averse to calcareous soils but succeeds on harder limestones[11, 200]. Although very winter-hardy, this species does not do well in Britain, it only really thrives in areas with hot summers[200]. Does not fruit well in Britain[11, 200]. A tree in semi-shade at Kew in 1990 was 9 metres tall[K]. Extensively cultivated for its edible seed in China, and also much grown in America, there are a number of named varieties[117, 183, 200, 266]. Plants can fruit in 5 - 7 years from seed[117] and yields from mature trees are around 25 - 60 kilos per tree[160]. Resistant, but not immune, to blight[183], it is hybridized with *C. dentata* to try and find blight resistant cultivars with superior seeds[200]. A shallow rooted tree[160]. Responds well to coppicing[11, 109]. An excellent soil-enriching understory in pine forests[200]. Flowers are produced on wood of the current year's growth[229]. Plants are fairly self-sterile[200]. They hybridize freely with other members of this genus[200]. Plants in this genus are notably resistant to honey fungus[200]. Special Features: Not North American native, Fragrant flowers, Blooms are very showy. The plant is heat tolerant in zones 8 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2].

5.2.63 *Corylus colurna*

Turkish Hazel, Chinese hazelnut, Turkish Filbert, Turkish Hazel

4 tlin 7 cyuc 3 kcaak 3 tcan 1 dwat 20 m hkuc
hmimhtut cyuti hgattcup hwicli hrasjlutnyik hpa7tli flatprikli-wissliip hpa7tmwatl fyif hjonli

drutta *Corylus colurna* is a deciduous Tree growing to 20 m (65ft) by 7 m (23ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 5. It is in flower from April to May, and the seeds ripen from September to October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. The plant is self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

nrakta Western N. America - British Columbia to California and Mexico, east to Nebraska. ksacta Dry plains and hills on calcareous soils[60]. Found on slightly acid and on alkaline soils[164].

propta Seed - surface sow from late winter to early summer in a greenhouse in a very free-draining soil, but making sure that the compost does not dry out. The sub-species A. tridentata vaseyana germinates better if given a cool stratification for 30 - 50 days. Other sub-species germinate in 1 - 2 weeks in a warm greenhouse[164]. When large enough to handle, prick the seedlings out into individual pots and grow them on in the greenhouse for their first winter, planting them out in late spring or early summer. Cuttings of half-ripe wood, July/August in a frame. Very slow to root[11] Division in spring or autumn. Layering[164].

nwatta Requires a sunny position and a well-drained soil that is not too rich[1, 11]. Requires a lime-free soil[60]. There are a number of sub-species growing in different habitats from deep fertile soils to poor shallow ones[164]. Plants are longer lived, more hardy and more aromatic when they are grown in a poor dry soil[245]. Established plants are very drought tolerant[200]. This species is not hardy in the colder areas of the country, it tolerates temperatures down to between -5 and -10°C[200]. The young growth in spring, even on mature plants, is frost-tender and so it is best to grow the plants in a position sheltered from the early morning sun[K]. The plant is very aromatic, especially after rain[11, 182]. The pollen of this species is one of the main causes of hayfever in N. America[212]. Plants in this genus are notably resistant to honey fungus[200]. Members of this genus are rarely if ever troubled by browsing deer[233].

5.2.60 Crataegus rotundifolia

4 tlin 8 cyuc 3 kcaak 0 tcan 2 dwat 6 m hkuc hmimhtut cyutli hgaccuphja7n hwicli hrasjlutnykfrp hpa7tli flatprikwisslip hpa7tmwattli xre7t hjonli

drutta Crataegus rotundifolia is a deciduous Tree growing to 6 m (19ft) by 4 m (13ft). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower in June, and the seeds ripen in September. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

ksacta Edible Parts: FruitEdible Uses: Fruit - raw or cooked. A fair size fruit, to 15mm in diameter, with a reasonable sweet meaty taste, though when not fully ripe there is a distinct bitterness[K]. It makes an acceptable dessert fruit[K]. The fruit can be used in making pies, preserves, etc, and can also be dried for later use. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta Eastern N. America. ksacta Not known

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up

the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. A tree bearing this name at Kew in September 1993 was fruiting abundantly[K]. There is some confusion over the correct name of this species. C. rotundifolia Moench. is said to be a synonym for C. chrysoarpa phoenicea, C. rotundifolia Borchk. is a synonym of C. chrysoarpa. There is also a C. rotundifolia Lam, which is a synonym of Amelanchier rotundifolia[200].

5.2.61 Crataegus pedicellata gloriosa

Scarlet Haw

4 tlin 8 cyuc 3 kcaak 3 tcan 2 dwat 7 m hkuc hmimhtut cyutli hgaccuphja7n hwicli hrasjlutnykfrp hpa7tli flatprikwisslip hpa7tmwattli xre7t hjonli

drutta Crataegus pedicellata gloriosa is a deciduous Shrub growing to 7 m (23ft) by 7 m (23ft). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from April to May, and the seeds ripen in October. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

ksacta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[K]. Up to 2cm long and pear shaped[11]. The fruit can be used in making pies, preserves, etc, and can also be dried for later use. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta Eastern N. America - New York. ksacta Not known

ous flowers or blooms. The plant is heat tolerant in zones 8 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is fleshy. Thick or swollen - fibrous or tap root [2-1].

3.1.3 Caragana boisii

Siberian peatree

tfo2n 2 tlin 9 cyuc 4 kcaak 4 tcan 0 dwat 2 m hkuc htut cyutli hgatkyuctup hwicli hyishrasjlut hpa7tli flatprikwisslip hpa7tmwattli xre7t hjonli

drutta Caragana boisii is a deciduous Shrub growing to 2 m (6ft) by 1.5 m (5ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 2. It is in flower in May, and the seeds ripen in September. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. It can fix Nitrogen. It is noted for attracting wildlife. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista The following report belongs to the closely related C. arborescens. Reports that this plant contains toxins have not been substantiated[65]. The occurrence of cystine in the seeds is doubtful[65].

ksacta Edible Parts: Oil Seed SeedpodEdible Uses: OilThe following uses are for the closely related C. arborescens and can probably also be applied to this species[K]. Seed - cooked[2, 105]. Small but produced in abundance[11], there are 4 - 6 seeds per pod[202]. A bland flavour, it is best used in spicy dishes[183]. The raw seed has a mild pea-like flavour, though we are not sure if it should be eaten in quantity when raw[K]. The seed contains 12.4% of a fatty oil and up to 36% protein[183], it has been recommended as an emergency food for humans[65]. Young pods - cooked and used as a vegetable[46, 61, 105, 177, 183].

tcanta Dye Fibre Hedge Oil Shelterbelt Soil stabilizationThe following uses are for the closely related C. arborescens and can probably also be applied to this species[K]. A fibre is obtained from the bark, used for cordage[46, 61, 74]. A blue dye is obtained from the leaves[74]. The seed contains 12.4% of a fatty oil[74]. The plant can be grown as a hedge[160]. It is quite wind-resistant and can also be planted in a shelterbelt[200]. The plant has an extensive root system and can be used for erosion control, especially on marginal land[160].

nrakta E. Asia - China. ksacta Not known

propta Seed - best sown as soon as it is ripe in a cold frame[200]. It usually germinates in 2 weeks[K]. Stored seed should be pre-soaked for 24 hours in warm water then sown in a cold frame[78, 113, 200]. If the seed has not swollen then scarify it and re-soak for another 12 hours before sowing[138]. Germination usually takes place within 2 - 3 weeks at 20°C[138]. Good percentage[11]. As soon as they are large enough to handle, prick the seedlings out into individual pots and grow them on in a greenhouse for at least their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. Cuttings of half-ripe wood, 7 - 10cm with a heel, July/August in a frame[113]. Layering in spring.

nwatta Succeeds in most well-drained soils, preferring full sun and a light sandy dry or well-drained soil[1, 11, 200]. Tolerates very alkaline soils[202]. Does not require a rich soil[1, 11, 108], succeeding on marginal land[160]. Established plants are drought resistant[160]. Fast growing[188]. This species is hardy to at least -30°C[184], it prefers a continental climate with hot summers and cold winters so it does not grow so well in the milder western half of Britain[200].

This species is closely related to C. arborescens, differing in the longer teeth of the calyx and in the downy ovary and young fruit[11]. It can probably be used in all the ways C. arborescens is used and therefore has an excellent potential for human food.[K]. A good bee plant[74]. Plants in this genus are notably resistant to honey fungus[200]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[200].

3.1.4 Elaeagnus commutata

Silverberry

tfo2n 2 tlin 6 cyuc 3 kcaak 4 tcan 2 dwat 3 m hkuc htut cyutli hgatkyuctup hwicli hyishrasjlutnyk hpa7tli flatprikwisslip hpa7tmwattli xre7t hjonli

drutta Elaeagnus commutata is a deciduous Shrub growing to 3 m (9ft) by 1.5 m (5ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 2 and is not frost tender. It is in flower in May, and the seeds ripen from July to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

ksacta Edible Parts: Fruit SeedEdible Uses: Fruit - raw or cooked[1, 2, 3, 43, 106]. Dry and mealy[11, 95, 172, 183]. Good when added to soups they also make an excellent jelly[183]. The fruit must be fully ripe before it can be enjoyed raw, if even slightly under-ripe it will be quite astringent[K]. The fruit contains a single large seed[K]. Seed - raw or cooked. It can be eaten with the fruit though the seed case is rather fibrous[K].

tcanta Beads Companion Fibre Hedge Hedge Soap-Plants can be grown as a hedge in exposed positions, tolerating maritime exposure. They have a rather open habit, however, and so do not afford a lot of wind protection. Because they fix atmospheric nitrogen, they enrich the soil and so make a very good companion hedge in orchards etc[K]. The fibrous bark is used in weaving, it has been twisted to make strong ropes and has also been used to make blankets and clothing[99, 257]. Dried fruits are used as beads[99, 257]. The berries have been used to make a soap[257].

dwatta Cancer Salve VDA strong decoction of the bark, mixed with oil, has been used as a salve for children with frostbite[257]. A decoction of the roots, combined with sumac roots (Rhus spp.), has been used in the treatment of syphilis[257]. This medicine was considered to be very poisonous and, if you survived it, you were likely to become sterile[257]. The fruit of many members of this genus is a very rich source of vitamins and minerals, especially in vitamins A, C and E, flavanoids and other bio-active compounds. It is also a fairly good source of essential fatty acids, which is fairly unusual for a fruit. It is being investigated as a food that is capable of reducing the incidence of cancer and also as a means of halting or reversing the growth of cancers[214].

nrakta N. America - Quebec to Alaska and south to Utah, S. Dakota and Minnesota.. ksacta Dry calcareous slopes[43, 184].

propta Seed - best sown as soon as it is ripe in a cold frame[78]. It should germinate in late winter or early spring, though it may take 18 months[K]. Stored seed can be very slow to germinate, often taking more than 18 months. A warm stratification for 4 weeks followed by 12 weeks cold stratification can help[98]. The seed usually (eventually) germinates quite well[78]. Prick out the seedlings into individual pot as soon as they are large enough to handle and plant out when they are at least 15cm tall. Cuttings of half-ripe wood, 7 - 10cm with a heel, July/August in a frame. Cuttings of mature wood of the current year's growth, 10 - 12cm with a heel, October/November in a frame[200]. The cuttings are rather slow and difficult to root, leave them for 12 months[113]. Layering in September/October. Takes 12 months[78]. Division of suckers during the dormant season[3, 11]. The larger suckers can be planted out direct into their permanent positions, but it is probably best to pot up

smaller suckers and grow them on in a cold frame until they are established.

nwatta An easily grown plant, it succeeds in most soils that are well-drained[200], though it dislikes shallow chalk soils[98]. This last report conflicts rather with the record of its natural habitat, it should grow well on chalk[K]. Prefers a light sandy soil that is only moderately fertile, succeeding in poor and dry soils[11, 200]. Requires a position in full sun[11, 200]. Plants are very drought and wind resistant[1, 11, 200]. A very hardy plant, tolerating temperatures down to about -40°c[184]. However, plants prefer a continental climate and are liable to be cut back in severe winters in Britain mainly because the wood is not fully ripened in our cooler summers. A moderately fast-growing plant[202]. The small flowers are deliciously scented[245]. This species does not normally require pruning but the plant can regenerate from very old wood and so can be cut back severely if required[202]. Plants resent root disturbance and should be placed in their permanent positions as soon as possible[202]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[200]. An excellent companion plant, when grown in orchards it can increase yields from the fruit trees by up to 10%. Often confused with *E. angustifolia* even though it is very distinct[50]. Plants produce suckers quite freely, often sending them up at some distance from the plant[182, K]. This species is notably resistant to honey fungus[88, 200]. The plant is heat tolerant in zones 6 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is multi-stemmed with multiple stems from the crown [1-2]. The root pattern is flat with shallow roots forming a plate near the soil surface [1-2]. The root pattern is stoloniferous rooting from creeping stems above the ground [1-2].

3.1.5 Shepherdia canadensis

Buffalo Berry, Russet buffaloberry, Canada Buffaloberry
tfo2n 2 lin 6 cyuc 3 kcaak 3 tcan 2 dwat 2.5 m hku
hmimhtut cyuti hgatkyuctup hwicli yehrasjlutnyik hpa7tli flatpriklwis hpa7tmwatl nyanhjen hjonli

drutta Shepherdia canadensis is a deciduous Shrub growing to 2.5 m (8ft 2in) at a medium rate. See above for USDA Hardiness. It is hardy to UK zone 2 and is not frost tender. It is in flower in April, and the seeds ripen from July to September. The species is dioecious (individual flowers are either male or female, but only one sex is to be found on any one plant so both male and female plants must be grown if seed is required). . The plant is not self-fertile. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

pcista The fruit contains low concentrations of saponins[101]. Although toxic, these substances are very poorly absorbed by the body and so tend to pass through without causing harm. They are also broken down by thorough cooking. Saponins are found in many plants, including several that are often used for food, such as certain beans. It is advisable not to eat large quantities of food that contain saponins. Saponins are much more toxic to some creatures, such as fish, and hunting tribes have traditionally put large quantities of them in streams, lakes etc in order to stupefy or kill the fish[K].

ksakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[2, 3, 22, 46, 85, 101]. The fruit can also be dried and

used like currants. A tart but pleasant flavour even before a frost, it becomes sweeter after frosts[62]. Another report says that the fruit is bitter and is dried, smoked or pressed into cakes[183]. The fruit was a favourite treat of the North American Indians, they would beat it in an equal quantity of water until a foam with a consistency of beaten eggs was formed. It was important that the berries were not allowed to come into contact with anything greasy since this would prevent it becoming foamy[256]. The foam would then be flavoured with a sweet food such as cooked quamah bulbs or other fruits and then served as a special treat in feasts etc. The taste is bitter sweet and is not always enjoyed the first time it is eaten, though it normally grows on one. Nowadays sugar is used to sweeten it and the confection is called 'Indian ice cream'[183, 256]. The fruit should be used in moderation due to the saponin content[101]. The fruit is about 5mm in diameter[200].

tcanta Hair Repellent SoapBecause of its saponin content, the fruit is a potential soap substitute. It is macerated in water to extract the saponins[172]. A decoction of the branches has been used as a hair tonic for dyeing and curling the hair[257]. The branches were harvested in mid summer, broken up and boiled for 2 - 3 hours in water, until the liquid looked like brown coffee. The liquid was decanted off and bottled without further treatment - it would store for a long time without deterioration. To use, the decoction was rubbed into the hair which was simultaneously curled and dyed a brownish colour[257]. The berries, the froth made from them, or a jelly of the fruit, have been eaten as an insect repellent[257]. It was said that mosquitoes were far less likely to bite a person who had eaten the fruit[257].

dwatta Birthing aid Cathartic Haemostatic Hypotensive Laxative Ophthalmic Poulitce Skin Stomachic TV VDBuffalo berry was commonly employed medicinally by several native North American Indian tribes, who used it in the treatment of a range of complaints[257]. It is little, if at all, used in modern herbalism. A poultice of the bark, softened by hot water and mixed with pin cherry bark (*Prunus pensylvanica*), has been used to make a plaster or bandage for wrapping broken limbs[257]. An infusion of the bark has been used as a wash for sore eyes[257]. The roots are antihæmorrhagic and cathartic[257]. An infusion of the roots has been used as an aid to childbirth and in the treatment of tuberculosis and the coughing up of blood[257]. A decoction of the stems has been used as a stomach tonic (it was also used to treat stomach cancer) and also in the treatment of constipation, high blood pressure and venereal diseases[257]. A decoction of the stems and leaves has been used as a wash in the treatment of sores, cuts and swellings[257]. A decoction of the plant has been used externally as a wash and rub for aching limbs, arthritic joints, head and face sores[257]. The inner bark is laxative[257]. An infusion has been used in the treatment of constipation[257]. The berries have been eaten as a treatment for high blood pressure[257]. The fruit juice has been drunk in the treatment of digestive disorders[257]. It has also been applied externally in the treatment of acne and boils[257].

nrakta N. America - Newfoundland to Alaska, south to British Columbia, New York and New Mexico. ksacta Calcareous rocks, banks and sandy shores[43], usually in partial shade[85].

propta Seed - it must not be allowed to dry out[113]. It is best harvested in the autumn and sown immediately in a cold frame. Stored seed requires 2 - 3 months cold stratification[113]. Prick out the seedlings into individual pots once they are large enough to handle. If sufficient growth is made it will be possible to plant them out in the summer, otherwise grow them on in a cold frame for their first winter and plant them out in the following spring or early summer. Cuttings of half-ripe wood, July/August in a frame sometimes work[113].

nwatta Landscape Uses:Erosion control, Hedge, Massing, Superior hedge. Succeeds in an ordinary well-drained moisture retentive soil[1, 3, 11]. Tolerates poor dry soils[200] and maritime exposure[182]. Established plants are drought resistant[182]. Plants can accumulate mercury when they are grown in polluted soils[172]. Rarely produces fruits in Britain[182]. Some named varieties have been developed for their ornamental value[200]. 'Xanthocarpa' has yellow fruits, 'Rubra' has red fruits[200]. Plants in this genus are notably resistant to honey fungus[200]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen.

more than 2 years without being transplanted[11]. A tree at Kew in September 1993 was fruiting heavily[K].

5.2.58 Crataegus pruinosa

Frosted Hawthorn, Waxyfruit hawthorn
4 tin 8 cyuc 3 kcaak 0 tcan 2 dwat 6 m hku
hmimhtut cyuti hgattcuphja7n hwicli hrasjlutnyikfrp hpa7tli flatpriklwisslip hpa7tmwatl hre7t hjonli

drutta Crataegus pruinosa is a deciduous Tree growing to 6 m (19ft 8in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower in May, and the seeds ripen in October. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

ksakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[105, 161, 177]. The flesh is thick[82]. A sweet yellow flesh[200]. The fruit can be used in making pies, preserves, etc, and can also be dried for later use[257]. The fruit is about 1cm in diameter[200]. The fruit is up to 16mm in diameter with a thin flesh[229]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotoxic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta North-eastern N. America - Newfoundland to North Carolina, west to Wisconsin and Oklahoma. ksacta Thickets and rocky ground[43] in open woods[235]. Slopes of low hills, often in limestone soils[82].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°c and then cold stratified for another 3 months at 4°c[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years

before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

5.2.59 Artemisia tridentata

Sage Brush, Big sagebrush, Bonneville big sagebrush
4 tin 10 cyuc 3 kcaak 5 tcan 2 dwat 2.5 m hku
htut cyuti hgatkyuctup hwicli yehrasjlut hpa7tli flatpriklwisslip hpa7tmwatl hre7t hjonli

drutta Artemisia tridentata is an evergreen Shrub growing to 2.5 m (8ft 2in). See above for USDA hardiness. It is hardy to UK zone 8 and is frost tender. It is in leaf all year, in flower in October, and the seeds ripen from October to November. The species is hermaphrodite (has both male and female organs) and is pollinated by Wind. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

pcista Although no reports of toxicity have been seen for this species, skin contact with some members of this genus can cause dermatitis or other allergic reactions in some people[222].

ksakta Edible Parts: Leaves SeedEdible Uses: Condiment TeaLeaves - cooked[61]. The subspecies *A. tridentata vaseyana* has a pleasant mint-like aroma whilst some other subspecies are very bitter and pungent[164]. The leaves are used as a condiment and to make a tea[257]. Seed - raw or cooked. Oily[46, 61]. It can be roasted then ground into a powder and mixed with water or eaten raw[84, 106, 161, 257]. The seed is very small and fiddly to use[K].

tcanta Basketry Disinfectant Dye Fibre Friction sticks Fuel Hair Miscellany Paper Repellent Stuffing TinderAn infusion of the leaves is used as a hair rinse, it treats dandruff and falling hair[84, 106, 168]. An infusion of the plant repels insects[99], it is also disinfectant and so is used for washing walls, floors etc[99]. A yellow to gold dye is obtained from the leaves, buds and stems combined[168]. The fibrous bark is used for weaving mats, baskets, cloth etc., or as a stuffing material in pillows etc and as an insulation in shoes to keep the feet warm[99, 257]. A fibre obtained from the inner bark is used for making paper[189]. The fibres are about 1.3mm long[189]. The stems are harvested in late summer, the leaves removed and the stems steamed until the fibre can be stripped off. The fibre is then cooked for two hours with lye before being ball milled for 4 hours. The resulting paper is a light tan/gold colour[189]. A bunch of the leafy stems can be tied together and used as a broom[257]. The shredded bark is a fine tinder for starting fires[99, 257]. The stems make good friction sticks for making fires[257]. The seeds are used during celebrations because, when thrown into a fire, they explode like crackers[257]. Wood - hard, dense[229]. It burns rapidly and well, even when green, and has a pleasant aromatic smell[212]. Sagebrush provides food and habitat for a variety of species, such as sage grouse, pronghorn antelope, gray vireo, pygmy rabbit, and mule deer.

dwatta Antirheumatic Antiseptic Digestive Disinfectant Febrifuge Miscellany Ophthalmic Poulitce Sedative SkinSage brush was widely employed by many native North American Indian tribes who used it to treat a wide range of disorders[257]. It is little used in modern herbalism, though it certainly merits further investigation[K]. The plant is antirheumatic, antiseptic, digestive, disinfectant, febrifuge, ophthalmic, poultice and sedative[46, 61, 99, 257]. A decoction of the leaves is used in the treatment of digestive disorders and sore throats[216, 257]. An infusion of the fresh or dried leaves is used to treat pneumonia, bad colds with coughing and bronchitis[257]. It is used both internally and externally in the treatment of rheumatism[257]. The crushed plant is used as a liniment on cuts, sores etc whilst a decoction of the leaves is used as an antiseptic wash for cuts, wounds and sores[257]. A poultice of the steeped leaves is applied to sore eyes[257]. The plant is burnt in the house in order to disinfect it[257].

obtained from the resin and is used for waterproofing, as a wood preservative etc. Wood - light, soft, close-grained. It is occasionally made into lumber and is also used for general carpentry[46, 61, 82].

dwatta Antiseptic Diuretic Rubefacient VermifugeThe turpentine obtained from the resin of all pine trees is antiseptic, diuretic, rubefacient and vermifuge[4]. It is a valuable remedy used internally in the treatment of kidney and bladder complaints and is used both internally and as a rub and steam bath in the treatment of rheumatic affections[4]. It is also very beneficial to the respiratory system and so is useful in treating diseases of the mucous membranes and respiratory complaints such as coughs, colds, influenza and TB[4]. Externally it is a very beneficial treatment for a variety of skin complaints, wounds, sores, burns, boils etc and is used in the form of liniment plasters, poultices, herbal steam baths and inhalers[4].

nrakta Western N. America - Alberta to California. ksacta Often forming open forests in the sub alpine to alpine zones, often in semi-arid areas[60, 82]. Usually found on dry rocky ridges and peaks[229].

propta It is best to sow the seed in individual pots in a cold frame as soon as it is ripe if this is possible otherwise in late winter. A short stratification of 6 weeks at 4°C can improve the germination of stored seed[80]. Plant seedlings out into their permanent positions as soon as possible and protect them for their first winter or two[11]. Plants have a very sparse root system and the sooner they are planted into their permanent positions the better they will grow[K]. Trees should be planted into their permanent positions when they are quite small, between 30 and 90cm[200]. We actually plant them out when they are about 5 - 10cm tall. So long as they are given a very good weed-excluding mulch they establish very well[K]. Larger trees will check badly and hardly put on any growth for several years. This also badly affects root development and wind resistance[200]. Cuttings. This method only works when taken from very young trees less than 10 years old. Use single leaf fascicles with the base of the short shoot. Disbudding the shoots some weeks before taking the cuttings can help. Cuttings are normally slow to grow away[81].

nwatta Landscape Uses:Pest tolerant, Specimen. Thrives in a light well-drained sandy or gravelly loam[1, 11]. Dislikes poorly drained moorland soils[1]. Established plants tolerate drought[200]. A fairly wind-resistant species[200], the plants often colonise exposed mountain slopes in the wild, their deep taproot anchoring them firmly[226, 229]. A very cold-tolerant plant when fully dormant[120]. A long-lived but slow-growing tree in the wild[229]. Growth in Britain can be fairly fast, over 30cm a year has been recorded[185]. It is slow to get started but then grows away quite well[120]. It only makes a small tree in cultivation[81]. Seed production in the wild consists of a cycle of one good year followed by several years of low crops[229]. Leaf secretions inhibit the germination of seeds, thereby inhibiting the growth of other plants below the tree[18]. The branches are very flexible[120]. The cones are 7 - 25cm long, they open and shed their seed whilst still attached to the tree[82, 226]. Plants are strongly outbreeding, self-fertilized seed usually grows poorly[200]. They hybridize freely with other members of this genus[200]. This species is closely allied to *P. albaucalis*[11], differing mainly in the cones[226]. Plants in this genus are notably susceptible to honey fungus[200]. Special Features:Attracts birds, Attractive foliage, North American native, Inconspicuous flowers or blooms. The plant is heat tolerant in zones 7 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2]. An evergreen. The root pattern is a tap root similar to a carrot going directly down [1-2].

5.2.57 Crataegus flabellata

Fanleaf hawthorn

4 tlin 8 cyuc 3 kcaak 3 tcan 2 dwat 6 m hkuc hmimhtut cyuti hgattcuphja7n hwicli hrasjlutnyikfrip hpa7tli flatprikwiwslip hpa7tmwatli xre7t hjonli

drutta Crataegus flabellata is a deciduous Shrub growing to 6 m (19ft 8in). See above for USDA hardiness. It is hardy to UK zone 4 and is not frost tender. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kaakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked. A sweet but very soft and mealy flesh, it makes an acceptable dessert fruit[K]. The fruit can be used in making pies, preserves, etc, and can also be dried for later use. The fruit is up to 15mm long and 8mm wide, it is borne in small clusters[82, 229]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta Eastern N. America - Quebec to South Carolina, west to Louisiana. ksacta Thickets and open woods[204]. Dry open places, borders of woods and the margins of high banks of streams[82].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for

Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[200]. Dioecious. Male and female plants must be grown if fruit and seed is required. Special Features: North American native, Inconspicuous flowers or blooms. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is multistemmed with multiple stems from the crown [1-2]. The root pattern is a heart root, dividing from the crown into several primary roots going down and out [1-2].

3.2 mran

3.2.1 Viburnum trilobum

American Cranberry, Highbush Cranberry, Cranberrybush, American Cranberrybush Viburnum

2 tlin 7 cyuc 3 kcaak 0 tcan 1 dwat 3 m hkuc hmimhtut cyuti hgattcup hwicli hrasjlutnyikfrip hpa7tli flatprikwls hpa7tmwatli fyikre7t hjonli

drutta Viburnum trilobum is a deciduous Shrub growing to 3 m (9ft 10in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 2 and is not frost tender. It is in flower in June, and the seeds ripen from July to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. The plant is self-fertile. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought.

pcista Large quantities of the fruit can cause vomiting and diarrhoea[10, 65]. The fruit is of very low or zero toxicity, it only causes mild upsets when eaten unripe or in large quantities[65, 76].

kaakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[3, 11, 161, 257]. Juicy but acid, the taste is best after a frost[62, 101, 102]. The fruits are rich in vitamin C, they are an excellent substitute for cranberries and are used in preserves, jams etc[183]. A jam made from the fruit has a very pleasant flavour that goes well in a porridge[K]. The fruit is about 8mm in diameter and contains a single large seed[200].

dwatta Emetic Febrifuge Laxative Stomachic Vitamin C Women's complaintsAn infusion of the roots has been used in the treatment of prolapse of the uterus[257]. A decoction has been given to babies with fevers[257]. A decoction of the branches has been used to treat a fallen womb after birth[257]. The bark is laxative[257]. An infusion of the roots has been used to make a person vomit in the treatment of bad blood and fevers[257]. An infusion of the inner bark has been used to treat stomach cramps[257].

nrakta N. America - Newfoundland to British Columbia, New Jersey, Michigan, Iowa, South Dakota and Oregon. ksacta Stream banks[62]. Low moist ground[235].

propta Seed - best sown in a cold frame as soon as it is ripe. Germination can be slow, sometimes taking more than 18 months. If the seed is harvested 'green' (when it has fully developed but before it has fully ripened) and sown immediately in a cold frame, it should germinate in the spring[80]. Stored seed will require 2 months warm then 3 months cold stratification and can still take 18 months to germinate[113]. Prick out the seedlings into individual pots when they are large enough to handle and grow them on in a cold frame or greenhouse. Plant out into their permanent positions in late spring or early summer of the following year. Cuttings of soft-wood, early summer in a frame[200]. Pot up into individual pots once they start to root and plant them out in late spring or early summer of the following year. Cuttings of half-ripe wood, 5 - 8 cm long with a heel if possible, July/August in a frame[78, 113]. Plant them into individual pots as soon as they start to root. These cuttings can be difficult to overwinter, it is best to keep them in a greenhouse or cold frame until the following spring before planting them out[113]. Cuttings of mature wood, winter in a frame. They should root in early spring - pot them up when large enough to handle and plant them out in the summer if sufficient new growth is made, otherwise keep them in a cold

frame for the next winter and then plant them out in the spring. Layering of current seasons growth in July/August. Takes 15 months[78].

nwatta Landscape Uses:Foundation, Massing, Screen, Specimen, Winter interest. An easily grown plant, it succeeds in most soils but is ill-adapted for poor soils and for dry situations[1]. It grows well in heavy clay soils. Established plants are drought tolerant[160]. Prefers a deep rich loamy soil in sun or semi-shade[11, 200]. Best if given shade from the early morning sun in spring[200]. This species is considered by some botanists to be no more than a superior fruiting form of *V. opulus* that was taken to America by early settlers[11]. Occasionally cultivated for its edible fruit, there are some named varieties[183]. The fruit is very attractive to birds[160]. Some reports say that this species is self-fertile[17, 200] whilst others say it is self-incompatible[11]. It is probably best to grow at least two different cultivars in order to produce fruit and fertile seed[11, 200]. Special Features: North American native, Attracts butterflies, Blooms are very showy. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is multistemmed with multiple stems from the crown [1-2]. The root pattern is flat with shallow roots forming a plate near the soil surface [1-2].

4 3 tlin

4.1 bwon

4.1.1 Hippophae rhamnoides

Sea Buckthorn, Seaberry
tfo2n 3 tlin 7 cyuc 5 kcaak 5 tcan 5 dwat 6 m hkuc htut cyuti hgatkuyctcuphja7n hwicli hyishrasjlutnyik hpa7tli flatprikwls hpa7tmwatli nyanhjen hjonli

drutta Hippophae rhamnoides is a deciduous Shrub growing to 6 m (19ft) by 2.5 m (8ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 3 and is not frost tender. It is in flower in April, and the seeds ripen from September to October. The species is dioecious (individual flowers are either male or female, but only one sex is to be found on any one plant so both male and female plants must be grown if seed is required), and is pollinated by Wind. The plant is not self-fertile. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry moist or wet soil and can tolerate drought. The plant can tolerate maritime exposure.

pcista Some reports suggest that the fruit is poisonous[13, 100], whilst it may be very acid it is most definitely not poisonous[65]. Avoid during pregnancy.

kaakta Edible Parts: Fruit OilEdible Uses: OilFruit - raw or cooked. Very rich in vitamin C (120mg per 100g)[74] and vitamin A[183], they are too acid when raw for most peoples tastes[11, 158], though most children seem to relish them[K]. Used for making fruit juice, it is high in vitamins and has an attractive aroma[141]. It is being increasingly used in making fruit juices, especially when mixed with other fruits, because of its reputed health benefits[214]. The fruits of some species and cultivars (not specified) contain up to 9.2% oil[214]. The fruit is very freely borne along the stems[K] and is about 6 - 8mm in diameter[200]. The fruit becomes less acid after a frost or if cooked[74]. The fruit is ripe from late September and usually hangs on the plants all winter if not eaten by the birds. It is best used before any frosts since the taste and quality of frosted berries quickly deteriorates[214].

tcanta Charcoal Cosmetic Dye Fodder Fuel Oil Pioneer Soil stabilization WoodVery tolerant of maritime exposure[29, 49, 75, 182], it can be used as a shelter hedge. It dislikes much trimming[75]. A very thorny plant, it quickly makes an impenetrable barrier. Sea buckthorn has an extensive root system and suckers vigorously and so has been used in soil conservation schemes, especially on sandy soils. The fibrous and suckering root system acts to bind the sand[186, 244]. Because the plant grows quickly, even in very exposed conditions, and also adds nitrogen to the soil, it can be used

as a pioneer species to help the re-establishment of woodland in difficult areas. Because the plant is very light-demanding it will eventually be out-competed by the woodland trees and so will not out-stay its welcome[K]. The seeds contain 12 - 13% of a slow-drying oil[240]. The vitamin-rich fruit juice is used cosmetically in face-masks etc[9]. A yellow dye is obtained from the fruit[74]. A yellow dye is obtained from the stems, root and foliage[4]. A blackish-brown dye is obtained from the young leaves and shoots[74]. Wood - tough, hard, very durable, fine-grained. Used for fine carpentry, turning etc[46, 61, 74]. The wood is also used for fuel and charcoal[146].

dwatta Astringent Cancer Cardiac Eczema Poulrice Tonic Vermifuge Vitamin CThe twigs and leaves contain 4 - 5% tannin[240]. They are astringent and vermifuge[7, 100]. The tender branches and leaves contain bio-active substances which are used to produce an oil that is quite distinct from the oil produced from the fruit. Yields of around 3% of oil are obtained[240]. This oil is used as an ointment for treating burns[214]. A high-quality medicinal oil is made from the fruit and used in the treatment of cardiac disorders, it is also said to be particularly effective when applied to the skin to heal burns, eczema and radiation injury, and is taken internally in the treatment of stomach and intestinal diseases[214]. The fruit is astringent and used as a tonic[9, 254]. The freshly-pressed juice is used in the treatment of colds, febrile conditions, exhaustion etc[9]. The fruit is a very rich source of vitamins and minerals, especially in vitamins A, C and E, flavanoids and other bio-active compounds. It is also a fairly good source of essential fatty acids, which is fairly unusual for a fruit. It is being investigated as a food that is capable of reducing the incidence of cancer and also as a means of halting or reversing the growth of cancers[214]. The juice is also a component of many vitamin-rich medicaments and cosmetic preparations such as face-creams and toothpastes[9]. A decoction of the fruit has been used as a wash to treat skin irritation and eruptions[254].

nrakta Europe, including Britain, from Norway south and east to Spain and Asia to Japan and the Himalayas. ksacta Usually found near the coast, often forming thickets on fixed dunes and sea cliffs[9, 17, 244].

propta Seed - sow spring in a sunny position in a cold frame[78]. Germination is usually quick and good although 3 months cold stratification may improve the germination rate. Alternatively the seed can be sown in a cold frame as soon as it is ripe in the autumn. Prick out the seedlings into individual pots when they are large enough to handle and grow on in a greenhouse for their first winter. Plant out in late spring into their permanent positions. Male seedlings, in spring, have very prominent axillary buds whilst females are clear and smooth at this time[78]. Cuttings of half-ripe wood, June/July in a frame[200]. Difficult[113]. This is the easiest method of vegetative propagation[214]. Cuttings of mature wood in autumn[200]. Difficult[113]. The cuttings should be taken at the end of autumn or very early in the spring before the buds burst. Store them in sand and peat until April, cut into 7 - 9cm lengths and plant them in a plastic tent with bottom heat[214]. Rooting should take place within 2 months and they can be put in their permanent positions in the autumn[214]. Division of suckers in the winter. They can be planted out direct into their permanent positions and usually establish well and quickly[K]. Layering in autumn[200].

nwatta Agroforestry Services: Alley crop Agroforestry Services: Nitrogen Agroforestry Services: Wind-break Fodder: Bank Industrial Crop: Biomass Management: Coppice Management: Standard Other Systems: Strip intercrop Staple Crop: OilLandscape Uses:Border, Seashore, Specimen. Succeeds in most soils[200], including poor ones[186], so long as they are not too dry[182, 200]. Grows well by water and in fairly wet soils[182]. Established plants are very drought resistant[186]. Requires a sunny position[3], seedlings failing to grow in a shady position and mature shrubs quickly dying if overshadowed by taller plants[186]. Does well in very sandy soils[1, 186]. Very tolerant of maritime exposure[75]. Plants are fairly slow growing[75]. Although usually found near the coast in the wild, they thrive when grown inland[11] and are hardy to about -25°c[184]. A very ornamental plant[1, 11], it is occasionally cultivated, especially in N. Europe, for its edible fruit, there are some named varieties[183]. 'Leikora' is a free-fruited form, developed for its ornamental value. Members of this genus are attracting considerable interest from breeding

institutes for their nutrient-rich fruits that can promote the general health of the body (see edible and medicinal uses below)[214]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[113, 186, 200]. Plants produce abundant suckers, especially when grown on sandy soils[186]. Dioecious. Male and female plants must be grown if seed is required. The sexes of plants cannot be distinguished before flowering, but on flowering plants the buds of male plants in winter are conical and conspicuous whilst female buds are smaller and rounded[11]. Plants in this genus are notably resistant to honey fungus[200].Special Features:Not North American native, Naturalizing, Inconspicuous flowers or blooms. The plant is heat tolerant in zones 8 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. A clumping plant, forming a colony from shoots away from the crown but with a limited spread [1-2]. The root pattern is suckering with new plants from underground runners away from the plant [1-2]. In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is suckering with new plants from underground runners away from the plant [2-1].

4.1.2 Elaeagnus umbellata

Autumn Olive
tfo2n 3 tlin 7 cyuc 4 kcaak 3 tean 2 dwat 4.5 m hkuc
htuc cyutli hgatkyuctcup hwicli hyhshrasljutnyik hpa7tli flat-prikliwis hpa7tmwattli xre7t hjonli

drutta Elaeagnus umbellata is a deciduous Shrub growing to 4.5 m (14ft) by 4 m (13ft) at a medium rate. See above for USDA hardness. It is hardy to UK zone 3 and is not frost tender. It is in flower from May to June, and the seeds ripen from September to November. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. It can fix Nitrogen. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

pcista E. umbellata has the potential of becoming one of the most troublesome adventive shrubs in the central and eastern United States.

kcaakta Edible Parts: Fruit SeedEdible Uses: Fruit - raw or cooked[2, 46, 105]. Juicy and pleasantly acid, they are tasty raw and can also be made into jams, preserves etc[160, 183, 194]. The fruit must be fully ripe before it can be enjoyed raw, if even slightly under-ripe it will be quite astringent[K]. The fruit contains about 8.3% sugars, 4.5% protein, 1% ash[194]. The vitamin C content is about 12mg per 100g[194]. Mature bushes in the wild yield about 650g of fruit over 2 - 3 pickings[194]. The harvested fruit stores for about 15 days at room temperature[194]. The fruit is about 8mm in diameter[200] and contains a single large seed[K]. Seed - raw or cooked[194]. It can be eaten with the fruit though the seed case is rather fibrous[160].

tcanta Companion Fodder Fuel Hedge HedgeVery tolerant of maritime exposure, it makes a good informal hedge, succeeding even in very exposed positions[75]. The plants make a reasonable wind-protecting screen, they are about as wide as they are tall. They make a good companion hedge, enriching the soil and fertilizing neighbouring plants[K]. The wood is a good fuel[146].

Chalk downs in S. England but only where there is least sunshine and most rain, heaths, moors, pine and birch woods in the north of Scotland on acid peat, often dominant on chalk, limestone and slead.

propta The seed requires a period of cold stratification. The seed has a hard seedcoat and can be very slow to germinate, requiring a cold period followed by a warm period and then another cold spell, each of 2 - 3 months duration[78, 81]. Soaking the seed for 3 - 6 seconds in boiling water may speed up the germination process[11]. The seed is best sown as soon as it is ripe in a cold frame. Some might germinate in the following spring, though most will take another year. Another possibility is to harvest the seed 'green' (when the embryo has fully formed but before the seedcoat has hardened). The seedlings can be potted up into individual pots when they are large enough to handle. Grow on in pots until large enough, then plant out in early summer. When stored dry, the seed can remain viable for several years[1]. Cuttings of mature wood, 5 - 10cm with a heel, September/October in a cold frame. Plant out in the following autumn[1, 78]. Layering in September/October. Takes 12 months[78].

nwatta Landscape Uses:Specimen. An easily grown plant, it succeeds in hot dry soils and in poor soils. Succeeds in most soils so long as they are well drained[186], preferring a neutral or slightly alkaline soil. Does well in chalky soils[1]. Grows well in heavy clay soils. Tolerates a pH range from 4 to 8[186]. Succeeds in light woodland but dislikes heavy shade[186]. Established plants are very tolerant of drought[186]. Although the fully dormant plant is cold-tolerant throughout Britain, the young growth in spring can be damaged by late frosts. All parts of the plant are very aromatic[245]. Juniper is a very polymorphic species that has a long history of culinary and medicinal use[244]. It is frequently grown in the ornamental and herb garden, there is a huge range of cultivars of widely diverse habits[11, 81]. At least some forms tolerate maritime exposure[186], there is a thriving colony in an exposed position at Land's End in Cornwall[81]. The fruits take 2 - 3 years to ripen on the plant[11]. Plants are usually very slow growing, often only a few centimetres a year[186]. Resists honey fungus[88]. Plants are sometimes attacked by a rust, this fungus has an aecidial stage on hawthorn (Crataegus spp.)[1]. Dioecious. Male and female plants must be grown if seed is required. Special Features: North American native, Fragrant foliage, Inconspicuous flowers or blooms.

5.2.55 Castanea crenata

Japanese Chestnut
4 tin 8 cyuc 3 kcaak 0 tcan 0 dwat 9 m hkuc
hmimhtuc cyutli hgatkyuctcup hwicli hyhshrasljutnyik hpa7tli frusflatprik hpa7tmwattli hjonli

drutta Castanea crenata is a deciduous Tree growing to 9 m (29ft 6in). See above for USDA hardness. It is hardy to UK zone 4. It is in flower in July, and the seeds ripen in October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought.

kcaakta Edible Parts: SeedEdible Uses: Seed - raw or cooked[1, 46, 61]. A good potato substitute[63, 105, 142, 171]. A source of starch[177]. Very poor flavour[142]. Coarse and of little value. Very variable in size and quality, any astringency can be removed by boiling the seed in salty water[183].

tcanta Tannin WoodThe bark, leaves, wood and seed husks all contain tannin. Wood - hard, strong, light, very durable. Used for furniture, construction, fence posts etc[46, 61].

nrakta E. Asia - Japan. ksacta Foothills[58].

propta Seed - where possible sow the seed as soon as it is ripe in a cold frame or in a seed bed outdoors[78]. The seed must be protected from mice and squirrels. The seed has a short viability and must not be allowed to become dry. It can be stored in a cool place, such as the salad compartment of a fridge, for a few months if it is kept moist, but check regularly for signs of germination. The seed should germinate in late

winter or early spring. If sown in an outdoor seedbed, the plants can be left in situ for 1 - 2 years before planting them out in their permanent positions. If grown in pots, the plants can be put out into their permanent positions in the summer or autumn, making sure to give them some protection from the cold in their first winter[K].

nwatta Industrial Crop: Tannin Management: Standard Regional Crop Staple Crop: Balanced carbPrefers a good well-drained slightly acid loam but succeeds in dry soils[1, 11, 200]. Once established, it is very drought tolerant[1, 11, 200]. Very tolerant of highly acid, infertile dry sands[200]. Averse to calcareous soils but succeeds on harder limestones[11, 200]. The majority of species in this genus only really thrive in areas with hot summers, though this species is better adapted to British conditions than most[200]. Cultivated for its edible seed in Japan, there are many named varieties[58, 63, 183]. It is often also cultivated for its seed in America because it is fairly resistant to chestnut blight[171, 200]. Individual trees are very variable with regard to size of the seed, resistance to blight and astringency of the seed[183]. Some cultivars have the largest seeds of any member of this genus. Trees fruit freely when only 3 - 3.5 metres tall[11]. This species is occasionally planted as a timber tree in S. Europe[50]. An excellent soil-enriching understory in pine forests[200]. Flowers are produced on wood of the current year's growth[229]. Plants are fairly self-sterile[200]. They hybridize freely with other members of this genus[200]. Plants in this genus are notably resistant to honey fungus[200].

5.2.56 Pinus flexilis

Limber Pine, Rocky Mountain White Pine
4 tin 7 cyuc 3 kcaak 3 tean 2 dwat 25 m hkuc
htuc cyutli hgatkyuctcup hwicli hyhshrasljutnyik hpa7tli flatprik hpa7tmwattli dyat hjonli

drutta Pinus flexilis is an evergreen Tree growing to 25 m (82ft 0in) at a medium rate. See above for USDA hardness. It is hardy to UK zone 3. It is in leaf all year, in flower from May to June, and the seeds ripen from September to October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. The plant is not self-fertile. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista The wood, sawdust and resins from various species of pine can cause dermatitis in sensitive people[222].

kcaakta Edible Parts: Inner bark SeedEdible Uses: CondimentSeed - raw or cooked[2, 105, 161, 177, 257]. The oil-rich seed has a delicious flavour with a hint of resin[K]. The seeds can also be ground into a powder and used in making bread, biscuits, as a thickener in soups etc[226]. A reasonable size, the seed is up to 11mm x 9mm[200], with a thick shell[82]. Inner bark[105, 161]. There are no more details but inner bark is often dried, ground into a powder and then used as a thickener in soups etc or added to cereals when making bread. A vanilla flavouring is obtained as a by-product of other resins that are released from the pulp-wood[200].

tcanta Dye Herbicide Shelterbelt WoodA tan or green dye is obtained from the needles[168]. The needles contain a substance called terpene, this is released when rain washes over the needles and it has a negative effect on the germination of some plants, including wheat[201]. A fairly wind resistant tree, it can be grown as part of a shelterbelt planting[200]. Oleo-resins are present in the tissues of all species of pines, but these are often not present in sufficient quantity to make their extraction economically worthwhile[64]. The resins are obtained by tapping the trunk, or by destructive distillation of the wood[4, 64]. In general, trees from warmer areas of distribution give the higher yields[64]. Turpentine consists of an average of 20% of the oleo-resin[64] and is separated by distillation[4, 64]. Turpentine has a wide range of uses including as a solvent for waxes etc, for making varnish, medicinal etc[4]. Rosin is the substance left after turpentine is removed. This is used by violinists on their bows and also in making sealing wax, varnish etc[4]. Pitch can also be

or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

ksakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[105, 177, 235]. Juicy[43]. A very nice flavour, it makes a very good dessert fruit[K]. The fruit can also be used in making pies, preserves, etc, and can be dried for later use. The fruit is up to 20mm in diameter with a thick flesh[235]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta Eastern N. America - Quebec to New York. ksakta Rocky banks and open woods on low limestone ridges[43, 82].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. This species is growing in a number of botanical gardens in Britain, where it is fruiting very well[K]. Some botanists do not recognise it as a distinct species and place it as part of *C. pedicellata*[82]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

5.2.54 Juniperus communis

Juniper, Common juniper

4 tin 10 cyuc 3 kcak 4 tcan 3 dwat 9 m hkuc hmimhtut cyutli hgatkyuctup hwicli hyishrasjnutnykfrp hpa7tli frusfatprkwisslip hpa7tmwatli nyanhjen hjonli

drutta Juniperus communis is an evergreen Shrub growing to 9 m (29ft) by 4 m (13ft) at a slow rate. See above for

USDA hardiness. It is hardy to UK zone 2 and is not frost tender. It is in leaf all year, in flower from May to June, and the seeds ripen in October. The species is dioecious (individual flowers are either male or female, but only one sex is to be found on any one plant so both male and female plants must be grown if seed is required). and is pollinated by Wind. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay and nutritionally poor soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid and very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

pcista Although the fruit of this plant is quite often used medicinally and as a flavouring in various foods and drinks, large doses of the fruit can cause renal damage. Juniper should not be used internally in any quantities by pregnant women[65, 165]. Diarrhoea with repeated use. Avoid in kidney disease. Do not use internally for more than 6 weeks [301].

ksakta Edible Parts: Fruit Leaves SeedEdible Uses: Coffee Condiment TeaFruit - raw or cooked[2, 5, 9, 15]. It is usually harvested in the autumn when fully ripe and then dried for later use[12]. A soft, mealy, sweet, resinous flesh[82]. The fruit is often used as a flavouring in sauerkraut, stuffings, vegetable pates etc, and is an essential ingredient of gin[183]. The aromatic fruit is used as a pepper substitute according to one report[183]. An essential oil is sometimes distilled from the fruit to be used as a flavouring[183]. Average yields are around 1%[7]. The cones are about 4 - 8mm in diameter and take 2 - 3 years to mature[82, 200]. Some caution is advised when using the fruit, see the notes above on toxicity. The roasted seed is a coffee substitute[177]. A tea is made by boiling the leaves and stems[161]. A tea made from the berries has a spicy gin-like flavour[183].

tcanta Fibre Fuel Hair Incense Repellent Resin Strewing TindaA decoction of the branches is used as an anti-dandruff shampoo[172]. The essential oil distilled from the fruits is used in perfumes with spicy fragrances[238]. In hot countries the tree yields the resin 'Sandarac' from incisions in the trunk[4, 74]. This is used in the production of a white varnish[74]. The stems were at one time used as a strewing herb to sweeten the smell of rooms[14, 244]. The whole plant can be burnt as an incense and fumigant[66, 102, 146]. It was used during epidemics in the belief that it would purify the air and cleanse it of infection[244]. Fresh or dried juniper branches also make a good insect repellent[102, 172]. Many forms of this species are good ground cover plants for sunny situations[208]. Forms to try include 'Depressa Aurea', 'Dumosa', 'Effusa', and 'Repanda'[197]. 'Prostrata' can also be used[188]. The bark is used as cordage[61] and as a tinder[172]. Wood - strong, hard, fragrant, very durable in contact with the soil and very close-grained, but usually too small to be of much use[82, 229, 244, 245]. It makes an excellent fuel[66].

dwatta Antiseptic Aromatherapy Aromatic Carminative Diaphoretic Diuretic Rubefacient Stomachic Tonic UrinaryJuniper fruits are commonly used in herbal medicine, as a household remedy, and also in some commercial preparations. They are especially useful in the treatment of digestive disorders plus kidney and bladder problems[4]. The fully ripe fruits are strongly antiseptic, aromatic, carminative, diaphoretic, strongly diuretic, rubefacient, stomachic and tonic[4, 7, 9, 21, 46, 165, 240, 254]. They are used in the treatment of cystitis, digestive problems, chronic arthritis, gout and rheumatic conditions[254]. They can be eaten raw or used in a tea[222], but some caution is advised since large doses can irritate the urinary passage[4]. Externally, it is applied as a diluted essential oil, having a slightly warming effect upon the skin and is thought to promote the removal of waste products from underlying tissues[254]. It is, therefore, helpful when applied to arthritic joints etc[254]. The fruits should not be used internally by pregnant women since this can cause an abortion[9]. The fruits also increase menstrual bleeding so should not be used by women with heavy periods[254]. When made into an ointment, they are applied to exposed wounds and prevent irritation by flies[4]. The essential oil is used in aromatherapy. Its keyword is 'Toxin elimination'[210].

nrakta Northern temperate zone, incl Britain, south to the mountains of N. Africa, Himalayas and California ksakta

dwatta Astringent Cancer Cardiac Pectoral Stimulant Vitamin CThe flowers are astringent, cardiac and stimulant[240]. The seeds are used as a stimulant in the treatment of coughs[240]. The expressed oil from the seeds is used in the treatment of pulmonary affections[240]. The fruit of many members of this genus is a very rich source of vitamins and minerals, especially in vitamins A, C and E, flavanoids and other bio-active compounds. It is also a fairly good source of essential fatty acids, which is fairly unusual for a fruit. It is being investigated as a food that is capable of reducing the incidence of cancer and also as a means of halting or reversing the growth of cancers[214].

nrakta E. Asia - China, Japan, Himalayas. ksakta Thickets and thin woods in the lowland and hills[58].

propta Seed - best sown as soon as it is ripe in a cold frame[78]. It should germinate in late winter or early spring, though it may take 18 months[K]. Stored seed can be very slow to germinate, often taking more than 18 months. A warm stratification for 4 weeks followed by 12 weeks cold stratification can help[98]. The seed usually (eventually) germinates quite well[78]. Prick out the seedlings into individual pot as soon as they are large enough to handle and plant out when they are at least 15cm tall. Cuttings of half-ripe wood, 7 - 10cm with a heel, July/August in a frame. Good percentage[78]. Cuttings of mature wood of the current year's growth, 10 - 12cm with a heel, November in a frame. Leave for 12 months. Fair to good percentage[78]. Layering in September/October. Takes 12 months[78].

nwatta Agroforestry Services: Nitrogen Agroforestry Services: Windbreak Fodder: Bank Industrial Crop: Biomass Management: Coppice Management: Standard Minor Global CropSucceeds in most soils that are well-drained[11, 200], though it dislikes shallow chalk soils[98]. It prefers a soil that is only moderately fertile, succeeding in very poor soils and in dry soils[11, 200]. Prefers a light sandy loam and a sunny position[11]. Established plants are very drought resistant[1]. A very hardy plant, tolerating temperatures down to at least -40°C[200]. This species is somewhat similar to *E. multiflora*, but it flowers a few weeks later[182]. Sometimes cultivated for its edible fruit, there are some named varieties[183]. 'Cardinal' and 'Red Wing' are very good fruiting forms (developed for ornament and not for fruit quality)[182]. 'Jazbo' has been bred for its edible fruits which are said to be ripe when 'they drop into your hand'[214]. This makes them valuable in breeding programmes to develop easily harvested fruits[214]. Flowers are rich in nectar and very aromatic, they are much visited by bees. Polymorphic[11, 275]. This species is notably resistant to honey fungus[88, 200]. Plants can fruit in 6 years from seed[160]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[160, 200]. An excellent companion plant, when grown in orchards it can increase yields from the fruit trees by up to 10%. In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is branching: a heart root, dividing from the crown into several primary roots going down and out [2-1].

4.1.3 Elaeagnus parvifolia

Autumn olive

tfo2n 3 tin 7 cyuc 4 kcak 2 tcan 2 dwat 4.5 m hkuc htut cyutli hgatkyuctup hwicli hyishrasjnutnyk hpa7tli fatprkrlwis hpa7tmwatli xre7t hjonli

drutta Elaeagnus parvifolia is a deciduous Shrub growing to 4.5 m (14ft) by 3 m (9ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 3 and is not frost tender. It is in flower from May to June, and the seeds ripen from September to November. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

ksakta Edible Parts: Fruit SeedEdible Uses: Fruit - raw, cooked or added to curries[2, 105, 183]. The fruit must be fully ripe before it can be enjoyed raw, if even slightly under-ripe it will be quite astringent - though children seem to love it at the slightly unripe stage[K]. The fruit is about 8mm in diameter[200] and contains a single large seed[K]. Seed - raw or cooked. It can be eaten with the fruit though the seed case is rather fibrous.

tcanta Hedge HedgeVery tolerant of maritime exposure, it can be grown as an informal hedge in exposed positions[75].

dwatta Astringent Cancer DysenteryThe unripe fruit is astringent and is eaten in the treatment of bloody dysentery[272]. The fruit of many members of this genus is a very rich source of vitamins and minerals, especially in vitamins A, C and E, flavanoids and other bio-active compounds. It is also a fairly good source of essential fatty acids, which is fairly unusual for a fruit. It is being investigated as a food that is capable of reducing the incidence of cancer and also as a means of halting or reversing the growth of cancers[214].

nrakta E. Asia - Himalayas. ksakta Shrubberies, 1500 - 3000 metres, from Afghanistan to S.W. China[51]. Forest openings at elevations of 1300 - 3000 metres in Nepal[272].

propta Seed - best sown as soon as it is ripe in a cold frame[78]. It should germinate in late winter or early spring, though it may take 18 months[K]. Stored seed can be very slow to germinate, often taking more than 18 months. A warm stratification for 4 weeks followed by 12 weeks cold stratification can help[98]. The seed usually (eventually) germinates quite well[78]. Prick out the seedlings into individual pot as soon as they are large enough to handle and plant out when they are at least 15cm tall. Cuttings of half-ripe wood, 7 - 10cm with a heel, July/August in a frame. Good percentage[78]. Cuttings of mature wood of the current year's growth, 10 - 12cm with a heel, November in a frame. Leave for 12 months. Fair to good percentage[78]. Layering in September/October. Takes 12 months[78].

nwatta Succeeds in most soils that are well-drained[11, 200]. Prefers a soil that is only moderately fertile, succeeding in very poor soils and in dry soils[11, 200]. Prefers a light sandy loam and a sunny position[11]. Dislikes shallow chalk soils[98]. Plants are very drought resistant[1] and very tolerant of maritime exposure[75]. A very hardy plant, tolerating temperatures down to at least -40°C[200]. Somewhat similar to *E. multiflora*, but flowering a few weeks later[182]. The flowers are rich in nectar and very aromatic, they are much visited by bees. This species is notably resistant to honey fungus[88, 200]. Plants can fruit in 6 years from seed[160]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[160, 200]. An excellent companion plant, when grown in orchards it can increase yields from the fruit trees by up to 10%.

4.1.4 Gymnocladus dioica

Kentucky Coffee Tree

tfo2n 3 tin 8 cyuc 3 kcak 0 tcan 2 dwat 20 m hkuc htut cyutli hgatkyuctup hwicli hyishrasjnutnyk hpa7tli fatprkrlkwissliphsom hpa7tmwatli nyanhjen hjonli

drutta Gymnocladus dioica is a deciduous Tree growing to 20 m (65ft) by 15 m (49ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 4. It is in flower in June, and the seeds ripen in October. The species is dioecious (individual flowers are either male or female, but only one sex is to be found on any one plant so both male and female plants must be grown if seed is required). The plant is not self-fertile. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline and saline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. It can tolerate atmospheric pollution.

pcista The ripe seed contains hydrocyanic acid. This toxin can be destroyed by thoroughly heating the seed for at least 3 hours at 150°C[183]. The seed contains saponins[222]. Although toxic, these substances are very poorly absorbed by the body and so tend to pass through

without causing harm. They are also broken down by heat so a long slow baking can destroy them. Saponins are found in many plants, including several that are often used for food, such as certain beans. It is not advisable to eat large quantities of food that contain saponins. Saponins are much more toxic to some creatures, such as fish, and hunting tribes have traditionally put large quantities of them in streams, lakes etc in order to stupefy or kill the fish[K].

kcakta Edible Parts: Seed Seedpod**Edible Uses:** CoffeeSeedpod - raw or cooked. The roasted seeds can be eaten like sweet chestnuts[257]. The pulp is sweet[2, 82]. A flavour like caramell[222]. The pods are up to 25cm long and 5cm wide[229]. The roasted seed is a caffeine-free coffee substitute[2, 11, 46, 95, 213]. A bitter flavour[226]. Thorough roasting for at least 3 hours at 150°C is necessary in order to destroy the poisonous hydrocyanic acid that is found in the seed[183]. Seed - roasted and eaten like a nut[161, 213, 226]. The seed contains toxic substances, see notes above.

tcanta Insecticide Miscellany Soap Soil reclamation WoodThe fruit is high in saponins and is used as a soap[200]. The leaves are used as a fly poison[222]. Trees are planted on the spoil tips of mines to stabilize and reclaim the soil[200]. Wood - coarse-grained, heavy though not hard, strong, very durable in contact with the soil, finishes to a fine lustre. A handsome wood, it weighs 43lb per cubic foot and is used for cabinet work, furniture, construction, fencing etc[46, 61, 82, 171, 229, 235].

dwatta Homeopathy MiscellanyThe pulverised root bark is used as an effective enema[213, 222, 257]. A tea made from the bark is diuretic[222]. It is used in the treatment of coughs due to inflamed mucous membranes and also to help speed up a protracted labour[222]. A snuff made from the pulverized root bark has been used to cause sneezing in comatose patients[257]. A tea made from the leaves and pulp from the pods is laxative and has also been used in the treatment of reflex troubles[222]. A decoction of the fresh green pulp of the unripe fruit is used in homeopathic practice[82].

nrakta Eastern and Central N. America - New York to Tennessee, west to Arkansas and South Dakota. ksacta Prefers deep rich soils in bottomlands, deep ravines and moist lower slopes[229].

propta Seed - best sown in a greenhouse as soon as it is ripe[200]. The seed can also be sown in early spring in a greenhouse[78]. Scarification and pre-soaking the seed for 24 hours in warm water, especially if it has been stored, will improve germination[200]. Make sure the seed has swollen after soaking, soak it again if it has not and, if it still does not swell, try fling away some of the seedcoat but be careful not to damage the embryo. As soon as they are large enough to handle, prick the seedlings out into fairly deep individual pots and grow them on in the greenhouse for at least their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. Consider giving them some protection against the cold for their first couple of winters outdoors Root cuttings 4cm long and 1cm thick in a greenhouse in December[200]. Plant the roots horizontally in pots[78]. Good percentage.

nwatta Landscape Uses:Pest tolerant, Specimen, Street tree. Requires a deep rich soil and a sunny position[1, 200]. Tolerates drought, atmospheric pollution, salt and limestone soils[200]. A very cold-hardy plant, tolerating temperatures down to about -30°C[200]. A very ornamental[1] but slow growing tree[11], it rarely flowers in Britain, requiring more summer heat than it usually gets here[11, 200]. Trees in the wild seldom live longer than 100 years[229]. The tree has a light canopy so does not cast much shade[200], making it a good tree to use for the top canopy of a woodland garden. Dioecious. Male and female plants must be grown if seed is required. Unlike most members of the Leguminosae, his species does not form nodules of nitrogen-producing bacteria on the roots[274]. **Special Features:** North American native, Fragrant flowers, Inconspicuous flowers or blooms.

4.1.5 Shepherdia argentea

Buffalo Berry, Silver Buffaloberry, tfo2n 3 tlin 9 cyuc 3 kcaak 4 tcan 1 dwat 4 m hkuc hmimhtut cyutli hgattkuyctup hwicli hysirhasjlatnyik hpa7tli flatprklwis hpa7tmwatli nyanhjen hjonli

drutta Shepherdia argentea is a deciduous Shrub growing to 4 m (13ft) by 4 m (13ft) at a medium rate. See above

for USDA hardiness. It is hardy to UK zone 2 and is not frost tender. It is in flower in March, and the seeds ripen from July to December. The species is dioecious (individual flowers are either male or female, but only one sex is to be found on any one plant so both male and female plants must be grown if seed is required). . The plant is not self-fertile. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

pcista The fruit contains low concentrations of saponins[101]. Although toxic, these substances are very poorly absorbed by the body and so tend to pass through without causing harm. They are also broken down by thorough cooking. Saponins are found in many plants, including several that are often used for food, such as certain beans. It is advisable not to eat large quantities of food that contain saponins. Saponins are much more toxic to some creatures, such as fish, and hunting tribes have traditionally put large quantities of them in streams, lakes etc in order to stupefy or kill the fish[K].

kcakta Edible Parts: Fruit**Edible Uses:** Fruit - raw or cooked[1, 2, 11, 61, 161, 257]. It can also be dried and used like currants[3, 46]. A tart but pleasant flavour even before a frost[85, 183], it becomes sweeter after frosts[3, 62, 95]. The fruit is also used for making preserves, pies etc[183]. The fruit should be used in moderation due to the saponin content[101]. The fruit is produced singly or in clusters, it is up to 9mm long and contains a single seed[229].

tcanta Dye Hedge Hedge Soil stabilizationThe plants can be grown as a hedge[160] and windbreak[229]. A red dye is obtained from the fruit[57, 106, 257]. Because it has a wide-ranging root system, forms thickets and is wind tolerant, it is sometimes planted for erosion control[229].

dwatta Febrifuge Laxative StomachicThe berries are febrifuge, laxative and stomachic[257]. They have been eaten in the treatment of stomach complaints, constipation and fevers[257].

nrakta Central N. America - Manitoba to New Mexico. ksacta Banks of streams[43] and open wooded areas, often on limestone[101] and on sandy soils[229].

propta Seed - it must not be allowed to dry out[113]. It is best harvested in the autumn and sown immediately in a cold frame. Stored seed requires 2 - 3 months cold stratification[113]. Prick out the seedlings into individual pots once they are large enough to handle. If sufficient growth is made it will be possible to plant them out in the summer, otherwise grow them on in a cold frame for their first winter and plant them out in the following spring or early summer. Cuttings of half-ripe wood, July/August in a frame sometimes work[113].

nwatta Landscape Uses:Erosion control, Massing. Succeeds in an ordinary well-drained moisture retentive soil[1, 3, 11]. Tolerates poor dry soils[200] and maritime exposure[182]. Established plants are drought resistant[182]. A very cold-tolerant plant[229]. Plants rarely produce fruit in Britain[11]. Occasionally cultivated for its edible fruit, there are some named varieties[183]. 'Xanthocarpa' has yellow fruits[200]. The fruit is difficult to harvest because the shrub is very thorny[3]. Plants in this genus are notably resistant to honey fungus[200]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[200]. Dioecious. Male and female plants must be grown if fruit and seed are required. **Special Features:**Attractive foliage, North American native, Inconspicuous flowers or blooms. The plant is heat tolerant in zones 6 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.)

species), and wrapped into a coil. The free end was set on fire and kept smouldering by blowing on it at intervals. Fire could be carried in this fashion for several hours[257]. The bark can be wound around a stick and used as a torch to provide light and carry fire to a new campsite[257]. The bark can be rubbed between the hands until it is soft and the fibres can then be woven into clothing[257]. The bark can also be rolled into rope, coiled and then sown to form sandals shoes[257]. The root fibre is used to make twined baskets[257]. The branches have been burnt as an incense and fumigant in the home[257]. The dried seeds have been used as beads or as the 'rattle' in rattles[216]. Wood - very close-grained, light, soft, exceedingly durable. It is easily worked and can be exquisitely finished. Because of its small size, however, it is mainly used for fencing, fuel[46, 61, 82, 229].

dwatta Analgesic Antiseptic Birthing aid Blood tonic Diuretic Febrifuge Laxative Miscellany Odontalgic PoulitceWestern juniper was quite widely employed as a medicinal herb by a number of native North American tribes who used it to treat a variety of complaints, especially those related to the kidneys and the skin[257]. It is rarely, if at all, used in modern herbalism. The leaves are blood tonic and laxative[216]. A decoction is used in the treatment of constipation, coughs and colds[216]. An infusion of the leaves has been taken by pregnant women prior to giving birth in order to relax the muscles[257]. A poultice of the pounded moistened leaves has been applied to the jaw to treat swollen and sore gums and toothaches[257]. The berries are analgesic, blood tonic and diuretic[257]. A decoction is used to relieve the pain of menstrual cramps and to induce urination[257]. Externally, the decoction is used as a poultice on rheumatic joints[257]. The young twigs are antiseptic, blood tonic and febrifuge[257]. A decoction is used in the treatment of kidney problems, fevers, stomach aches, smallpox, influenza and haemorrhages[257]. The branches have been used in a sweat bath to ease rheumatism[257]. A poultice of the twigs has been used as a dressing on burns and as a drawing agent on boils or splinters[257]. A decoction has been used as an antiseptic wash on sores[257]. The leaves or young twigs have been burnt and the smoke inhaled to ease the pain of headaches[257].

nrakta Western N. America - British Columbia to the Sierra Nevada. ksacta Usually found on thin rocky or sandy soils[229] on desert foothills and lower mountains[60], also on windswept peaks[82] up to elevations of 3,000 metres where they become low gnarled shrubs[229].

propta The seed requires a period of cold stratification. The seed has a hard seedcoat and can be very slow to germinate, requiring a cold period followed by a warm period and then another cold spell, each of 2 - 3 months duration[78, 81]. Soaking the seed for 3 - 6 seconds in boiling water may speed up the germination process[11]. The seed is best sown as soon as it is ripe in a cold frame. Some might germinate in the following spring, though most will take another year. Another possibility is to harvest the seed 'green' (when the embryo has fully formed but before the seedcoat has hardened). The seedlings can be potted up into individual pots when they are large enough to handle. Grow on in pots until large enough, then plant out in early summer. When stored dry, the seed can remain viable for several years[1]. Cuttings of mature wood, 5 - 10cm with a heel, September/October in a cold frame. Plant out in the following autumn[1, 78]. Layering in September/October. Takes 12 months[78].

nwatta Succeeds in most soils, including chalk, so long as they are well drained[1, 11], preferring a neutral or slightly alkaline soil[11]. Established plants are drought tolerant, succeeding in hot dry positions[200]. Plants are slow-growing, though they can live for 3000 years in the wild[200, 229]. They are much shorter-lived in cultivation[200], growing better in dry areas with hot summers[200]. Western Britain is generally to cool and wet for this species to thrive[200]. Plants are usually monoecious but are sometimes dioecious. Male and female plants must usually be grown if seed and fruit is required. The fruit takes two summers to ripen[229]. Plants are resistant to honey fungus[88]. In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is flat with shallow roots spreading near the soil surface [2-1].

5.2.52 Brassica oleracea gongyloides

Kohl Rabi 4 tlin 8 cyuc 3 kcaak 0 tcan 1 dwat 0.5 m hkuc hmimhtut cyutli hgattcup hwicli hrasjlatnyikfrip hpa7tli flatprklwis hpa7tmwatli fyfjkrx7e hjonli

drutta Brassica oleracea gongyloides is a BIENNIAL growing to 0.5 m (1ft 8in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from May to August, and the seeds ripen from July to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. The plant is self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought. The plant can tolerate maritime exposure.

kcakta Edible Parts: Leaves Stem**Edible Uses:** Leaves - cooked[142]. Used as a vegetable, though the quality is not as good as cabbage. The young leaves can also be added to salads, though some people find them difficult to digest. A nutritional analysis is available[218]. Stem - raw or cooked. The plant produces a swollen stem just above ground level, and this is often used as a root vegetable[K]. It has a mild cabbage flavour; when finely grated it makes a good addition to mixed salads and, when cooked, is an excellent vegetable[K]. It is best eaten whilst fairly small and tender, between golf ball and tennis ball size. It becomes coarse with age[33, 116, 142]. A nutritional analysis is available[218].

dwatta Digestive TonicThe leaf is digestive and tonic[218].

nrakta A cultivated form of B. oleracea, not known in the wild. ksacta Not known in the wild.

propta Seed - sow April to August in situ. Earlier sowings can be made under clothes.

nwatta Succeeds in full sun in a well-drained fertile preferably alkaline soil[200]. Succeeds in any reasonable soil, though it is best not grown in an acid soil[16, 33]. Tolerates a pH in the range 4.5 to 7.5. Prefers some shade and plenty of moisture in the growing season[20, 37]. Established plants are drought tolerant but the best stems are formed when the plant does not go short of moisture[20, 37]. Succeeds in maritime gardens[200]. Very winter hardy, kohl rabi withstands severe frosts and so can be left in the ground all winter in most areas and be harvested as required. The young growing plant, however, is sensitive to low temperatures and a week at 10°C will cause the plants to bolt[200]. It grows best at a temperature between 18 and 25°C[200]. Kohl rabi is often cultivated for its edible swollen stem which can be available almost all year round from successional sowings. There are several named varieties and stem colour can range from white to green and purple[200]. Green forms are faster to mature and so more suitable for early sowings, the purple forms are harder and later to mature, they are used mainly for winter crops[200]. Very fast growing, the stems of some cultivars can be harvested 6 - 8 weeks after sowing[33]. The plant is more tolerant of drought and high temperatures than turnips, which it resembles in flavour, and so it is often grown as a substitute for that species[200]. Grows well with onions, beet and aromatic herbs which seem to reduce insect predations[18, 20, 201]. Plants also grow well with cucumbers, the roots of each species occupying different levels in the soil[201]. Grows badly with strawberries, runner beans and tomatoes[18, 20, 201].

5.2.53 Crataegus anomala

Arnold Hawthorn 4 tlin 8 cyuc 3 kcaak 3 tcan 2 dwat 5 m hkuc hmimhtut cyutli hgattcuphja7n hwicli hrasjlatnyikfrip hpa7tli flatprklwis hpa7tmwatli hpa7tmwatli xre7t hjonli

drutta Crataegus anomala is a deciduous Shrub growing to 5 m (16ft 5in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist

medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought. It can tolerate atmospheric pollution.

ksakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[2, 11, 51, 105, 158, 272]. Up to 2.5cm in diameter[194]. The fruit is usually bletted[183], but even then it is not sweet[146]. Tasty when fully ripe, even when dried[194]. Our experience is that the fully ripe fruit has a reasonable flavour and, when bletted, is sweet and very pleasant[K]. A mature tree yields about 45kg of fruit per year[194]. The fruit contains about 6.8% sugars, 3.7% protein, 1% ash, 0.4% pectin. Vitamin C is very low, about 1.2mg per 100g[194].

tcanta Rootstock WoodThis plant can be used as a rootstock for the cultivated pear[194]. Wood - compact fine grained, hard, durable, liable to split and warp during seasoning. Used for small implements, walking sticks and fuel[51, 158, 266].

dwatta AstringentThe juice of the ripe fruit is used in the treatment of diarrhoea[272].

nrakta E. Asia - Afghanistan to W. China. ksacta Shrubberies in the Himalayas to 2700 metres[51].

propta Seed - best sown in a cold frame as soon as it is ripe in the autumn, it will then usually germinate in mid to late winter. Stored seed requires 8 - 10 weeks cold stratification at 1°C and should be sown as early in the year as possible[200]. Temperatures over 15 - 20°C induce a secondary dormancy in the seed[200]. Prick out the seedlings into individual pots when they are large enough to handle and grow them on in light shade in a cold frame or greenhouse for their first year. Plant them out in late spring or early summer of the following year.

nwatta Prefers a good well-drained loam in full sun[200]. Grows well in heavy clay soils. Tolerates light shade but does not fruit so well in such a position. Tolerates atmospheric pollution, excessive moisture and a range of soil types if they are moderately fertile[200]. Established plants are drought tolerant[200]. Plants are hardy to at least -15°C[200].

5.2.50 Crataegus chryscarpa

Fireberry Hawthorn, Red haw, Piper's hawthorn, 4 tlin 8 cyuc 3 kcaak 0 tcan 2 dwat 6 m hkuc hmimhtut cyutli hgattcuphja7n hwicli hrsajlutnyikfrip hpa7tli flatprikwlisslip hpa7tmwatli xre7t hjonli

drutta Crataegus chryscarpa is a deciduous Tree growing to 6 m (19ft 8in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower in May, and the seeds ripen in September. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

ksakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[161, 177]. Used mainly as a famine food[257]. A very pleasant flavour when ripe, with the added bonus of ripening in late summer before most other members of the genus[K]. The fruit can be used in making pies, preserves, etc, and can also be dried for later use. It is about 1cm in diameter and borne in small clusters[200]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K]. A tea can be made from the twigs[257]. (This probably means the young shoots with leaves[K].)

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotonic Hypotensive LaxativeA decoction of the dried berries has been used as a mild laxative[257]. A compound decoction of the root has been used in the treatment of diarrhoea[257]. Although no other specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as

a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta North-eastern N. America - Newfoundland to Pennsylvania, west to the Rocky Mountains. ksacta Thickets and rocky ground along streams[43].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. A ten year old tree was seen at Kew Gardens in 2002. It was about 2.5 metres tall and was bearing a very good crop of fruit[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Hybridizes freely with other members of this genus[200]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

5.2.51 Juniperus occidentalis

Western Juniper

4 tlin 8 cyuc 3 kcaak 3 tcan 2 dwat 18 m hkuc htut cyutli hgatkyuctup hwicli hrsajlutnyik hpa7tli flatprikwlisslip hpa7tmwatli dyat hjonli

drutta Juniperus occidentalis is an evergreen Tree growing to 18 m (59ft 1in) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 5. It is in leaf all year, and the seeds ripen in October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

ksakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[46, 61, 105]. A thin dry flesh[82] with a resinous flavour[2, 82]. The fruit is sweet and nutritious[2], it can also be dried or ground into a powder and mixed with cereal flours to be made into a bread[161]. The cones are about 10mm in diameter, they take 2 years to mature[200].

tcanta Basketry Beads Fibre Fuel Incense Lighting Miscellany Tinder WoodThe bark is employed as a tinder and is also made into a slow match[216, 257]. The crushed bark was twisted into a rope, tied at intervals with yucca (Yucca

4.2 mran

4.2.1 Ginkgo biloba

Maidenhair Tree, Ginkgo

3 tlin 8 cyuc 5 kcaak 2 tcan 5 dwat 30 m hkuc htut cyutli hgatkyuctup hwicli hrsajlutnyik hpa7tli flatprikwlisslip hpa7tmwatli nyanhjen hjonli

drutta Ginkgo biloba is a deciduous Tree growing to 30 m (98ft) by 9 m (29ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 4. It is in flower from April to May, and the seeds ripen from October to November. The species is dioecious (individual flowers are either male or female, but only one sex is to be found on any one plant so both male and female plants must be grown if seed is required), and is pollinated by Wind. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. It can tolerate atmospheric pollution.

pcista The seed contains a mildly acrimonious principle that is unstable when heated. It is therefore best to cook the seed before eating it to ensure any possible toxicity is destroyed. This acrimonious principle is probably 4-methoxypyridoxine, which can destroy vitamin B6[237]. It is more toxic for children, but the raw nuts would have to be eaten often over a period of time for the negative effects to become apparent[237]. Avoid if known allergy to Ginkgo or cross-react species (cashew, poison ivy). Not recommended for children. Avoid if on blood thinning medication (e.g. warfarin). Discontinue prior to surgery. Avoid parental use as possible hypotension, shock, dizziness. Excessive seed ingestion can cause 'gin-man' food poisoning [301].

ksakta Edible Parts: Oil Oil SeedEdible Uses: Oil OilSeed - raw (in small quantities), or cooked[237]. A soft and oily texture[229], the seed has a sweet flavour[2, 63] and tastes somewhat like a large pine nut[237]. The baked seed makes very pleasant eating, it has a taste rather like a cross between potatoes and sweet chestnuts[K]. The seed can be boiled and used in soups, porridges etc[183, 237]. It needs to be heated before being eaten in order to destroy a mildly acrimonious principle[57]. Another report says that the seed can be eaten raw[132] whilst another says that large quantities of the seed are toxic[218]. See the notes above on toxicity for more details[237]. The raw seed is said to have a fish-like flavour[218]. The seed is rich in niacin[160]. It is a good source of starch and protein, but is low in fats[237]. These fats are mostly unsaturated or monosaturated[237]. A more detailed nutritional analysis is available[218]. An edible oil is obtained from the seed[2, 183].

tcanta Oil Oil Soap WoodAn oil from the seed is used as a fuel in lighting[2]. A soap substitute is produced by mixing the pulp of the seed (is the fruit meant here?) with oil or wine[178]. Wood - light, soft, it has insect repelling qualities[117].

dwatta Antianxiety Antiasthmatic Antibacterial Antifungal Astringent Cancer Digestive Expectorant Infertility Ophthalmic Sedative Tonic Urinary VermifugeGinkgo has a long history of medicinal use in traditional Chinese medicine, where the seed is most commonly used. These uses are mentioned in more detail later. Recent research into the plant has discovered a range of medicinally active compounds in the leaves and this has excited a lot of interest in the health-promoting potential of the plant[237]. In particular, the leaves stimulate the blood circulation and have a tonic effect on the brain, reducing lethargy, improving memory and giving an improved sense of well-being[237]. They have also been shown to be effective in improving peripheral arterial circulation[218, 237] and in treating hearing disorders such as tinnitus where these result from poor circulation or damage by free radicals[237]. The leaves contain ginkgolides, these are compounds that are unknown in any other plant species[238]. Ginkgolides inhibit allergic responses and so are of use in treating disorders such as asthma[238]. Eye disorders and senility have also responded to treatment[237]. The leaves are best harvested in the late summer or early autumn just before they begin to change colour. They are dried for later use[237, 238]. The fruit is antibacterial, antifungal, astringent, cancer, digestive, expectorant, sedative, vermifuge[117, 147, 176, 178]. The fruit is macerated in vegetable oil for 100 days and then the pulp is used in

the treatment of pulmonary tuberculosis, asthma, bronchitis etc[218]. (This report might be referring to the seed rather than the fleshy fruit[K]). The cooked seed is antitussive, astringent and sedative[218]. It is used in the treatment of asthma, coughs with thick phlegm and urinary incontinence[176, 238]. The raw seed is said to have anticancer activity and also to be antitussive[176, 218]. It should be used with caution, however, due to reports of toxicity[176, 218]. The cooked seeds stabilize spermatogenesis[176].

nrakta E. Asia - N. China. ksacta Found wild in only 2 localities at Guizhou and on the Anhui/Zhejiang border[200], where it grows on rich sandy soils[147].

propta Seed - best sown as soon as it is ripe in a cold frame or in a sheltered outdoor bed[78, 80]. The seed requires stratification according to one report[78] whilst another says that stratification is not required[80] and that the seed can be sown in spring but that it must not have been allowed to dry out[80]. Germination is usually good to fair. Prick out the seedlings into individual pots when they are large enough to handle and grow them on in light shade in the greenhouse for their first year. Plant them out into their permanent positions in the following spring[78, 80] and consider giving them some protection from winter cold for their first winter outdoors[K]. Softwood cuttings in a frame in spring[238]. Cuttings of half-ripe wood, July/August in a frame. The cutting may not grow away in its first year but usually grows all right after that[113]. Cuttings of mature wood, December in a frame[200].

nwatta Industrial Crop: Medicinal Management: Copice Management: Standard Minor Global Crop Staple Crop: Balanced carbLandscape Uses:Firewood, Pest tolerant, Specimen, Street tree. Succeeds in most soil types so long as they are well-drained[117, 200, 202], though it prefers a rather dry loam in a position sheltered from strong winds[11]. Some of the best specimens in Britain are found growing on soils over chalk or limestone[185]. Plants flower and fruit more reliably after hot summers or when grown in a warm sunny position[202]. Established plants are drought resistant[117], they also tolerate atmospheric pollution[117, 200]. Plants can grow in poor hard-packed soil, making the male forms good candidates for street planting[229]. Trees are often used for street planting in towns, only the males are used because the fruit from female plants has a nauseous smell. The fruit contains butanoic acid, it has the aroma of rancid butter[200]. Ginkgo is a very ornamental plant[1, 117] and there are several named forms[11, 200]. This species is the only surviving member of a family that was believed to be extinct until fairly recent times. It has probably remained virtually unchanged for at least 150 million years and might have been growing when the dinosaurs were roaming the earth[237]. It is exceptional in having motile sperm[185] and fertilization may not take place until after the seed has fallen from the tree[81]. This genus belongs to a very ancient order and has affinities with tree ferns and cycads[185]. The ginkgo is usually slow growing, averaging less than 30cm per year with growth taking place from late May to the end of August[185]. Growth is also unpredictable, in some years trees may not put on any new growth whilst in others there may be 1 metre of growth[185]. This variability does not seem to be connected to water or nutrient availability. Trees are probably long-lived in Britain, one of the original plantings (in 1758) is still growing and healthy at Kew (1993). Plants are not troubled by insects or diseases[132, 200], have they evolved a resistance?[132]. Ginkgo is a popular food and medicinal crop in China, the plants are often cultivated for this purpose and are commonly grown in and around temples. Plants are either male or female, one male plant can pollinate up to 5 females. It takes up to 35 years from seed for plants to come into bearing[117]. Prior to maturity the sexes can often be distinguished because female plants tend to have almost horizontal branches and deeply incised leaves whilst males have branches at a sharper angle to the trunk and their leaves are not so deeply lobed[132]. Branches of male trees can be grafted onto female frees in order to fertilize them. When a branch from a female plant was grafted onto a male plant at Kew it fruited prolifically[11]. Female trees have often been seen in various gardens with good crops of fruit[K]. Seeds are marked by two or three longitudinal ridges, it is said that those with two ridges produce female plants whilst those with three ridges produce male plants[178]. Trees can be coppiced[200]. They can also be pruned into a fan-shape for growing on walls[202]. Another

report says that the trees dislike pruning and will often die back as a result[238]. Special Features:Attractive foliage, Not North American native, Fragrant flowers, Inconspicuous flowers or blooms, Flowers have an unpleasant odor. The plant is heat tolerant in zones 9 through 3. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2].

4.2.2 Secale strictum

Mountain Rye
3 tlin 7 cyuc 5 kcaak 0 tcan 0 dwat 1.2 m hkuc
htut cyutli hgattcup hwicli hrasjlutnyik hpa7tli flatprikwis hpa7tmwatli xre7t hjonli

drutta Secale strictum is a PERENNIAL growing to 1.2 m (4ft) by 0.3 m (1ft in). See above for USDA hardiness. It is hardy to UK zone 3 and is not frost tender. It is in flower from June to August, and the seeds ripen from August to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Wind. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

kcakta Edible Parts: SeedEdible Uses: Seed - used as a whole grain or ground into a flour and used for making bread etc[46, 177, 183]. Somewhat smaller than the seed of *S. cereale* but produced abundantly. It is relatively difficult to extract the seed from the glumes by hand[K].

nrakta Europe - Mediterranean to northern Africa and western Asia. Ksacta Dry stony or rocky mountain sides.

propta Seed - sow March or October in situ and only just cover the seed. Germination should take place within 2 weeks. If the seed is in short supply, it can be grown in pots in the greenhouse or cold frame in early spring. Only just cover the seed. Prick out the seedlings into individual pots as soon as they are large enough to handle and plant them out in late spring or early summer. Division in spring. Larger divisions can be planted out direct into their permanent positions. We have found it best to pot up the smaller divisions and grow them on in a lightly shaded position in a cold frame, planting them out once they are well established in the summer.

nwatta Succeeds in most soils but prefers a well-drained light soil in a sunny position[1]. One report says that it requires protection from severe frosts[1], though our experience is that it is hardy in most parts of the country[K]. Mountain rye is occasionally cultivated for its edible seed[61], it is possibly a parent of the cultivated Rye, *S. cereale*[57]. This species has an excellent potential as a perennial cereal crop in temperate zones. Although the seed is somewhat smaller than the cultivated annual rye, it is produced abundantly, especially from the second year onwards. The plant tillers well, especially in its second and subsequent years, and the ears in selected varieties can be 25cm long[K]. Not all forms of this species are perennial, the subspecies *S. strictum kuprijanovii*. Gross. is reliably so[46].

4.2.3 Secale strictum kuprijanovii

3 tlin 7 cyuc 5 kcaak 0 tcan 0 dwat 1.2 m hkuc
htut cyutli hgattcup hwicli hrasjlutnyik hpa7tli flatprikwis hpa7tmwatli xre7t hjonli

drutta Secale strictum kuprijanovii is a PERENNIAL growing to 1.2 m (4ft). See above for USDA hardiness. It is hardy to UK zone 3 and is not frost tender. The species is hermaphrodite (has both male and female organs) and is pollinated by Wind. Suitable for: light (sandy), medium (loamy)

and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist soil and can tolerate drought.

kcakta Edible Parts: SeedEdible Uses: Seed - used as a whole grain or ground into a flour and used for making bread etc[46, 177, 183]. Somewhat smaller than the seed of *S. cereale* but produced abundantly. It is relatively difficult to extract the seed from the glumes by hand[K].

nrakta W. Asia - Caucasia. ksacta Mountain meadows[74].

propta Seed - sow March or October in situ and only just cover the seed. Germination should take place within 2 weeks. If the seed is in short supply, it can be grown in pots in the greenhouse or cold frame in early spring. Only just cover the seed. Prick out the seedlings into individual pots as soon as they are large enough to handle and plant them out in late spring or early summer. Division in spring. Larger divisions can be planted out direct into their permanent positions. We have found it best to pot up the smaller divisions and grow them on in a lightly shaded position in a cold frame, planting them out once they are well established in the summer.

nwatta Succeeds in most soils but prefers a well-drained light soil in a sunny position[1]. One report says that it requires protection from severe frosts[1], though our experience is that it is hardy in most parts of the country[K]. Occasionally cultivated for its edible seed[61], it is possibly a parent of the cultivated Rye, *S. cereale*[57]. This species has an excellent potential as a perennial cereal crop in temperate zones. Although the seed is somewhat smaller than the cultivated annual rye, it is produced abundantly, especially from the second year onwards. The plant tillers well, especially in its second and subsequent years, and the ears in selected varieties can be 25cm long[K]. This subspecies is reliably perennial[46].

4.2.4 Foeniculum vulgare

Fennel, Sweet fennel
3 tlin 10 cyuc 5 kcaak 4 tcan 3 dwat 1.5 m hkuc
htut cyutli hgatkuyctcup hwicli hrasjlutnyik hpa7tli flatprikwis hpa7tmwatli fyfxre7t hjonli

drutta Foeniculum vulgare is an evergreen Perennial growing to 1.5 m (5ft) by 1 m (3ft 3in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in leaf all year; in flower from August to October, and the seeds ripen from September to October. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. The plant is self-fertile. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista Skin contact with the sap or essential oil is said to cause photo-sensitivity and/or dermatitis in some people[218, 222]. Ingestion of the oil can cause vomiting, seizures and pulmonary oedema[222]. Avoid for small children. Avoid if cirrhosis/liver disorders. Diabetics check sugar content of preparation [301].

kcakta Edible Parts: Flowers Leaves Oil Root Seed StemEdible Uses: Condiment Drink Oil TeaLeaves - raw or cooked[2, 4, 5, 9, 27]. A delicious aniseed flavour[183], the young leaves are best since older ones soon become tough[K]. They are often used as a garnish on raw or cooked dishes and make a very pleasant addition to salads[183]. They help to improve digestion and so are particularly useful with oily foods[244]. The leaves are difficult to store dried[200], though this does not really matter since they can often be harvested all year round, especially if the plants are in a warm, sheltered position[K]. Leaf stalks and flower heads - raw or cooked[14, 37, 52, 183]. A similar aniseed flavour to the leaves[K]. The aromatic seeds are used as a flavouring in cakes, bread, stuffings etc[2, 4, 5, 21, 27, 183]. They have a similar flavour to the leaves[K] and also improve the digestion[244]. The sprouted seeds can be added to salads[183]. An essential oil from the fully ripened and dried seed is used as a food flavouring in similar ways to the whole seed[1, 46, 183, 245]. Root - cooked[53]. Somewhat parsnip-like. The

5.2.47 Crataegus altaica

Altai Mountain Thorn
4 tlin 8 cyuc 3 kcaak 0 tcan 2 dwat 6 m hkuc
hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfripr hpa7tli flatprikwis hpa7tmwatli xre7t hjonli

drutta Crataegus altaica is a deciduous Tree growing to 6 m (19ft) by 4 m (13ft). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcakta Fruit - raw or cooked. About 8mm in diameter, the fruit is yellow with a fairly dry mealy texture and a pleasantly sweet flesh[K]. The fruit can also be used in making pies, preserves, etc, and can also be dried for later use. The fruit ripens in August, making it one of the earliest ripening hawthorns[K]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Although no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta W. Asia - Altai Mountains. ksacta Not known
propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. This species is closely related to *C. wattiiana*[11]. Hawthorns in general hybridize freely with other members of the genus[200]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

5.2.48 Castanea x neglecta

Chinknut
4 tlin 8 cyuc 3 kcaak 3 tcan 0 dwat 4 m hkuc
htut cyutli hgatkuyctcup hwicli hrasjlutnyik hpa7tli frusflatprik hpa7tmwatli hjonli

drutta Castanea x neglecta is a deciduous Shrub growing to 4 m (13ft) by 4 m (13ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 5. It is in flower in July, and the seeds ripen in October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

kcakta Edible Parts: SeedEdible Uses: Seed - raw or cooked[183]. Eaten raw, there is a distinct astringency, especially if the fleshy inner skin beneath the outer shell of the seed is not removed[K]. When cooked, however, and especially when baked, the seed becomes much sweeter and has a floury texture[K]. It then makes an excellent food and can be used as a staple food in much the same way as potatoes or cereals[K]. The seed is quite small, though it is larger than *C. pumila*[11]. Another report says that only one large seed is formed in each seed case[82].

tcanta Tannin WoodThe bark, leaves, wood and seed husks all contain tannin. Wood - coarse-grained, hard, strong, light, durable, easy to split.

nrakta Eastern N. America - N. Carolina. ksacta A natural hybrid, *C. dentata* x *C. pumila*, found on well-drained soils[82].

propta Seed - where possible sow the seed as soon as it is ripe in a cold frame or in a seed bed outdoors[78]. The seed must be protected from mice and squirrels. The seed has a short viability and must not be allowed to become dry. It can be stored in a cool place, such as the salad compartment of a fridge, for a few months if it is kept moist, but check regularly for signs of germination. The seed should germinate in late winter or early spring. If sown in an outdoor seedbed, the plants can be left in situ for 1 - 2 years before planting them out in their permanent positions. If grown in pots, the plants can be put out into their permanent positions in the summer or autumn, making sure to give them some protection from the cold in their first winter[K]. This species is a natural hybrid and might not breed true from seed[K]. Division of suckers in winter[200]. They can be planted straight out into their permanent positions.

nwatta Prefers a good well-drained slightly acid loam but succeeds in dry soils[1, 11, 200]. Once established, it is very drought tolerant[1, 11, 200]. Very tolerant of highly acid, infertile dry sands[200]. Averse to calcareous soils but succeeds on harder limestones[11, 200]. This species is an excellent soil-enriching understorey in pine forests[200], growing and fruiting well so long as the canopy of pines is fairly light. Although it is very winter-hardy, this species only really thrives in areas with hot summers[200]. This species is a natural hybrid, *C. dentata* x *C. pumila*[11, 200]. It is very similar to *C. pumila*[270], but has larger fruits than *C. pumila*[11] and often produces two fertile seeds in each fruit[270]. Flowers are produced on wood of the current year's growth[229]. Plants are fairly self-sterile[200]. They hybridize freely with other members of this genus[200]. Fruits are produced in 2 - 3 years from seed[117]. This species is occasionally cultivated for its edible seed in N. America, there are some named varieties[183]. The plants produce seeds abundantly in the wild[183]. Plants in this genus are notably resistant to honey fungus[200].

5.2.49 Pyrus pashia

Indian Wild Pear
4 tlin 8 cyuc 3 kcaak 0 tcan 1 dwat 9 m hkuc
hmimhtut cyutli hgattcup hwicli hrasjlutnyikfripr hpa7tli flatprikwis hpa7tmwatli xre7t hjonli

drutta Pyrus pashia is a deciduous Tree growing to 9 m (29ft 6in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower in April. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. Suitable for: light (sandy),

individual deep pots and plant them out into their permanent positions in the summer. Give the plants some protection from the cold for their first few winters outdoors.

nwatta Agroforestry Services: Living Fence Fodder: Bank Fodder: Pod Industrial Crop: Biomass Management: Coppice Management: Standard Minor Global Crop Staple Crop: Balanced carbLandscape Uses:Aggressive surface roots possible, Specimen. Succeeds in most soils, acid or alkaline[160, 200], so long as they are well-drained[202]. Requires a sunny position[11]. Tolerates drought once established[1] and atmospheric pollution[200]. Salt tolerant[200]. The honey locust is speculated to tolerate an annual precipitation of 60 to 150cm, an annual temperature range of 10 to 21°C, and a pH in the range of 6 to 8[269]. Trees are rather tender when young, but they are hardy to about -30°C once they are established[200]. They grow best in southern Britain[11]. The honey locust is often cultivated in warm temperate zones for its edible seeds and seedpods[202], trees start to bear when about 10 years old and produce commercial crops for about 100 years[227]. Wild trees seldom live longer than 120 years[229]. Trees are shy to flower and therefore do not often produce a worthwhile crop in Britain due to our cooler summers[202]. There are some named varieties[183]. The sub-species nana produced lots of viable seed in the hot summer of 1989 at Kew[K], it also had a very good crop in 1994, 1996 and in 1999[K]. The sub-species inermis had a very good crop of pods in the autumn of 1996[K]. 'Ashworth' has pods with a very sweet pulp that has a melon-like flavour[183]. The flowers have a pleasing scent[245]. A very ornamental tree[1], the flowers are very attractive to bees[149, 269]. Trees have a light canopy, they come into leaf late and lose their leaves early[11] making them an excellent canopy tree for a woodland garden. Plants in this genus are notably resistant to honey fungus[200]. Unlike most plants in this family, honey locusts do not fix atmospheric nitrogen[160, 226]. Special Features:North American native, Naturalizing, Fragrant flowers, Inconspicuous flowers or blooms. The plant is heat tolerant in zones 7 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2]. The root pattern is flat with shallow roots forming a plate near the soil surface [1-2]. The root pattern is a heart root, dividing from the crown into several primary roots going down and out [1-2]. The root pattern is a tap root similar to a carrot going directly down [1-2].

5.2.46 Yucca filamentosa

Spoonleaf Yucca, Adam's needle, Desert Candle, Needle Palm, St. Peter's Palm, Spanish Bayonet, Comm 4 tin 10 cyuc 3 kcaak 4 tcan 1 wat 1.2 m hkuc hmimhtut cyuti hgatkuyctup hwicli hyhshrajlitnyik hpa7tli flatprilklis hpa7tmwatl xre7t hwicli

drutta Yucca filamentosa is an evergreen Shrub growing to 1.2 m (4ft) by 0.6 m (2ft in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 4. It is in leaf all year, in flower from July to August. The species is hermaphrodite (has both male and female organs) and is pollinated by Hand. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista The roots contain saponins[222]. Whilst saponins are quite toxic to people, they are poorly absorbed by the body and so tend to pass straight through. They are also destroyed by prolonged heat, such as slow baking in an oven.

Saponins are found in many common foods such as beans[K]. Saponins are much more toxic to some creatures, such as fish, and hunting tribes have traditionally put large quantities of them in streams, lakes etc in order to stupefy or kill the fish[K].

kcaakta Edible Parts: Flowers Fruit StemEdible Uses: Fruit - raw or cooked[2, 46, 61]. Large and fleshy[161, 183]. The fruit is often dried for winter use[1]. Flowers - raw or dried, crushed and used as a flavouring[159, 164, 177]. A tasty addition to the salad bowl[183]. We have found the flowers to be fairly bitter[K]. Flowering stem - cooked and used like asparagus[164].

tcanta Brush Fibre Paper SoapA fibre obtained from the leaves is used for making ropes, cloth, baskets and mats[21, 46, 61, 82, 169]. The fibre can also be used for making paper[189] The leaves are harvested in summer, they are scraped to remove the outer skin and are then soaked in water for 24 hours prior to cooking. The fibres are cooked for 2 hours with lye and then beaten in a ball mill for 4 hours. They make a cream paper[189]. The leaves are used as paint brushes[92]. The roots are rich in saponins and can be used as a soap substitute for washing the hair, body and clothing[46, 61, 82, 257].

dwatta Poultice SalveMedicinal Parts: Leaves and roots of non-flowering plants[301]. A poultice made from the roots is used in the treatment of sores, skin diseases and sprains[222, 257]. Liver and gallbladder disorders[301].

nrakta South-eastern N. America - Southern New Jersey to Florida. Naturalized in S. Europe. ksacta Sand dunes, waste ground and pine forests along the coastal plain[1, 43].

propta Seed - sow spring in a greenhouse. Pre-soaking the seed for 24 hours in warm water may reduce the germination time. It usually germinates within 1 - 12 months if kept at a temperature of 20°C. Prick out the seedlings into individual pots when they are large enough to handle and grow them on in the greenhouse or cold frame for at least their first two winters. Plant them out into their permanent positions in early summer and consider giving them some winter protection for at least their first winter outdoors - a simple pane of glass is usually sufficient[K]. Seed is not produced in Britain unless the flowers are hand pollinated. Root cuttings in late winter or early spring. Lift in April/May and remove small buds from base of stem and rhizomes. Dip in dry wood ashes to stop any bleeding and plant in a sandy soil in pots in a greenhouse until established[78]. Division of suckers in late spring. Larger divisions can be planted out direct into their permanent positions. We have found that it is best to pot up smaller divisions and grow them on in light shade in a greenhouse or cold frame until they are growing away well. Plant them out in the following spring.

nwatta Agroforestry Services: Living fence Industrial Crop: Fiber Management: Standard Regional CropLandscape Uses:Border, Container, Erosion control, Foundation, Ground cover, Massing, Rock garden, Seashore, Specimen. A very easily grown plant, it thrives in most soils but prefers a sandy loam and full exposure to the south[11]. Dislikes peaty or chalky soils[111]. Can succeed in light shade[K]. Plants are harder when grown on poor sandy soils[200]. Established plants are very drought resistant[190]. Plants are hardy to at least -15°C when grown in a well-drained soil. This species is one of the toughest members of the genus and once established is capable of surviving, and even thriving, despite considerable neglect. Plants growing in dense weed competition on our Cornwall trial grounds have managed to spread and even flower[K]. A very ornamental and free flowering species[1], there are some named varieties[182]. In the plants native environment, its flowers can only be pollinated by a certain species of moth. This moth cannot live in Britain and, if fruit and seed is required, hand pollination is necessary. This can be quite easily and successfully done using something like a small paint brush. Individual crowns are monocarpic, dying after flowering[233]. However, the crown will usually produce a number of sideshoots before it dies and these will grow on to flower in about four years[233]. Plants in this genus are notably resistant to honey fungus[200]. Members of this genus seem to be immune to the predations of rabbits[233]. Special Features:Attracts birds, Attractive foliage, North American native, Attracts butterflies, Attractive flowers or blooms.

leaves or the seeds can be used to make a pleasant-tasting herbal tea[16, 183].

tcanta Dye Essential Oil Repellent StrewingThe seed yields up to 5% of an essential oil[1, 4, 46]. This is used medicinally, as a food flavouring, in toothpastes, soaps, perfume, air fresheners etc[1, 46, 238]. The flavour of fennel oil depends upon its two main constituents. 'Fenchone' is a bitter tasting element whilst 'anethole' has a sweet anise-like flavour[238]. The proportions of these two ingredients varies according to strain and region. Plants growing in the Mediterranean and southern Europe usually have a sweet oil whilst plants growing in central and northern Europe usually produce a more bitter oil[238]. The quality of the oil also depends upon how well the seed has been dried - the oil from fully ripened and dried seeds being much sweeter and more fragrant[245]. The dried plant is an insect repellent[14, 53], the crushed leaves are effective for keeping dogs free of fleas[201]. The plant was formerly used as a strewing herb[201]. Yellow and brown dyes are obtained from the flowers and leaves combined[168].

dwatta Analgesic Antiinflammatory Antispasmodic Aromatherapy Aromatic Carminative Diuretic Emmenagogue Expectorant Galactagogue Hallucinogenic Stimulant Stomachic UrinaryFennel has a long history of herbal use and is a commonly used household remedy, being useful in the treatment of a variety of complaints, especially those of the digestive system[244]. The seeds, leaves and roots can be used, but the seeds are most active medicinally and are the part normally used[4]. An essential oil is often extracted from the fully ripened and dried seed for medicinal use, though it should not be given to pregnant women[4, 238]. The plant is analgesic, anti-inflammatory, antispasmodic, aromatic, carminative, diuretic, emmenagogue, expectorant, galactagogue, hallucinogenic, laxative, stimulant and stomachic[4, 7, 9, 21, 147, 165, 176, 192, 238]. An infusion is used in the treatment of indigestion, abdominal distension, stomach pains etc[254]. It helps in the treatment of kidney stones and, when combined with a urinary disinfectant like Arctostaphylos uva-ursi, makes an effective treatment for cystitis[254]. It can also be used as a gargle for sore throats and as an eyewash for sore eyes and conjunctivitis[254]. Fennel is often added to purgatives in order to allay their tendency to cause gripe, and also to improve the flavour[4]. An infusion of the seeds is a safe and effective cure for wind in babies[244]. An infusion of the root is used to treat urinary disorders[238]. An essential oil obtained from the seed is used in aromatherapy. Its keyword is 'Normalising'[210]. The essential oil is bactericidal, carminative and stimulant[218]. Some caution is advised, see notes above on toxicity[222]. The German Commission E Monographs, a therapeutic guide to herbal medicine, approve Foeniculum vulgare for cough, bronchitis, dyspeptic complaints (see [302] for critics of commission E).

nrakta S. Europe. Naturalized in Britain. ksacta Found most often in dry stony calcareous soils near the sea[1, 16, 190].

propta Seed - best sown in early spring in situ[1]. The seed can also be sown in situ in the autumn[4, 37]. In many gardens it self sows freely. Division in March as the new growth appears[16, 200]. The plants are very tolerant of disturbance, we have found divisions to take well at any time of the year, though these divisions are never as good as seed-sown plants[K].

nwatta An easily grown plant, it succeeds in most soils but prefers a sunny dry position[4, 16, 37, 200]. It grows well in sandy soils[188] and is drought tolerant once established[190]. Plants often self-sow freely in the garden[K]. Plants can be grown in quite coarse grass, which can be cut annually in the autumn[233]. Although hardy in most parts of Britain, plants are liable to die out over the winter if the soil is not well-drained or the weather is persistently cold and wet[238]. Fennel is often cultivated in the herb garden for its edible and medicinal uses, there are some named varieties[183]. Especially in mild winters, the leaves can be available all year round[K]. It is best to cut a few plants back to ground level occasionally during the growing season, thus ensuring a constant supply of fresh young shoots[4]. In a dry summer make sure that you water the cut-down clump or it might not regrow that year[K]. Fennel is also grown commercially as a medicinal plant and for its essential oil[4, 238]. Fennel is in general a poor companion plant in the garden. It inhibits the growth of nearby plants, especially beans, toma-

toes and kohlrabi[14, 18]. It is itself inhibited by wormwood and coriander[14, 18]. However, the flowering plant attracts beneficial insects such as bees, parasitic wasps, tachnid flies and hoverflies to the garden. The presence of these creatures will help to maintain a natural balance of insects in the garden and help prevent infestations by aphids etc[238]. It is best not to grow fennel and dill (Anethum graveolens) close to each other since hybridisation can occur and the resulting seedlings will be of indeterminate flavour[238]. The plant is heat tolerant in zones 9 through 6. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a clumper with limited spread [1-2].

4.2.5 Pinus cembra

Swiss Stone Pine, Swiss Pine, Arolla Pine 3 tin 9 cyuc 4 kcaak 3 tcan 2 dwat 15 m hkuc hmimhtut cyuti hgatkuyctup hwicli hyhshrajlitnyikfrip hpa7tli flatprk hpa7tmwatl dyat hwicli

drutta Pinus cembra is an evergreen Tree growing to 15 m (49ft) by 6 m (19ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 4. It is in leaf all year, in flower from May to June, and the seeds ripen in September. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay and nutritionally poor soils. Suitable pH: mildly acid and neutral soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista The wood, sawdust and resins from various species of pine can cause dermatitis in sensitive people[222].

kcaakta Edible Parts: Oil SeedEdible Uses: Condiment OilSeed - raw or cooked[1, 2, 4, 34, 177, 183]. Much valued as a food, the oil-rich seed has a delicious flavour but with a slight flavour of turpentine. A reasonable size, it is about 10mm x 8 mm[200]. An edible drying oil is obtained from the seed[2, 57, 63, 183]. A vanilla flavouring is obtained as a by-product of other resins that are released from the pulp-wood[200].

tcanta Dye Herbicide Oil Resin WoodLandscape Uses: Screen, Specimen, ornamental. A tan or green dye is obtained from the needles[168]. The needles contain a substance called terpene, this is released when rain washes over the needles and it has a negative effect on the germination of some plants, including wheat[201]. Turpentine is obtained from the leaves[46, 61]. Oleo-resins are present in the tissues of all species of pines, but these are often not present in sufficient quantity to make their extraction economically worthwhile[64]. The resins are obtained by tapping the trunk, or by destructive distillation of the wood[4, 64]. In general, trees from warmer areas of distribution give the higher yields[64]. Turpentine consists of an average of 20% of the oleo-resin[64] and is separated by distillation[4, 64]. Turpentine has a wide range of uses including as a solvent for waxes etc, for making varnish, medicinal etc[4]. Rosin is the substance left after turpentine is removed. This is used by violinists on their bows and also in making sealing wax, varnish etc[4]. Pitch can also be obtained from the resin and is used for waterproofing, as a wood preservative etc. Wood - soft, easily worked. Used for furniture, turnery etc[46, 61, 100].

dwatta The turpentine obtained from the resin of all pine trees is antiseptic, diuretic, rubefacient and vermifuge[4]. It is a valuable remedy used internally in the treatment of kidney and bladder complaints and is used both internally and

as a rub and steam bath in the treatment of rheumatic affections[4]. It is also very beneficial to the respiratory system and so is useful in treating diseases of the mucous membranes and respiratory complaints such as coughs, colds, influenza and TB[4]. Externally it is a very beneficial treatment for a variety of skin complaints, wounds, sores, burns, boils etc and is used in the form of liniment plasters, poultices, herbal steam baths and inhalers[4].

nrakta Europe - Alps, running north to Russia and Siberia. ksacta Rarely found below elevations of 1500 metres, it grows with larch up to the tree line[11, 81].

propta It is best to sow the seed in individual pots in a cold frame as soon as it is ripe if this is possible otherwise in late winter. A short stratification of 6 weeks at 4°C can improve the germination of stored seed[80]. Plant seedlings out into their permanent positions as soon as possible and protect them for their first winter or two[11]. Plants have a very sparse root system and the sooner they are planted into their permanent positions the better they will grow[K]. Trees should be planted into their permanent positions when they are quite small, between 30 and 90cm[200]. We actually plant them out when they are about 5 - 10cm tall. So long as they are given a very good weed-excluding mulch they establish very well[K]. Larger trees will check badly and hardly put on any growth for several years. This also badly affects root development and wind resistance[200]. Cuttings. This method only works when taken from very young trees less than 10 years old. Use single leaf fascicles with the base of the short shoot. Disbudding the shoots some weeks before taking the cuttings can help. Cuttings are normally slow to grow away[81].

nwatta Thrives in a light well-drained sandy or gravelly loam[1]. Dislikes poorly drained moorland soils[1]. Established plants tolerate drought[200]. Succeeds in most situations, flourishing on N. facing slopes and in moist heavy clay soils[81]. Grows best in the cooler wetter areas of Britain[11, 81]. A very hardy plant tolerating temperatures down to about -30°C[160]. The edible seeds are collected in large numbers in Siberia and are often exported[142]. (This report probably refers to the sub-species *P. cembra sibirica*.) This species does not appear to be long lived or to produce its cones freely in S. Britain[11]. It does not produce cones until it is 30 years old[200]. The cones take three years to ripen and then fall from the tree with the seeds still inside[120]. The seed is often eaten by squirrels etc before it can fall to the ground. The cones do not open, seed is extracted by breaking up the soft scales of the cone[200]. Plants are strongly outbreeding, self-fertilized seed usually grows poorly[200]. They hybridize freely with other members of this genus[200]. Slow growing in cultivation[81, 120], plants usually make less than 30 cm increase in height per year even when young[185]. Leaf secretions inhibit the germination of seeds, thereby inhibiting the growth of other plants below the tree[18]. Plants in this genus are notably susceptible to honey fungus[200]. Special Features:Not North American native, Inconspicuous flowers or blooms. The plant is heat tolerant in zones 7 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2]. An evergreen.

4.2.6 Pyrus ussuriensis

Harbin Pear, Chinese pear, Ussurian Pear

3 tlin 7 cyuc 4 kcak 2 tcan 0 dwat 15 m hkuc hmimhtut cyutli hgattcup hwicli hrasjlutnykfrp hpa7tli flat-prikliwis hpa7tmwatli xre7t hjonli

drutta *Pyrus ussuriensis* is a deciduous Tree growing to 15 m (49ft 3in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 4 and is not frost tender. It is in

flower in April, and the seeds ripen from September to October. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought. It can tolerate atmospheric pollution.

ksakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[183]. Size and quality varies tremendously from tree to tree. Good forms have somewhat dry but pleasantly flavoured fruits up to 4cm in diameter, other forms are less pleasant and often smaller[K].

tcanta Rootstock WoodUsed as a rootstock[183] for *P. pyrifolia* culta in Korea[151], it is very frost resistant[74].

nrakta E. Asia - N.E. China, Korea. ksacta Forests and river valleys in lower mountain zones[74].

propta Seed - best sown in a cold frame as soon as it is ripe in the autumn, it will then usually germinate in mid to late winter. Stored seed requires 8 - 10 weeks cold stratification at 1°C and should be sown as early in the year as possible[200]. Temperatures over 15 - 20°C induce a secondary dormancy in the seed[200]. Prick out the seedlings into individual pots when they are large enough to handle and grow them on in light shade in a cold frame or greenhouse for their first year. Plant them out in late spring or early summer of the following year.

nwatta Prefers a good well-drained loam in full sun[200]. Grows well in heavy clay soils. Tolerates light shade but does not fruit so well in such a position. Tolerates atmospheric pollution, excessive moisture and a range of soil types if they are moderately fertile[200]. Established plants are drought tolerant[200]. A very frost resistant tree[74], tolerating temperatures down to below -15°C[200], it is a possible rootstock for northern areas[74]. It is used as a rootstock for *P. pyrifolia* culta in Korea. This species is a parent of the cultivated Asian pears[200]. Special Features:Not North American native, Blooms are very showy.

4.2.7 Malus prunifolia

Chinese Apple, Plumleaf crab apple

3 tlin 7 cyuc 4 kcak 0 tcan 0 dwat 8 m hkuc hmimhtut cyutli hgattcup hwicli hrasjlutnykfrp hpa7tli flat-prikliwis hpa7tmwatli xre7t hjonli

drutta *Malus prunifolia* is a deciduous Tree growing to 8 m (26ft) by 8 m (26ft). See above for USDA hardiness. It is hardy to UK zone 3 and is not frost tender. It is in flower from April to May, and the seeds ripen in October. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought.

pcista All members of this genus contain the toxin hydrogen cyanide in their seeds and possibly also in their leaves, but not in their fruits. Hydrogen cyanide is the substance that gives almonds their characteristic taste but it should only be consumed in very small quantities. Apple seeds do not normally contain very high quantities of hydrogen cyanide but, even so, should not be consumed in very large quantities. In small quantities, hydrogen cyanide has been shown to stimulate respiration and improve digestion, it is also claimed to be of benefit in the treatment of cancer. In excess, however, it can cause respiratory failure and even death.

ksakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[183]. A bitter flavour[K]. Fruits we have tasted have been astringent rather than bitter, though some cultivars and forms are not at all bitter. A fruit of the species, tasted at Kew in October 1991, had a sweet pleasant taste, was mealy and of low acidity[K]. The fruit can be used fresh or in preserves etc. The fruit is about 20mm in diameter[200], though some forms are considerably larger[K].

tcanta RootstockThis species is an excellent stock for grafting apple trees[266].

nrakta E. Asia - northern China. ksacta Slopesand plains from sea level to 1300 metres[266].

cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

pcista The wood, sawdust and resins from various species of pine can cause dermatitis in sensitive people[222].

ksakta Edible Parts: SeedEdible Uses: CondimentSeed - raw or cooked[105, 177]. A reasonable size, being up to 10mm x 8mm[200]. The oil-rich seed has a resinous flavour. A vanillin flavouring is obtained as a by-product of other resins that are released from the pulpwood[200].

tcanta Dye HerbicideA tan or green dye is obtained from the needles[168]. The needles contain a substance called terpenene, this is released when rain washes over the needles and it has a negative effect on the germination of some plants, including wheat[201]. Oleo-resins are present in the tissues of all species of pines, but these are often not present in sufficient quantity to make their extraction economically worthwhile[64]. The resins are obtained by tapping the trunk, or by destructive distillation of the wood[4, 64]. In general, trees from warmer areas of distribution give the higher yields[64]. Turpentine consists of an average of 20% of the oleo-resin[64] and is separated by distillation[4, 64]. Turpentine has a wide range of uses including as a solvent for waxes etc, for making varnish, medicinal etc[4]. Rosin is the substance left after turpentine is removed. This is used by violinists on their bows and also in making sealing wax, varnish etc[4]. Pitch can also be obtained from the resin and is used for waterproofing, as a wood preservative etc.

dwatta The turpentine obtained from the resin of all pine trees is antiseptic, diuretic, rubefacient and vermifuge[4]. It is a valuable remedy used internally in the treatment of kidney and bladder complaints and is used both internally and as a rub and steam bath in the treatment of rheumatic affections[4]. It is also very beneficial to the respiratory system and so is useful in treating diseases of the mucous membranes and respiratory complaints such as coughs, colds, influenza and TB[4]. Externally it is a very beneficial treatment for a variety of skin complaints, wounds, sores, burns, boils etc and is used in the form of liniment plasters, poultices, herbal steam baths and inhalers[4].

nrakta E. Asia - C. and N. China. ksacta Mud and sandstone shales, 1000 - 1250 metres[109]. Often found on limestone[1].

propta It is best to sow the seed in individual pots in a cold frame as soon as it is ripe if this is possible otherwise in late winter. A short stratification of 6 weeks at 4°C can improve the germination of stored seed[80]. Plant seedlings out into their permanent positions as soon as possible and protect them for their first winter or two[11]. Plants have a very sparse root system and the sooner they are planted into their permanent positions the better they will grow[K]. Trees should be planted into their permanent positions when they are quite small, between 30 and 90cm[200]. We actually plant them out when they are about 5 - 10cm tall. So long as they are given a very good weed-excluding mulch they establish very well[K]. Larger trees will check badly and hardly put on any growth for several years. This also badly affects root development and wind resistance[200]. Cuttings. This method only works when taken from very young trees less than 10 years old. Use single leaf fascicles with the base of the short shoot. Disbudding the shoots some weeks before taking the cuttings can help. Cuttings are normally slow to grow away[81].

nwatta Landscape Uses:Border, Pest tolerant, Rock garden, Specimen, Street tree. Prefers a deep loamy soil[120]. Thrives in a light well-drained sandy or gravelly loam[1]. Dislikes poorly drained moorland soils[1]. Established plants tolerate drought, succeeding in hot dry sites[200]. A very ornamental tree with beautiful bark. Plants are strongly outbreeding, self-fertilized seed usually grows poorly[200]. They hybridize freely with other members of this genus[200]. This species is slow growing and hard to establish in Britain, doing best in the mid areas of the country[120, 185]. Leaf secretions inhibit the germination of seeds, thereby inhibiting the growth of other plants below the tree[18]. Plants in this genus are notably susceptible to honey fungus[200]. Special Features:Not North American native, Inconspicuous flowers or blooms.

5.2.45 Gleditsia triacanthos

Honey Locust

4 tlin 8 cyuc 3 kcak 2 tcan 2 dwat 20 m hkuc htut cyutli hgattcup hwicli hysihrasjlutnyk hpa7tli flat-prikliwisom hpa7tmwatli xre7t hjonli

drutta *Gleditsia triacanthos* is a deciduous Tree growing to 20 m (65ft) by 15 m (49ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 3. It is in flower in July, and the seeds ripen from October to November. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in saline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. It can tolerate atmospheric pollution.

pcista The plant contains potentially toxic compounds[222].

ksakta Edible Parts: Seed SeedpodEdible Uses: Coffee Drink Gum SweetenerSeed - raw or cooked. It can contain up to 30% sugar[160]. Young seeds taste like raw peas[183]. Seeds are not always borne in maritime regions because the tree prefers long hot summers[11]. The oval seeds are about 8mm long[227]. They contain 10.6 - 24.1% protein, 0.8 - 4.3% fat, 84.7% carbohydrate, 21.1% fibre, 4% ash, 280mg calcium and 320mg phosphorus per 100g[218]. The seeds have been roasted and used as a coffee substitute[269]. Seedpods - the pulp is sweet and can be eaten raw or made into sugar[149, 159, 183]. The tender young seedpods can be cooked and eaten[183]. The pulp in older pods turns bitter[227]. The seedpods are up to 40cm long and 4cm wide[227]. A sweet, pleasant tasting drink can be made from the seed pods[257]. The seed pulp has been used to make a drink[257].

tcanta Fodder Gum Soil reclamation Tannin Wood-Planted for land reclamation on mining waste[200]. The gum from the seeds has been suggested as an emulsifying substitute for acacia and tragacanth[269]. The heartwood contains 4 - 4.8% tannin[240]. Wood - strong, coarse-grained, elastic, very hard, very durable in contact with the soil, highly shock resistant[46, 61, 82, 149]. It does not shrink much but splits rather easily and does not glue well[227]. It weighs 42lb per cubic foot[227]. Largely used for making fence posts and rails, wheel hubs, farm implements etc and in construction[46, 61, 82, 149].

dwatta Anaesthetic Antiseptic Cancer StomachicThe pods have been made into a tea for the treatment of indigestion, measles, catarrh etc[222, 257]. The juice of the pods is antiseptic[222]. The pods have been seen as a good antidote for children's complaints[257]. The alcoholic extract of the fruits of the honey locust, after elimination of tannin, considerably retarded the growth, up to 63% of Ehrlich mouse carcinoma[269]. However, the cytotoxicity of the extract was quite high and the animals, besides losing weight, showed dystrophic changes in their liver and spleen[260]. The alcoholic extract of the fruit exerted moderate oncostatic activity against sarcoma 180 and Ehrlich carcinoma at the total dose 350 mg/kg/body weight/mouse. Weight loss was considerable[269]. An infusion of the bark has been drunk and used as a wash in the treatment of dyspepsia[257]. It has also been used in the treatment of whooping cough, measles, smallpox etc[257]. The twigs and the leaves contain the alkaloids gleditsine and stencarpine[4]. Stencarpine has been used as a local anaesthetic whilst gleditsine causes stupor and loss of reflex activity[4]. Current research is examining the leaves as a potential source of anticancer compounds[222].

nrakta Eastern N. America. Occasionally naturalized in C. and S. Europe. ksacta Usually growing singly, though occasionally forming almost pure woods, on the borders of streams and in rich woods, usually in most fertile soils but sometimes on dry sterile gravelly hills[43, 82].

propta Seed - pre-soak for 24 hours in warm water and then sow in spring in a greenhouse[78]. The seed should have swollen up, in which case it can be sown, if it has not swollen then soak it for another 24 hours in warm water. If this does not work then file away some of the seed coat but be careful not to damage the embryo[78]. Further soaking should then cause the seed to swell. One it has swollen, the seed should germinate within 2 - 4 weeks at 20°C. As soon as they are large enough to handle, prick the seedlings out into

May/June in a frame[200]. Cuttings of half-ripe wood, 5 - 8cm with a heel, July/August in a frame[200]. Layering.

nwatta Requires a light well-drained preferably calcareous soil in a sunny position[1, 200]. Succeeds in dry soils, tolerating drought once it is established[190]. Grows well between stepping stones on paths, tolerating light treading[183, 200]. Succeeds on walls. Thymes dislike wet conditions, especially in the winter. A layer of gravel on the soil around them will help protect the foliage from wet soils[238]. Hardy to about -15°C[200]. Closely related to *T. serpyllum*[11], this plant is the true native wild thyme in Britain[11]. It is a very polymorphic plant, there are a number of named forms[183]. This is a very difficult genus taxonomically, the species hybridize freely with each other and often intergrade into each other[1]. A good companion for most other plants[54], it makes a very good carpeting plant for the rockery or between paving stones[1]. The flowers are rich in nectar and are very attractive to honey bees[200].

5.2.42 *Crataegus x grignonensis*

4 tlin 8 cyuc 3 kcaak 3 tcan 2 dwat 4 m hkuc
hmimhtut cyutli hgattucpha7n hwicli hrasjlutnyikfrip hpa7tli flatprikliwsslip hpa7tmwatli xre7t hjonli

drutta *Crataegus x grignonensis* is a deciduous Shrub growing to 4 m (13ft 1in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked. The fruit can be used in making pies, preserves, etc, and can also be dried for later use. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta A hybrid species of garden origin, *C. crus-galli* x *C. pubescens*. ksacta Not known in the wild.

propta Seed - this is a hybrid species and it will not breed true from seed. If this is no problem, then the seed is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245].

5.2.43 *Leymus racemosus*

Volga Wild Rye, Mammoth wildrye

4 tlin 8 cyuc 3 kcaak 0 tcan 0 dwat 1.2 m hkuc
htut cyutli hgatkuyctcup hwicli hyishrasjlutnyik hpa7tli flatprikliwis hpa7tmwatli xre7t hjonli

drutta *Leymus racemosus* is a PERENNIAL growing to 1.2 m (4ft). See above for USDA hardiness. It is hardy to UK zone 5. It is in flower from July to September, and the seeds ripen from September to October. The species is hermaphrodite (has both male and female organs) and is pollinated by Wind. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

kcakta Edible Parts: Oil Seed StemEdible Uses: OilSeed - used as a cereal substitute in some parts of Russia, especially in times of drought[183]. The seed is rather small and difficult to extract[K]. Young underground shoots - raw. Sweet and tender[183].

tcanta Oil Soil stabilizationPlants have an extensive spreading root system and are used to stabilize inland sand dunes, though they do not tolerate salty conditions[61].

nrakta Europe, in Russia, to central Asia and Tibet. ksacta Dry sandy soils[50].

propta Seed - sow mid spring in situ and only just cover the seed[162]. Germination should take place within 2 weeks. If the supply of seed is limited, it can also be sown in mid spring in a cold frame. Only just cover the seed. When large enough to handle, prick the seedlings out into individual pots and plant them out in summer[K] Division in spring or summer[162]. Very easy, larger clumps can be replanted direct into their permanent positions, though it is best to pot up smaller clumps and grow them on in a cold frame until they are rooting well. Plant them out in the spring.

nwatta Succeeds in most soils, preferring a sandy soil and a sunny position[1, 200]. Established plants are drought resistant[183]. Plants can be very invasive, spreading freely by means of the rhizomes. Currently (1990) being evaluated as a perennial grain crop in N. America[183]. There are some named varieties, selected for their ornamental value[200].

5.2.44 *Pinus bungeana*

Lace-Bark Pine, Bunge's pine

4 tlin 7 cyuc 3 kcaak 0 tcan 2 dwat 10 m hkuc
htut cyutli hgatkuyctcup hwicli hyishrasjlut hpa7tli flatprikliwis hpa7tmwatli dyat hjonli

drutta *Pinus bungeana* is an evergreen Tree growing to 10 m (32ft) by 6 m (19ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 5. It is in leaf all year; in flower from April to May, and the seeds ripen in October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. The plant is not self-fertile. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It

propta Seed - best sown as soon as it is ripe in the autumn in a cold frame. It usually germinates in late winter. Stored seed requires stratification for 3 months at 1°C and should be sown in a cold frame as soon as it is received[200]. It might not germinate for 12 months or more. Prick out the seedlings into individual pots as soon as they are large enough to handle. If given a rich compost they usually grow away quickly and can be large enough to plant out in late summer, though consider giving them some protection from the cold in their first winter. Otherwise, keep them in pots in a cold frame and plant them out in late spring of the following year. Cuttings of mature wood, November in a frame[11].

nwatta An easily grown plant, it succeeds in most fertile soils, preferring a moisture retentive well-drained loamy soil[1, 200]. Grows well in heavy clay soils. Prefers a sunny position but succeeds in partial shade though it fruits less well in such a situation[200]. Highly resistant to frost and drought, this species is being used to a limited extent in breeding programmes for cultivated apples[183]. The cultivar 'Hyslop' has edible fruits 4cm in diameter[200]. Hybridizes freely with other members of this genus[200]. The fruit is a good wildlife food source, especially for birds[200]. Plants in this genus are notably susceptible to honey fungus[200].

4.2.8 *Rhus aromatica*

Lemon Sumach, Fragrant sumac

3 tlin 9 cyuc 4 kcaak 2 tcan 2 dwat 1.2 m hkuc
htut cyutli hgatkuyctcup hwicli hyishrasjlutnyik hpa7tli flatprikliwis hpa7tmwatli nyanhjen hjonli

drutta *Rhus aromatica* is a deciduous Shrub growing to 1.2 m (4ft) by 1.5 m (5ft in) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 3 and is not frost tender. It is in flower in April, and the seeds ripen in September. The species is dioecious (individual flowers are either male or female, but only one sex is to be found on any one plant so both male and female plants must be grown if seed is required), and is pollinated by Bees. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

pcista There are some suggestions that the sap of this species can cause a skin rash in susceptible people, but this has not been substantiated. See also notes in 'Cultivation Details'.

kcakta Edible Parts: Fruit OilEdible Uses: Drink Oil-Fruit - raw or cooked[2, 22]. The fruit is small with very little flesh, but it is easily harvested and when soaked for 10 - 30 minutes in hot or cold water makes a very refreshing lemonade-like drink (without any fizz of course)[61, 85, 183, K]. The mixture should not be boiled since this will release tannic acids and make the drink astringent. The fruit can also be dried and ground into a powder then mixed with corn meal and used in cakes, puddings etc[183].

tcanta Basketry Dye Mordant Oil Soil stabilization TanninThe leaves are rich in tannin (up to 25%) and can be collected as they fall in the autumn then used as a brown dye or as a mordant[169]. The bark is also a good source of tannin[4]. An oil is extracted from the seeds[4]. It attains a tallow-like consistency on standing and is used to make candles. These burn brilliantly, though they emit a pungent smoke[4]. The plant has an extensive root system and is sometimes planted to prevent soil erosion[200]. The split stems are used in basket making[4, 46, 61].

dwatta Astringent Diuretic DysenteryThe leaves are astringent and diuretic[61, 222]. They were used in the treatment of colds, stomach aches and bleeding[222]. The root bark is astringent and diuretic[4, 222]. An infusion can be used in the treatment of diarrhoea, dysentery. Used externally, it is used to treat excessive vaginal discharge and skin eruptions and also as a gargle for sore throats[254]. Its use is contraindicated if inflammation is present[222]. The root is harvested in the autumn and dried for later use[254]. The fruits are astringent and diuretic[254]. They have been chewed in the treatment of stomach aches, toothaches and gripe[222] and used as a gargle to treat mouth and throat complaints[254]. They help reduce fevers and may be of help in treating late-onset diabetes[254]. Some caution is advised

in the use of the leaves and stems of this plant, see the notes above on toxicity.

nrakta Eastern N. America - Quebec to Florida and Indiana to Texas. ksacta Dry rocks, sands and open woods[43], often on limestone outcrops[149].

propta Seed - best sown in a cold frame as soon as it is ripe. Pre-soak the seed for 24 hours in hot water (starting at a temperature of 80 - 90c and allowing it to cool) prior to sowing in order to leach out any germination inhibitors[200]. This soak water can be drunk and has a delicious lemon-flavour. The stored seed also needs hot water treatment and can be sown in early spring in a cold frame[200]. When they are large enough to handle, prick the seedlings out into individual pots and grow them on in the greenhouse for their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. Cuttings of half-ripe wood, 10cm with a heel, July/August in a frame[200]. Root cuttings 4cm long taken in December and potted up vertically in a greenhouse. Good percentage[78, 200]. Suckers in late autumn to winter[200].

nwatta Landscape Uses:Border, Erosion control, Foundation, Ground cover, Massing, Seashore, Woodland garden. Succeeds in a well-drained fertile soil in full sun[11, 200]. Tolerates poor soils[169, 200]. Established plants are drought resistant[169]. A very hardy plant when fully dormant, tolerating temperatures down to about -25°C[184]. However, the young growth in spring can be damaged by late frosts. Many of the species in this genus are highly toxic and can also cause severe irritation to the skin of some people, whilst other species such as this one are not poisonous. It is relatively simple to distinguish which is which, the poisonous species have axillary panicles and smooth fruits whilst non-poisonous species have compound terminal panicles and fruits covered with acid crimson hairs[1, 4]. The toxic species are sometimes separated into their own genus, *Toxicodendron*, by some botanists[200]. This species is a low suckering shrub[182]. There is a specially low growing form, var. *arenaria*, that is found growing on sand dunes in the mid-west of N. America[184]. A polymorphic species[43]. Plants are susceptible to coral spot fungus[11]. Plants have brittle branches that are easily damaged in very strong winds[11]. Plants in this genus are notably resistant to honey fungus[200]. This species transplants easily[169]. The plant has an offensive smell[149]. Or, to go by another nose, the bruised leaves emit a delicious resinous scent[245]. Dioecious. Male and female plants must be grown if seed is required. Special Features:Attracts birds, North American native, Attractive flowers or blooms. The plant is heat tolerant in zones 8 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. A clumping plant, forming a colony from shoots away from the crown but with a limited spread [1-2]. The root pattern is flat with shallow roots forming a plate near the soil surface [1-2]. The root pattern is suckering with new plants from underground runners away from the plant [1-2].

4.2.9 *Secale cereale*

Rye, Cereal rye

3 tlin 7 cyuc 4 kcaak 3 tcan 1 dwat 1.8 m hkuc
htut cyutli hgattucp hwicli hrasjlutnyik hpa7tli flatprikliwis hpa7tmwatli xre7t hjonli

drutta *Secale cereale* is a ANNUAL growing to 1.8 m (6ft) by 0.1 m (0ft 4in). See above for USDA hardiness. It is hardy to UK zone 3 and is not frost tender. It is in flower from May to July, and the seeds ripen from August to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Wind. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic

(mildly alkaline) soils. It cannot grow in the shade. It prefers moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

kcakta Edible Parts: Oil Seed**Edible Uses:** Coffee Oil Sweetener**Seed** - cooked[2, 13, 34, 46]. A common cereal, it is used especially in N. Europe to make bread[183]. The seed contains about 13% protein[61]. The grain also contains some gluten, though not as much as wheat, so it makes a heavier bread than wheat. It can also be used to make cakes etc. The seed can be sprouted and added to salads[183]. A nutritional analysis is available[218]. Malt, a sweet substance produced by germinating the seed, is extracted from the roasted germinated seed and used as a sweetening agent and in making beer etc[13]. The roasted (ungerminated) seed is used as a coffee substitute[46, 183].

tcanta Biomass Green manure Oil Soil stabilization ThatchingThe straw is used as a fuel or as a biomass in industry[141]. It is quite strong[100] and can also be used in thatching, for paper making, weaving mats and hats etc[13, 34, 46, 61, 171]. Other uses for the straw include as a packing material for nursery stock, bricks and tiles, for bedding, archery targets, and mushroom compost[269]. The plant is a good green manure crop. It is fast growing with an extensive and deep root system[46]. It is especially useful if sown in late autumn. Its growth over the winter will prevent soil erosion and the leaching of nutrients from the soil, it can then be incorporated into the soil in the spring[171]. The extensive root system also makes this a good plant to use for soil stabilization, especially on sandy soils[171].

dwatta Cancer Laxative PoulticeThe seed is made into a poultice and applied to tumours[218]. The seed is also an effective laxative due to its fibrous seed coat[269].

nrakta W. Asia? Original habitat is obscure. ksacta Not known in a truly wild situation.

propta Seed - sow March or October in situ and only just cover the seed. Germination should take place within 2 weeks.

nwatta An easily grown plant, it succeeds in most soils but prefers a well-drained light soil in a sunny position[1, 132]. It thrives on infertile, submarginal areas and is renowned for its ability to grow on sandy soils[269]. Established plants are drought tolerant[1]. The plant is reported to tolerate an annual precipitation in the range of 22 to 176cm, an annual temperature in the range of 4.3 to 21.3°C and a pH of 4.5 to 8.2[269]. Rye is a widely cultivated temperate zone cereal crop. It is able to withstand severe climatic conditions and can be grown much further north and at higher altitudes than wheat[13, 34, 57]. Average yields vary widely from country to country, the world average is around 1.6 tonnes per hectare with yields of almost 7 tonnes per hectare achieved in Norway[269]. There are many named varieties[183]. Rye is a rather variable species and botanists have divided it into a number of sub-species, all of which could be of value in breeding programmes. These sub-species are briefly listed below:- *S. cereale afghanicum* (Vavilov,K.Hammer. Native to the Caucasus, western Asia and India. *S. cereale ancestrale Zhuk*. Native to western Asia. *S. cereale dighoricum Vavilov*. Native to the Caucasus and eastern Europe. *S. cereale segetale Zhuk*. Native to temperate Asia. Rye grows well with cornflowers and pansies[18, 20], though it inhibits the growth of poppies and couch grass[18, 20]. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a clumper with limited spread [1-2]. In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is fibrous dividing into a large number of fine roots [2-1].

4.2.10 Helianthus pauciflorus

Stiff Sunflower, Prairie Sunflower

3 tlin 7 cyuc 4 kcak 1 tcan 0 dwat 1.5 m hkuc htut cyutli hगतक्युत्तुप hwicli hrasjlutnyik hpa7tli flatprklwis hpa7tmwatli hjonli

drutta Helianthus pauciflorus is a PERENNIAL growing to 1.5 m (5ft) by 0.3 m (1ft in) at a fast rate. See above for

USDA hardiness. It is hardy to UK zone 3. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

kcakta Edible Parts: Oil Seed**Edible Uses:** Oil**Carbon Farming Solutions - Staple Crop:** protein-oil (The term staple crop typically refers to a food that is eaten routinely and accounts for a dominant part of people's diets in a particular region of the world) [1-1]. Perennial crops are being developed for their oil-seed. The Land Institute see them as part of a perennial polyculture system [1-1].

tcanta OilDrought-tolerant and suitable for xeriscaping. Attractive to bees, butterflies and/or birds **nrakta** North American. Widespread across the Great Plains, the Rocky Mountains, and the Great Lakes region. Naturalized in the eastern United States and in much of southern Canada (from Alberta to Nova Scotia). ksacta Dry to moderately wet prairies and open areas. Subspecies *Helianthus pauciflorus* subsp. *subrhomboideus* occurs in dry, open habitats.

propta An easy plant to grow. Division. Herbaceous stem cuttings. Seed; direct sow outdoors in autumn. Self-sows freely.

nwatta Management: Standard Staple Crop: Protein-oil Under DevelopmentClimate: boreal to warm temperate. Humidity: semi-arid to humid. Soil pH: 6.1 (mildly acidic) to 7.8 (mildly alkaline). Prefers full sun and mesic to dry conditions. Soil can contain significant amounts of loam, clay loam, sand, or gravelly material. Easy to grow. **Carbon Farming Solutions - Cultivation:** under development. Management: standard (Describes the non-destructive management systems that are used in cultivation) [1-1]. Perennial crops are being developed for their oil-seed. The Land Institute see them as part of a perennial polyculture system [1-1]. Several perennial sunflowers are being worked with including prairie natives handling boreal to warm temperate semi-arid conditions: *Helianthus maximiliani* (Maximilian sunflower), *Helianthus tuberosus* (Jerusalem artichoke), *Helianthus pauciflorus* (Stiff sunflower). Less tolerant of boreal conditions but good on poor soils is *Helianthus cusickii* (Cusick's sunflower) [1-1].

4.2.11 Prunus besseyi

Western Sand Cherry

3 tlin 6 cyuc 4 kcak 2 tcan 1 dwat 1.2 m hkuc hmimhtut cyutli hgattcup hwicli hrasjlutnyik hpa7tli flatprklwis hpa7tmwatli xre7t hjonli

drutta *Prunus besseyi* is a deciduous Shrub growing to 1.2 m (4ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 3. It is in flower in May. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought.

pcista Although no specific mention has been seen for this species, it belongs to a genus where most, if not all members of the genus produce hydrogen cyanide, a poison that gives almonds their characteristic flavour. This toxin is found mainly in the leaves and seed and is readily detected by its bitter taste. It is usually present in too small a quantity to do any harm but any very bitter seed or fruit should not be eaten. In small quantities, hydrogen cyanide has been shown to stimulate respiration and improve digestion, it is also claimed to be of benefit in the treatment of cancer. In excess, however, it can cause respiratory failure and even death.

kcakta Edible Parts: Fruit Seed**Edible Uses:** Fruit - raw or cooked[85, 183, 257]. A sweetish flavour, the fruit can also be dried for later use[183]. It makes a rather astringent but tasty jelly[182]. The fruit is a reasonable size, up to 18mm in diameter, and contains one large seed[200]. Seed - raw or cooked. Do not eat the seed if it is too bitter - see the notes above on toxicity.

tcanta Dye rootstockA green dye can be obtained from the leaves[168]. A dark grey to green dye can be obtained from the fruit[168]. The plant can be used as a rootstock for

in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. It thrives in acid soils[160]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. A very hardy species, tolerating temperatures down to about -30°C[160]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. Occasionally cultivated for its fruit in America, there are some named varieties[183].

5.2.40 Hosta longipes

4 tlin 8 cyuc 3 kcak 3 tcan 0 dwat 0.3 m hkuc

pcimhmimhtut cyutli hgattcup hwicli hrasjlutnyikfrp hpa7tli flatprklwis hpa7tmwatli xre7t hjonli

drutta *Hosta longipes* is a PERENNIAL growing to 0.3 m (1ft) by 1 m (3ft 3in). See above for USDA hardiness. It is hardy to UK zone 4 and is not frost tender. It is in flower from July to September, and the seeds ripen from September to October. The species is hermaphrodite (has both male and female organs). Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in full shade (deep woodland) semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought.

kcakta Edible Parts: Leaves Stem**Edible Uses:** Young leaves and leaf stems - cooked. Sourish[105]. A very acceptable taste, but somewhat fibrous[K].

tcanta A good ground cover plant, succeeding in dense shade.

nrakta E. Asia - Japan, Korea. ksacta Usually found growing on trees or rocks in the wild[251].

propta Seed - sow spring in a lightly shaded position in a greenhouse and only just cover the seed. Germination usually takes place within 1 - 3 months at 10°C. Make sure you keep the compost moist. When they are large enough to handle, prick the seedlings out into individual pots and grow them on in the greenhouse for at least their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. Division is possible at almost any time of the year so long as there is sufficient moisture[233]. It is best carried out in March as growth commences or in early autumn if the soil is not too dry[200]. Hostas can be left undivided for many years and should not be divided any more frequently than once every 3 - 5 years to allow the leaves to reach maturity[200].

nwatta Thrives in most fertile soils if they are rich in humus[200]. Grows well in heavy clay soils and in sandy ones[208]. Very limy soils inhibit growth, but plants can thrive in such a situation if plenty of humus is added[208]. Prefers a pH between 6 and 7[200]. Requires a rich soil that does not dry out readily[1]. Another report says that once established it is drought tolerant[187]. Does well in the semi-shade of a woodland[200] also succeeding in deeper shade[187]. In general, the sunnier the position the moister the soil should be[233]. Plants are best not grown under trees in town gardens since the soot washed from the leaves of the trees in wet weather will tend to remain on the hosta[208]. Plants flower better when grown in a sunny position but the foliage is better when the plant is in a shady position[200]. Plants are in general fully hardy in Britain, but young leaves in spring can be destroyed by frost. New leaves are only produced in the spring and very early summer, so any damage at this time has a deep effect on the plant[233]. A vigorous plant, forming medium sized clumps. The roots travel extensively[200]. Members of this genus are rarely if ever troubled by browsing deer or rabbits[233]. Plants are very attractive to slugs and snails, the young shoots in spring are especially at risk[111, K]. Hybridizes freely with other members of this genus, especially with *H. kikutii*[200].

5.2.41 Thymus praecox arcticus

Wild Thyme

4 tlin 8 cyuc 3 kcak 5 tcan 2 dwat 0.1 m hkuc htut cyutli hगतक्युत्तुप hwicli hrasjlut hpa7tli prklwisslip hpa7tmwatli xre7t hjonli

drutta *Thymus praecox arcticus* is an evergreen Shrub growing to 0.1 m (0ft 4in) by 0.3 m (1ft). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in leaf all year, in flower from May to August, and the seeds ripen from July to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees, flies, Lepidoptera (Moths and Butterflies). It is noted for attracting wildlife. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained soil. Suitable pH: neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

kcakta Edible Parts: Leaves**Edible Uses:** Condiment TeaLeaves - raw in salads or added as a flavouring to cooked foods[183]. Retains its flavour well in long slow cooking. If the leaves are to be dried, the plants should be harvested in early and late summer just before the flowers open and the leaves should be dried quickly[200]. An aromatic tea is made from the leaves or dried flowers[183].

tcanta Deodorant Disinfectant Essential Fungicide RepellentAn essential oil from the leaves is used in perfume, soaps, medicinally etc[200]. It has fungicidal properties[171]. The dried flowers are used to repel moths from clothing[4].

dwatta Anthelmintic Antiseptic Antispasmodic Carminative Deodorant Diaphoretic Disinfectant Expectorant Sedative TonicThe leaves, and especially the essential oil contained in them, are anthelmintic, antiseptic, antispasmodic, carminative, deodorant, diaphoretic, disinfectant, expectorant, sedative and tonic[4, 7, 21, 200, 238]. The plant can be used fresh at any time of the year, or it can be harvested as it comes into flower and either be distilled for the oil or dried for later use[238].

nrakta Western Europe, including Britain, from Iceland and Norway to France and Spain. ksacta Chalk downs, dry grassland, heaths, dunes, screes and amongst rocks[17].

propta Seed - sow spring in a cold frame. Seed can also be sown in autumn in a greenhouse. Surface sow or barely cover the seed. Germination can be erratic. When they are large enough to handle, prick the seedlings out into individual pots and grow them on in the greenhouse for at least their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. Division in spring or autumn[200]. Larger divisions can be planted out direct into their permanent positions. We have found that it is best to pot up smaller divisions and grow them on in light shade in a greenhouse or cold frame until they are growing away well. Plant them out in the summer or the following spring. Cuttings of young shoots, 5 - 8cm with a heel,

in full shade (deep woodland) semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcakta Edible Parts: Fruit Leaves**Edible Uses:** Coffee TeaFruit - raw or cooked[2, 9, 12, 183]. A dry and mealy texture, they are not very appetizing[K]. The fruit can be used for jams and preserves[9]. The fruit pulp can be dried, ground into a meal and mixed with flour in making bread etc[46, 183]. The fruit is about 1cm in diameter[200]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K]. Young leaves and young shoots - raw[5, 177]. A tasty nibble, they are nice in a salad[K]. Young leaves are a tea substitute[21, 46, 177, 183]. The roasted seed is a coffee substitute[12, 21, 183].

tcanta Charcoal Fuel Hedge Hedge Rootstock WoodA good hedge plant, it is very tolerant of neglect and is able to regenerate if cut back severely, it makes a good thorny stock-proof barrier[186] and resists very strong winds. It can be used in layered hedges[11, 29]. The plant is often used as a rootstock for several species of garden fruit such as the medlar (*Mespilus germanica*) and the pear (*Pyrus communis sativa*) [4]. Wood - very hard and tough but difficult to work[7, 46, 61]. It has a fine grain and takes a beautiful polish but is seldom large enough to be of great value[4]. It is used for tool handles and making small wooden articles etc[4, 7, 46, 61]. The wood is valued in turning and makes an excellent fuel, giving out a lot of heat, more so even than oak wood[4]. Charcoal made from the wood is said to be able to melt pig iron without the aid of a blast[4].

dwatta Antiarrhythmic Antispasmodic Astringent Cardiotonic Diuretic Hypotensive Malaria Sedative Tonic VasodilatorHawthorn is an extremely valuable medicinal herb. It is used mainly for treating disorders of the heart and circulation system, especially angina[254]. Western herbalists consider it a 'food for the heart', it increases the blood flow to the heart muscles and restores normal heart beat[254]. This effect is brought about by the presence of bioflavonoids in the fruit, these bioflavonoids are also strongly antioxidant, helping to prevent or reduce degeneration of the blood vessels[254]. The fruit is antispasmodic, cardiac, diuretic, sedative, tonic and vasodilator[4, 9, 21, 46, 165]. Both the fruits and flowers of hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222], they are also used to treat a heart muscle weakened by age, for inflammation of the heart muscle, arteriosclerosis and for nervous heart problems[21]. Prolonged use is necessary for the treatment to be efficacious[222]. It is normally used either as a tea or a tincture[222]. Hawthorn is combined with ginkgo (*Ginkgo biloba*) to enhance poor memory, working by improving the blood supply to the brain[254]. The bark is astringent and has been used in the treatment of malaria and other fevers[7]. The roots are said to stimulate the arteries of the heart[218].

nrakta Europe, including Britain, from Sweden to Spain, eastwards to Poland. ksacta Woods, hedges, thickets etc on clays and heavy loams, especially in E. Britain[17, 186]. Where found in hedges it is often as a relic of ancient woodland[186].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80].

If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be

best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta Landscape Uses:Border, Espalier, Pollard, Specimen, Street tree. A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. A true woodland species, it grows well in quite dense shade[17, 186]. A very hardy plant, tolerating temperatures down to at least -18°C[202]. Hybridizes freely with other members of this genus[200]. Closely allied to *C. monogyna*, it often hybridizes with that species in the wild when growing in its proximity[186]. There are many named forms selected for their ornamental value[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. An important food plant for the larvae of many lepidoptera species[30]. **Special Features:**Not North American native, Blooms are very showy.

5.2.39 Crataegus opaca

Western Mayhaw

4 tin 8 cyuc 3 kcak 3 tcan 2 dwat 9 m hkuc
hmimhtut cyutli hgactcuphja7n hwicli hrasjlutnyikfrip hpa7tli
frusflatprikhwis hpa7tmwatli xre7t hjonli

drutta Crataegus opaca is a deciduous Shrub growing to 9 m (29ft 6in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 4 and is not frost tender. It is in flower in March, and the seeds ripen from May to June. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcakta Edible Parts: Fruit**Edible Uses:** Fruit - raw or cooked[160]. Juicy and acid with a pleasant flavour[2]. It is up to 2cm in diameter[227]. The fruit is frequently used and much prized in parts of southern N. America where it is often gathered in quantity from the wild. Its acid flavour makes it a favourite for preserves and jellies[82, 183, 227]. The fruit can also be dried for later use. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard and strong, but not large enough for commercial use[227]. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta Southern N. America - North Carolina to Mississippi. ksacta Deep depressions filled with water for most of the year, borders of swamps, low river banks etc[82].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate

plums[160]. It produces mostly dwarf trees that are poorly anchored[183]. Prone to severe suckering[183]. Compatible with most prunes, it is incompatible with damsons and Victoria plums[183]. Resistant to 'Crown Gall'[183]. Trees on this rootstock are productive and very cold hardy[183]. Cuttings are often easy to root but seedlings vary widely[183].

dwatta Although no specific mention has been seen for this species, all members of the genus contain amygdalin and prunasin, substances which break down in water to form hydrocyanic acid (cyanide or prussic acid). In small amounts this exceedingly poisonous compound stimulates respiration, improves digestion and gives a sense of well-being[238].

nrakta Central N. America - Manitoba and Minnesota to Kansas and Utah. ksacta Sandy hills, open plains, rocky slopes or shores[43].

propta Seed - requires 2 - 3 months cold stratification and is best sown in a cold frame as soon as it is ripe[200]. Sow stored seed in a cold frame as early in the year as possible[200]. Protect the seed from mice etc. The seed can be rather slow, sometimes taking 18 months to germinate[113]. Prick out the seedlings into individual pots when they are large enough to handle. Grow them on in a greenhouse or cold frame for their first winter and plant them out in late spring or early summer of the following year. Cuttings of half-ripe wood with a heel, July/August in a frame[11, 200]. Softwood cuttings from strongly growing plants in spring to early summer in a frame[200]. Division of suckers in the dormant season. They can be planted out direct into their permanent positions. Layering in spring.

nwatta Landscape Uses:Specimen. Thrives in a well-drained moisture-retentive loamy soil, doing well on limestone[11, 200]. Prefers some lime in the soil but is likely to become chlorotic if too much lime is present[1]. Succeeds in sun or partial shade though it fruits better in a sunny position[11, 200]. Established plants are drought resistant[160]. A very hardy plant, probably tolerating temperatures down to about -50°C when it is fully dormant[160]. It is cultivated for its edible fruit in warmer climates than Britain[11], there are some named varieties[183]. It flowers very well in this country but does not usually produce much fruit[11]. Another report says that it sometimes fruits abundantly in Britain. The cultivar 'Black Beauty' crops well and has small black sweet fruits[200]. 'Hansens' has large fruits with a good flavour[200]. Most members of this genus are shallow-rooted and will produce suckers if the roots are damaged[238]. Plants are inclined to sucker and can produce dense thickets[160]. Plants in this genus are notably susceptible to honey fungus[200]. **Special Features:**Attracts birds, North American native, All or parts of this plant are poisonous, Fragrant flowers, Blooms are very showy.

4.2.12 Allium moly

Golden Garlic, Ornamental Onion

3 tin 9 cyuc 4 kcak 0 tcan 2 dwat m hkuc
htut cyutli hgatkyuctup hwicli hrasjlut hpa7tli flatprikhwis
hpa7tmwatli xre7t hjonli

drutta Allium moly is a BULB growing to 0.3 m (1ft) by 0.1 m (0ft 4in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 7 and is not frost tender. It is in leaf from September to ?, in flower from June to July, and the seeds ripen from July to August. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees, insects. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

pcista Although no individual reports regarding this species have been seen, there have been cases of poisoning caused by the consumption, in large quantities and by some mammals, of certain members of this genus. Dogs seem to be particularly susceptible[76].

kcakta Edible Parts: Flowers Leaves Root**Edible Uses:** Bulb - raw or cooked. A pleasant mild garlic flavour, when sliced it makes a very nice addition to salads and can also be used as a flavouring in cooked foods[K]. The bulbs are about 25mm in diameter[200]. Leaves - raw or cooked. Flowers - raw. The yellow flowers make an attractive garnish on salads and have a pleasant onion flavour[K].

tcanta RepellentThe juice of the plant is used as a moth repellent. The whole plant is said to repel insects and moles[20].

dwatta Although no specific mention of medicinal uses has been seen for this species, members of this genus are in general very healthy additions to the diet. They contain sulphur compounds (which give them their onion flavour) and when added to the diet on a regular basis they help reduce blood cholesterol levels, act as a tonic to the digestive system and also tonify the circulatory system[K].

nrakta Europe - Mediterranean in south-western Europe and northern Africa. ksacta Shady rocks and screes in mountains[90]. Limestone rubble[190].

propta Seed - sow spring in a cold frame. Prick out the seedlings into individual pots when they are large enough to handle - if you want to produce clumps more quickly then put three plants in each pot. Grow them on in the greenhouse for at least their first winter and plant them out into their permanent positions in spring once they are growing vigorously and are large enough. Division in spring. Very easy, the plants divide successfully at any time in the growing season and the divisions can be planted straight out into their permanent positions if required. Plants sometimes produce bulbils, these can be potted up as soon as they are ripe and planted out in late spring.

nwatta Landscape Uses:Border, Container, Foundation, Massing, Rock garden, Woodland garden. An easily grown plant[203], preferring a sunny position in a light well-drained soil[1, 90]. Established plants are fairly drought tolerant[190]. The bulbs should be planted fairly deeply[1]. The dormant bulbs are fairly hardy and will withstand soil temperatures down to at least -10°C[214]. There are some named forms selected for their ornamental value[203]. The flowers are softly scented[245]. Some forms of this species, especially *A. moly* bifurum[203], produce bulbils in the flowering head[42] and can be invasive[203]. The species type is sometimes considered to be invasive, though it has not proved so with most people[203]. It is useful for naturalising between shrubs and grows well at the base of a beech hedge in a wet garden[203]. Grows well with most plants, especially roses, carrots, beet and chamomile, but it inhibits the growth of legumes[18, 20, 54]. It is a bad companion for alfalfa, each species negatively affecting the other[201]. Members of this genus are rarely if ever troubled by browsing deer[233]. **Special Features:**Not North American native, Naturalizing, Attracts butterflies, Suitable for dried flowers.

4.2.13 Prunus pumila

Dwarf American Cherry, Sandcherry, Western sandcherry, Eastern sandcherry, Great Lakes sandcherry
3 tin 8 cyuc 4 kcak 2 tcan 1 dwat 0.6 m hkuc
htut cyutli hgatkyuctup hwicli hrasjlutnyik hpa7tli flatprikhwis
hpa7tmwatli fyfikre7t hjonli

drutta Prunus pumila is a deciduous Shrub growing to 0.6 m (2ft) by 1 m (3ft 3in). See above for USDA hardiness. It is hardy to UK zone 2. It is in flower in May, and the seeds ripen in August. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. The plant is self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista Although no specific mention has been seen for this species, it belongs to a genus where most, if not all members of the genus produce hydrogen cyanide, a poison that gives almonds their characteristic flavour. This toxin is found mainly in the leaves and seed and is readily detected by its bitter taste. It is usually present in too small a quantity to do any harm but any very bitter seed or fruit should not be eaten. In small quantities, hydrogen cyanide has been shown to stimulate respiration and improve digestion, it is also claimed to be of benefit in the treatment of cancer. In excess, however, it can cause respiratory failure and even death.

kcakta Edible Parts: Fruit Seed**Edible Uses:** Fruit - raw or cooked[2, 159, 161]. A reasonable size, up to 10mm in diameter with one large seed[200], this is the largest of the N. American cherries[213]. A rich and pleasantly acid taste

when fully ripe though they are sometimes slightly bitter[2, 11, 101, 183]. Eaten out of hand, used in preserves or dried for later use[183]. Seed - raw or cooked. Do not eat the seed if it is too bitter - see the notes above on toxicity.

tcanta Dye RootstockA green dye can be obtained from the leaves[168]. A dark grey to green dye can be obtained from the fruit[168]. Used as a rootstock for the sour cherry[160].

dwatta Although no specific mention has been seen for this species, all members of the genus contain amygdalin and prunasin, substances which break down in water to form hydrocyanic acid (cyanide or prussic acid). In small amounts this exceedingly poisonous compound stimulates respiration, improves digestion and gives a sense of well-being[238].

nrakta Eastern N. America - New Brunswick to Manitoba, Maine, New Jersey, Indiana and Wisconsin. ksacta Dunes and sand, or on calcareous rocky shores[43].

propta Seed - requires 2 - 3 months cold stratification and is best sown in a cold frame as soon as it is ripe[200]. Sow stored seed in a cold frame as early in the year as possible[200]. Protect the seed from mice etc. The seed can be rather slow, sometimes taking 18 months to germinate[113]. Prick out the seedlings into individual pots when they are large enough to handle. Grow them on in a greenhouse or cold frame for their first winter and plant them out in late spring or early summer of the following year. Cuttings of half-ripe wood with a heel, July/August in a frame[11, 200]. Softwood cuttings from strongly growing plants in spring to early summer in a frame[200]. Layering in spring.

nwatta Requires a well-drained moisture retentive soil[1, 11]. Thrives in a loamy soil, doing well on limestone[11]. Prefers some chalk in the soil but apt to become chlorotic if too much is present[1]. Requires a sunny position[11]. Established plants are very drought resistant[160]. This species is hardy to about -35°C when the plants are fully dormant[160], though the young growth in spring is fairly tender[K]. Plants are susceptible to mildew in low areas[160]. Plants thrive in areas with a short growing season[160]. The fruits are highly resistant to all fruit worms[160]. Plants can produce fruit in 3 years from seed[160]. A single plant, growing at Hilliers Arboretum in 1999, produced a good crop of fruit with viable seed, so the species is almost certainly self-fertile[K]. Most members of this genus are shallow-rooted and will produce suckers if the roots are damaged[238]. Plants in this genus are notably susceptible to honey fungus[200]. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is multistemmed with multiple stems from the crown [1-2].

4.2.14 Gaultheria procumbens

Checkerberry, Eastern teaberry, Teaberry, Creeping Wintergreen

3 tin 6 cyuc 4 kcak 4 tcan 3 dwat 0.2 m hkuc pcmhmm cyutil hgatkyuctup hwicli vyishrasjlut hpa7tli frusflatprik hpa7tmwatli fyfxre7t hjonli

drutta Gaultheria procumbens is an evergreen Shrub growing to 0.2 m (0ft 8in) by 1 m (3ft 3in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 4. It is in leaf all year, in flower from July to August, and the seeds ripen from October to December. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. The plant is self-fertile. Suitable for: light (sandy) and medium (loamy) soils and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It can grow in full shade (deep woodland) or semi-shade (light woodland). It prefers dry or moist soil and can tolerate drought.

pcista The pure distilled essential oil is toxic in large doses[222]. If used orally may aggravate stomach ulcers. Do not use if allergic to aspirin. Avoid if under 12. Topical use can cause contact dermatitis [301].

kcakta Edible Parts: Fruit LeavesEdible Uses: Condiment TeaFruit - raw or cooked[2, 3, 14, 95, 101]. Pleasant but insipid[11]. The fruit is not at all insipid, it has a very strong spicy taste of germolene, just like being in a hospital waiting room[K]. Best after a frost, the fruit hangs onto the plant until spring if it is not eaten by birds etc[62,

K]. The fruits can also be used in pies, or made into jams etc[183]. The fruit is up to 15mm in diameter[200]. Young leaves - raw[62, 102, 106]. A pleasant wayside nibble if used when very young[183]. Dry and powdery according to our taste buds[K]. A very agreeable tea is made from the fresh leaves[3, 95, 183]. A stronger tea can be made by first fermenting the bright red leaves[183]. 'Oil of wintergreen' can be distilled from this plant. It is used to flavour beer, sweets, chewing gum etc[183].

tcanta EssentialAn essential oil is obtained from the leaves by steam distillation[2, 14, 57, 213]. In order to obtain the oil, the leaves need to be steeped for 12 - 24 hours in water[4]. The essential oil is used as a food flavouring, medicinally (the original source of Wintergreen oil used as a liniment for aching muscles) and in perfumery and toothpastes. In large doses it can be toxic[165, 244]. A good ground-cover plant for shady positions though it requires weeding for the first year or so[28, 31, 197]. Forming a dense tuft-like carpet, it roots as it spreads and should be spaced about 45cm apart each way[208]. A dynamic accumulator gathering minerals or nutrients from the soil and storing them in a more bioavailable form - used as fertilizer or to improve mulch.

dwatta Analgesic Antinflammatory Antirheumatic Aromatic Astringent Carminative Diuretic Emmenagogue Stimulant TonicCheckerberry leaves were widely used by the native North American Indians in the treatment of aches and pains and to help breathing whilst hunting or carrying heavy loads[238]. An essential oil (known as 'oil of wintergreen') obtained from the leaves contains methyl salicylate, which is closely related to aspirin and is an effective anti-inflammatory[213]. This species was at one time a major source of methyl salicylate, though this is now mainly synthesized[238]. The leaves, and the oil, are analgesic, anti-inflammatory, aromatic, astringent, carminative, diuretic, emmenagogue, stimulant and tonic[4, 21, 165]. An infusion of the leaves is used to relieve flatulence and colic[254]. The plant, especially in the form of the essential oil, is most useful when applied externally in the treatment of acute cases of rheumatism, sciatica, myalgia, sprains, neuralgia and catarrh[4, 238]. The oil is sometimes used in the treatment of cellulitis, a bacterial infection that causes the skin to become inflamed[254]. Some caution is advised, especially if the oil is used internally, since essential oil is toxic in excess, causing liver and kidney damage[4, 238]. It should not be prescribed for patients who are hypersensitive to salicylates (aspirin)[238]. The leaves can be gathered at any time from spring to early autumn, they are dried for use in infusions or distilled to produce the oil[238].

nrakta Eastern N. America. Introduced and established on one site in Britain, in Scotland. ksacta Sterile woods (poor acid soils) and clearings[43, 62]. Especially found beneath evergreen trees[23].

propta The seed requires a period of cold stratification. Pre-chill for 4 - 10 weeks and then surface sow in a lime-free compost in a shady part of the greenhouse and keep the compost moist[78]. The seed usually germinates well, usually within 1 - 2 months at 20°C, but the seedlings are liable to damp off. It is important to water them with care and to ensure that they get plenty of ventilation. Watering them with a garlic infusion can also help to prevent damping off[K]. Prick out the seedlings into individual pots when they are about 25mm tall and grow them on in light shade in the greenhouse for at least their first winter[K]. Plant them out in late spring or early summer. The seedlings are susceptible to spring frosts so might need some protection for their first few years outdoors. The leaves remain very small for the first few years[11]. Cuttings of half-ripe wood 3 - 6cm long, July/August in a frame in a shady position. They form roots in late summer or spring[78]. A good percentage usually take. Division can be carried out at almost any time of the year, but works best in the spring just before new growth begins[K]. Very easy, larger clumps can be replanted direct into their permanent positions, though it is best to pot up smaller clumps and grow them on in a cold frame until they are rooting well. Plant them out in the spring.

nwatta Landscape Uses:Ground cover, Massing, Rock garden, Woodland garden. Forms a moist but not boggy humus rich soil in shade or semi-shade[11, 182]. A peat and moisture loving species, it requires a lime-free soil[11, 182]. Succeeds in dry soils once it is well established and tolerates considerable drought[208]. Grows well under the thin shade of deciduous shrubs or evergreens[4, 11]. A very

and borne in small clusters[200]. Ripening in October, it is quite apple-like in texture and appearance, making a good dessert fruit[K]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta MiscellanyWood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotonic Hypotensive MiscellanyA compound decoction of the shoots and bark has been used to stop menstrual flow[257]. Although no other specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta Eastern N. America - Quebec to Georgia, west to Minnesota and Oklahoma. ksacta Open rocky ground, thickets and pasture[43]. Rich hillsides[82].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. A very ornamental plant[1], it grows very well in Britain, flowering and fruiting abundantly[11]. There are some named varieties selected for their ornamental value[200]. 'Ohio Pioneer' is a thornless form growing about 8 metres tall[200]. The plant is heat tolerant in zones 7 through 5. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering

single trunk [1-2]. The root pattern is a tap root similar to a carrot going directly down [1-2].

5.2.37 Allium sphaerocephalon

Round-Headed Leek

4 tin 8 cyuc 3 kcak 0 tcan 2 dwat 0.6 m hkuc htut cyutil hgatkyuctup hwicli hrasjlut hpa7tli flatpriklwis hpa7tmwatli fyfxre7t hjonli

drutta Allium sphaerocephalon is a BULB growing to 0.6 m (2ft) by 0.1 m (0ft 4in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from July to August. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. The plant is self-fertile. It is noted for attracting wildlife. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

pcista Although no individual reports regarding this species have been seen, there have been cases of poisoning caused by the consumption, in very large quantities and by some mammals, of certain members of this genus. Dogs seem to be particularly susceptible[76].

kcakta Edible Parts: Flowers Leaves RootEdible Uses: Edible bulb - raw or cooked[2, 46, 61, 177]. An onion substitute[22]. The bulbs are up to 35mm in diameter[200]. Leaves - raw or cooked[177]. They can be dried for later use[183]. Flowers - raw. Used as a garnish on salads.

tcanta RepellentThe juice of the plant is used as a moth repellent. The whole plant is said to repel insects and moles[20].

dwatta Although no specific mention of medicinal uses has been seen for this species, members of this genus are in general very healthy additions to the diet. They contain sulphur compounds (which give them their onion flavour) and when added to the diet on a regular basis they help reduce blood cholesterol levels, act as a tonic to the digestive system and also tonify the circulatory system[K].

nrakta Western Europe, including Britain, south to the Mediterranean. ksacta Limestone rocks and fields in dry places[17, 90].

propta Seed - sow spring in a cold frame. Prick out the seedlings into individual pots when they are large enough to handle - if you want to produce clumps more quickly then put three plants in each pot. Grow them on in the greenhouse for at least their first winter and plant them out into their permanent positions in spring once they are growing vigorously and are large enough. Division in spring. The plants divide successfully at any time in the growing season, pot up the divisions in a cold frame or greenhouse until they are growing well and then plant them out into their permanent positions.

nwatta An easily grown plant[203]. It prefers a sunny position in a light well-drained soil[1, 90]. Established plants are fairly drought tolerant[190]. The bulbs should be planted fairly deeply[1]. Grows well with most plants, especially roses, carrots, beet and chamomile, but it inhibits the growth of legumes[18, 20, 54]. This plant is a bad companion for alfalfa, each species negatively affecting the other[201]. Plants often divide freely at the roots[233]. A good bee plant[163]. The flowers are very attractive to bees[203]. The flowers are sometimes replaced with bulbils[90]. Members of this genus are rarely if ever troubled by browsing deer[233].

5.2.38 Crataegus laevigata

Midland Hawthorn, Smooth hawthorn, English Hawthorn 4 tin 8 cyuc 3 kcak 5 tcan 5 dwat 6 m hkuc pcmhmmiyctul hgatcuphja7n hwicli hrasjlutnykfrfp hpa7tli flatprikwlisslp hpa7tmwatli xre7t hjonli

drutta Crataegus laevigata is a deciduous Shrub growing to 6 m (19ft) by 6 m (19ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from April to May, and the seeds ripen from September to November. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow

smells of carrots[13]. The boiled or roasted roots are said to resemble parsnips or chestnuts in flavour[2, 183].

tcanta Soil stabilizationThe extensive root system helps to bind sand on the sea shore[13].

dwatta Aphrodisiac Aromatic Diaphoretic Diuretic Expectorant Stimulant TonicSea holly roots were collected on a large scale in the 17th and 18th centuries in England and were candied then used as restorative, quasi-aphrodisiac lozenges[238]. The plant is still used in modern herbalism where it is valued especially for its diuretic action[254]. The root is to be aphrodisiac, aromatic, diaphoretic, diuretic, expectorant, stimulant and tonic[4, 165, 200]. The root promotes free expectoration and is very useful in the treatment of debility attendant on coughs of chronic standing in the advanced stages of pulmonary consumption[4]. It is used in the treatment of cystitis, urethritis, as a means to alleviate kidney stones (it is unlikely that it dissolves the stones, but it probably helps to retard their formation), and to treat enlargement or inflammation of the prostate gland[254]. Drunk freely, it is used to treat diseases of the liver and kidneys[4, 238]. Used externally as a poultice, the dried powdered root aids tissue regeneration[268]. The root should be harvested in the autumn from plants that are at least 2 years old[4].

nrakta European coasts, including Britain, from Scandinavia to the Mediterranean and Baltic, and Black Sea ksacta Sea shores, preferring sand and shingle whilst avoiding acid soils[17].

propta Seed - best sown as soon as it is ripe in early autumn on the surface of a well-drained compost in a cold frame[200]. The seed can also be sown in spring. Germination can be very slow[4], although another report says that the seed usually germinates in 5 - 90 days at 20°C. When they are large enough to handle, prick the seedlings out into individual pots and grow them on in the greenhouse for their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. Division in early spring or autumn. Take care since the plant resents root disturbance[200]. Root cuttings in autumn or winter[200].

nwatta Requires a deep well-drained soil and a sunny position[1]. Prefers a light sandy saline soil but tolerates most soil types including lime and poor gravels[200, 268]. Plants are best grown in a hot dry position[187, 233]. Established plants are drought tolerant[190]. Plants are hardy to about -15°C[187]. Sea holly has very long roots that penetrate deeply in the soil and are often several feet long[4]. These roots are sweetly scented[245]. The plant should be placed in its final position whilst small since it resents root disturbance[200]. Although a sea-shore plant, it is amenable to garden cultivation[4]. A good bee plant[108]. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a clumper with limited spread [1-2]. The root pattern is a tap root similar to a carrot going directly down [1-2].

5.2.35 Yucca angustissima

Narrowleaf yucca, Kanab yucca, Toft's yucca, Yucca

4 tlin 9 cyuc 3 kcak 4 tcan 0 dwat 0.4 m hkuc hmimhtut cyutli hgatkuyctup hwicli hyishrasjlutnyik hpa7tli flatprikwlis hpa7tmwatli xre7t hjonli

drutta Yucca angustissima is an evergreen Shrub growing to 0.4 m (1ft 4in) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 8. It is in leaf all year; in flower from June to July. The species is hermaphrodite (has both male and female organs) and is pollinated by Hand. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista The roots contain saponins[222]. Whilst saponins are quite toxic to people, they are poorly absorbed by the body and so tend to pass straight through. They are also destroyed by prolonged heat, such as slow baking in an oven. Saponins are found in many common foods such as beans[K]. Saponins are much more toxic to some creatures, such as

fish, and hunting tribes have traditionally put large quantities of them in streams, lakes etc in order to stupefy or kill the fish[K].

kcakta Edible Parts: Flowers Fruit StemEdible Uses: Fruit - the immature fruit is cooked[85]. Baked in an oven[216]. A bitter taste, the bitterness is in the skin[85]. The fruit is about 6cm long and 2.5cm wide[200]. Flowers - raw or cooked. They are delicious raw, or can be dried, crushed and used as a flavouring[85]. Flowering stem - peeled, cooked and used like asparagus. The whitish inner portion is used[85].

tcanta Basketry Broom Brush Fibre SoapA fibre obtained from the leaves is used for making ropes, baskets and mats[85]. The leaves are very fibrous and can be used as paint brushes[92] or as a broom or woven to make mats etc[85]. They are also used in basketry[216]. The roots are rich in saponins and can be used as a soap substitute[85, 216].

nrakta South-western N. America. ksacta Sandy places, sandstone outcrops, rocky hillsides of deserts at elevations of 900 - 2200 metres in Arizona, New Mexico and Utah[270].

propta Seed - sow spring in a greenhouse. Pre-soaking the seed for 24 hours in warm water may reduce the germination time. It usually germinates within 1 - 12 months if kept at a temperature of 20°C. Prick out the seedlings into individual pots when they are large enough to handle and grow them on in the greenhouse or cold frame for at least their first two winters. Plant them out into their permanent positions in early summer and consider giving them some winter protection for at least their first winter outdoors - a simple pane of glass is usually sufficient[K]. Seed is not produced in Britain unless the flowers are hand pollinated. Root cuttings in late winter or early spring. Lift in April/May and remove small buds from base of stem and rhizomes. Dip in dry wood ashes to stop any bleeding and plant in a sandy soil in pots in a greenhouse until established[78].

nwatta Landscape Uses:Border, Massing, Specimen. Thrives in any soil but prefers a sandy loam and full exposure to the south[11]. Plants can succeed in light shade[K]. They are hardier when grown on poor sandy soils[200]. Established plants are very drought resistant, this species is also tolerant of damp weather[11]. Plants are not hardy in the colder areas of the country, they tolerate temperatures down to about -10° if in a suitable location[11, 200]. Closely allied to *Y. glauca*[11]. The plant has a thick prostrate rootstock[11]. In the plants native environment, its flowers can only be pollinated by a certain species of moth. This moth cannot live in Britain and, if fruit and seed is required, hand pollination is necessary. This can be quite easily and successfully done using something like a small paint brush. Individual crowns are monocarpic, dying after flowering[233]. However, the crown will usually produce a number of sideshoots before it dies and these will grow on to flower in later years[233]. Plants in this genus are notably resistant to honey fungus[200]. Members of this genus seem to be immune to the predations of rabbits[233]. Special Features:North American native, Fragrant flowers, Attractive flowers or blooms.

5.2.36 Crataegus punctata

Dotted Hawthorn,

4 tlin 8 cyuc 3 kcak 2 tcan 2 dwat 10 m hkuc hmimhtut cyutli hgattcuphja7n hwicli brasjlutnyikfrip hpa7tli flatprikwlislip hpa7tmwatli xre7t hjonli

drutta Crataegus punctata is a deciduous Tree growing to 10 m (32ft 10in). See above for USDA hardiness. It is hardy to UK zone 4 and is not frost tender. It is in flower in June, and the seeds ripen in October. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[159]. Eaten out of hand or made into jellies, preserves etc[177, 183]. A good size, about 25mm in diameter;

cold-hardy plant, tolerating temperatures down to about -35°C[160]. Plants can become invasive when growing in good conditions[182]. Some named forms have been developed for their ornamental value, 'Dart's Red Giant' has specially large berries[182]. All parts of the plant are aromatic, the bruised leaves having the scent of wintergreen[245]. Plants in this genus are notably resistant to honey fungus[200]. Special Features: North American native, Fragrant foliage, Inconspicuous flowers or blooms. The plant is heat tolerant in zones 8 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. An evergreen. A clumping mat former. Forming a dense prostrate carpet spreading indefinitely [1-2]. The root pattern is flat with shallow roots forming a plate near the soil surface [1-2]. The root pattern is stoloniferous rooting from creeping stems above the ground [1-2].

4.2.15 Quercus x hybrid

Burgambel oak

3 tlin 8 cyuc 3 kcak 3 tcan 2 dwat 30 m hkuc hmimhtut cyutli hgatkuyctup hwicli jlutnyik hpa7tli flatprikwlis hpa7tmwatli hjonli

drutta Quercus x hybrid is a deciduous Tree growing to 30 m (98ft) by 15 m (49ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 3. The flowers are pollinated by Wind. It is noted for attracting wildlife. Suitable for: medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

kcakta Edible Parts: SeedEdible Uses: Carbon Farming Solutions - Staple Crop: balanced carb (The term staple crop typically refers to a food that is eaten routinely and accounts for a dominant part of people's diets in a particular region of the world) [1-1].

tcanta FodderCarbon Farming Solutions - Industrial Crop: tannin (Crops grown for non-food uses. Industrial crops provide resources in three main categories: materials, chemicals, and energy. Traditional materials include lumber and thatch, paper and cardboard, and textiles) [1-1]. Fodder: mast. Drought-tolerant; suitable for xeriscaping

dwatta DysenteryNone Report. As a cross between Quercus macrocarpa and Quercus gambelii we may expect some of the medicinal qualities to be present. Quercus macrocarpa has Antispasmodic; Astringent; and Tonic qualities. The bark is astringent and tonic[61]. An infusion has been used in the treatment of diarrhoea[257]. A decoction of the root or inner bark has been used in the treatment of cramps[257]. Any galls produced on the tree are strongly astringent and can be used in the treatment of haemorrhages, chronic diarrhoea, dysentery etc[4]. Quercus gambelii has Analgesic; Astringent; and Cathartic properties. Any galls produced on the tree are strongly astringent and can be used in the treatment of haemorrhages, chronic diarrhoea, dysentery etc[4]. The acorns have been eaten to give greater sexual potency[257]. The root bark is analgesic and cathartic[257]. A decoction has been used to treat postpartum pain and facilitate delivery of the placenta[257].

nrakta Origin: Natural hybrid in W. N. America. ksacta A cross between the bur oak, whose native range is in the eastern U.S., and the Gambel oak, whose native range is in the southwestern U.S. and Mexico.

propta Seed - it quickly loses viability if it is allowed to dry out. It can be stored moist and cool overwinter but is best sown as soon as it is ripe in an outdoor seed bed, though it must be protected from mice, squirrels etc. Small quantities

of seed can be sown in deep pots in a cold frame. Plants produce a deep taproot and need to be planted out into their permanent positions as soon as possible, in fact seed sown in situ will produce the best trees[11]. Trees should not be left in a nursery bed for more than 2 growing seasons without being moved or they will transplant very badly.

nwatta Experimental Crop Fodder: Mast Industrial Crop: Tannin Management: Standard Staple Crop: Balanced carbClimate: boreal to warm temperate. Humidity: semi-arid to humid. A naturally occurring cross between the bur oak, whose native range is in the eastern U.S., and the Gambel oak, whose native range is in the southwestern U.S. and Mexico. It is a member of the white oak group and produces abundant acorns annually. The mature size of the tree can vary from large tree (typical of bur oaks) to medium tree/large shrub (typical of Gambel oaks) depending on its environment. Both parents are known to be tough and drought-tolerant. Burgambel acorns are low in tannins and relatively quick to bear, between three and six years [1-1]. The low tannins make them more palatable. Burgambel begins producing acorns at a young age when the trees are only 3-6 feet tall. The acorns ripen early in the season.Burgambel averages 1-2 ft. in height per year. Carbon Farming Solutions - Cultivation: experimental as food. Management: standard (Describes the non-destructive management systems that are used in cultivation) [1-1]. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2].

4.2.16 Celtis occidentalis

Hackberry, Common hackberry

3 tlin 9 cyuc 3 kcak 2 tcan 1 dwat 20 m hkuc htut cyutli hgatkuyctup hwicli hyishrasjlut hpa7tli flatprikwlis hpa7tmwatli xre7t hjonli

drutta Celtis occidentalis is a deciduous Tree growing to 20 m (65ft) by 20 m (65ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 2. It is in flower in May, and the seeds ripen in October. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

kcakta Edible Parts: Fruit SeedEdible Uses: Fruit - raw[2, 3, 55, 149]. Very sweet and pleasant tasting, they can be eaten out of hand or can be used for making jellies, preserves etc[183]. The fruit is often produced abundantly in Britain, it is about the size of a blackcurrant, but there is very little flesh surrounding a large seed and it is therefore a very fiddly crop[K]. The fruit is dark orange to purple- or blue-black when fully ripe, usually about 7-11mm in diameter, though occasionally up to 20mm[270]. The flesh is dry and mealy but with a pleasant sweet taste[K]. Seed[57]. No more details. The fruit and seed can be ground up finely together and used as a flavouring[161, 183]. The N. American Indians ate it with parched corn[183].

tcanta Dye Fuel Miscellany Shelterbelt WoodA dye is obtained from the roots[61]. No more details are given. Fairly wind-tolerant, it can be planted as part of a shelterbelt[200]. Wood - rather soft, weak, coarse-grained, heavy. It weighs 45lb per cubic foot and is sometimes used commercially for cheap furniture, veneer, fencing fuel etc[46, 61, 82, 171, 227].

dwatta Miscellany VDAAn extract obtained from the wood has been used in the treatment of jaundice[226]. A decoction of the bark has been used in the treatment of sore throats[257]. When combined with powdered shells it has been used to treat VD[257].

nrakta Eastern N. America - Quebec to Manitoba, North Carolina, Missouri and Oklahoma. ksacta Dry to moist and rich woods, river banks, rocky barrens etc[43]. Frequently found on limestone soils[229].

propta Seed - best sown as soon as it is ripe in a cold frame[200]. Stored seed is best given 2 - 3 months cold stratification and then sown February/March in a greenhouse[78,

200]. Germination rates are usually good, though the stored seed might take 12 months or more to germinate. The seed can be stored for up to 5 years[113]. As soon as they are large enough to handle, prick the seedlings out into individual pots. The leaves of seedlings often have a lot of white patches without chlorophyll, this is normal and older plants produce normal green leaves. Grow the seedlings on in a cold frame for their first winter, and plant them out in the following late spring or early summer[K]. Give them some protection from the cold for their first winter outdoors. Cuttings

nwnatta Landscape Uses:Firewood, Aggressive surface roots possible, Street tree, Woodland garden. Succeeds in any reasonably good soil, preferring a good fertile well-drained loamy soil[1, 11, 200]. Succeeds on dry gravels and on sandy soils[200]. Tolerates alkaline soils[160]. Established plants are very drought resistant[149, 160, 200]. Wind resistant[160]. Trees transplant easily[226]. Trees prefer hotter summers and more sunlight than are normally experienced in Britain, they often do not fully ripen their wood when growing in this country and they are then very subject to die-back in winter[1, 11, 200]. Plants in the wild are very variable in size, ranging from small shrubs to large trees[43]. They are fast-growing[98, 229], and can be very long-lived, perhaps to 1000 years[200]. Only to 200 years according to another report[229]. They usually produce good crops of fruit annually[229]. Trees respond well to coppicing, readily sending up suckers after cutting or the top being killed off in a fire[226]. Plants in this genus are notably resistant to honey fungus[200]. Special Features: North American native, Naturalizing, Wetlands plant, Attracts butterflies, Inconspicuous flowers or blooms. The plant is heat tolerant in zones 9 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2]. The root pattern is a heart root, dividing from the crown into several primary roots going down and out [1-2].

4.2.17 Quercus x bebbiana

3 tlin 7 cyuc 3 kcaak 0 tcan 2 dwat 15 m hkuc hmimhtut cyutli hgatkyuctcup hwicli jlutnyikfrip hpa7tli flatprikhwis hpa7tmwatli hjonli

drutta Quercus x bebbiana is a deciduous Tree growing to 15 m (49ft) by 8 m (26ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 3 and is not frost tender. It is in flower in May, and the seeds ripen in October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. Suitable for: medium (loamy) and heavy (clay) soils and can grow in highly clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcakta Edible Parts: SeedEdible Uses: CoffeeSeed - raw or cooked[183]. The large seeds are sweet and can be eaten out of hand[183]. The seed can be ground into a powder and used in making bread, dumplings etc and as a thickener in soups[183]. If the seed is bitter then this is due to the presence of tannins, these can be leached out by thoroughly washing the dried and ground up seed in water, though many minerals will also be lost. The traditional method of preparing the seed was to bury it in boggy ground overwinter. The germinating seed was dug up in the spring when it would have lost most of its astringency. The roasted seed is a coffee substitute.

tcanta Repellent Tannin WoodA mulch of the leaves repels slugs, grubs etc, though fresh leaves should not be used

as these can inhibit plant growth[20]. Oak galls are excrescences that are sometimes produced in great numbers on the tree and are caused by the activity of the larvae of different insects. The insects live inside these galls, obtaining their nutrient therein. When the insect pupates and leaves, the gall can be used as a rich source of tannin, that can also be used as a dyestuff[4]. Wood - hard, heavy, strong, tough, very durable, close grained.

dwatta Astringent DysenteryAny galls produced on the tree are strongly astringent and can be used in the treatment of haemorrhages, chronic diarrhoea, dysentery etc[4].

nrrakta A hybrid of garden origin. ksacta Not known in the wild.

propta Seed - it quickly loses viability if it is allowed to dry out. It can be stored moist and cool overwinter but is best sown as soon as it is ripe in an outdoor seed bed, though it must be protected from mice, squirrels etc. Small quantities of seed can be sown in deep pots in a cold frame. Plants produce a deep taproot and need to be planted out into their permanent positions as soon as possible, in fact seed sown in situ will produce the best trees[11]. Trees should not be left in a nursery bed for more than 2 growing seasons without being moved or they will transplant very badly. This species is a hybrid and may not breed true from seed[K].

nwnatta Prefers a good deep fertile loam which can be on the stiff side[11]. Lime tolerant[188]. Succeeds in a hot dry position. Young plants tolerate reasonable levels of side shade[200]. Tolerates moderate exposure, surviving well but being somewhat stunted[200]. A vigorous, fast-growing hybrid species, some forms are capable of reaching 1.5 metres tall in 2 years[183]. Established plants are drought resistant[229] and tolerant of atmospheric pollution[226]. This species is occasionally cultivated for its edible seed, there are some named varieties[183]. It is a hybrid of garden origin, Q. alba x Q. macrocarpa[183]. Both of its parents prefer warmer summers than are usually experienced in Britain, often growing poorly in this country and failing to properly ripen their wood, resulting in frost damage overwinter[11, 200]. The tree flowers on new growth produced in spring, the seed ripening in its first year[200, 229]. Hybridizes freely with other members of the genus[200]. Plants in this genus are notably resistant to honey fungus[200].

4.2.18 Juniperus scopulorum

Rocky Mountain Juniper, Weeping Rocky Mountain Juniper, Colorado Red Cedar

3 tlin 7 cyuc 3 kcaak 4 tcan 2 dwat 10 m hkuc htut cyutli hgatkyuctcup hwicli hrasjlutnyik hpa7tli flatprikhwisslip hpa7tmwatli nyanhjen hjonli

drutta Juniperus scopulorum is an evergreen Tree growing to 10 m (32ft) by 4 m (13ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 3. It is in leaf all year, in flower from April to May, and the seeds ripen in October. The species is dioecious (individual flowers are either male or female, but only one sex is to be found on any one plant so both male and female plants must be grown if seed is required), and is pollinated by Wind. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

kcakta Edible Parts: FruitEdible Uses: Coffee Condiment TeaFruit - raw or cooked[105, 161, 183]. Sweet and fleshy, but strongly flavoured[85, 229]. Resinous[227]. Often used as a flavouring, imparting a sage-like taste, for which purpose it is usually dried and ground into a powder[85, 183]. The fruit can also be dried and ground into a meal for making mush and cakes[183]. The fruits are about 5 - 8mm in diameter[200, 227]. The roasted fruit is a coffee substitute[183]. A tea is made from the fruits and young shoots[183].

tcanta Beads Disinfectant Incense Parasiticide Repellent Shelterbelt Tinder Wax WoodA fragrant wax on the fruits can be obtained by boiling the fruit and skimming off the wax as it floats to the surface. It is used to make aromatic candles but is only present in small quantities[85]. The boughs are used as an incense to fumigate houses and to drive off smells. The wood can be burnt or just hung in the room, or it can be boiled up in water and the water used to wash the

5.2.32 Blephilia ciliata

Downy wood mint

4 tlin 7 cyuc 3 kcaak 2 tcan 1 dwat 0.7 m hkuc hmimhtut cyutli hgatkyuctcup hwicli hrasjlut hpa7tli frusflatprik hpa7tmwatli hjonli

drutta Blephilia ciliata is a PERENNIAL growing to 0.7 m (2ft 4in) by 0.4 m (1ft 4in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 4. The flowers are pollinated by Bees, Insects. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought.

kcakta Edible Parts: LeavesEdible Uses: Leaves. Minty leaves eaten raw and used in teas. The leaves can be used to prepare sauces and drinks [1-4].

tcanta Soil stabilizationA strong scented plant that may act as an aromatic pest confuser reducing their ability to find other nearby crops [1-3]. The flowers attract long-tongued and short-tongued bees, bee flies, Syrphid flies, butterflies, and skippers (illinoiswildflowers.info). A plant for Forest Gardens, Pollinator Gardens, Prairie or Meadow. Used as Butterfly Nectar Plants or as part of a Groundcover or Mass Planting. Showy Blooms can be used in Cottage Gardens, Deer Resistant Plantings, Rock Gardens, Water-wise Landscapes, Low Maintenance Plantings, Perennial Borders, Restoration Projects and Wildlife Gardens (newmoonnursery.com).

dwatta Traditionally used by the Cherokee to make a poultice to treat headaches.

nrrakta Eastern North American and through parts of the Central United States. Plants occur from Canada south to Georgia and west to Oklahoma. ksacta Indigenous to dry open woods, prairies, savannas, limestone bluffs, glades, barrens, clearings, fields, steep slopes, disturbed sites and roadsides. Plants often occur in thin soils over limestone.

propta Propagate by division.

nwnatta A Short-Lived fast-growing herbaceous perennial with an upright form. It prefers full sun to semi-shade and a loamy, silty soil with a pH 6 to 8. Downy wood mint has some drought tolerance but dislikes waterlogged soils or flooding. It is sensitive to salt, soil compaction. Flowers are fragrant. Soil can contain loam, clay, gravel and limestone. A high pH is tolerated but will restrict growth. It has a greater tolerance to drought than other mint species. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a clumper with limited spread [1-2]. Root type is fibrous and shallow. Flowering time: June to August (Northern Hemisphere).

5.2.33 Crataegus coccinoides

Kansas Hawthorn

4 tlin 8 cyuc 3 kcaak 0 tcan 2 dwat 6 m hkuc hmimhtut cyutli hgatkyuctcuphja7n hwicli hrasjlutnyikfrip hpa7tli flatprikhwisslip hpa7tmwatli xre7t hjonli

drutta Crataegus coccinoides is a deciduous Tree growing to 6 m (19ft 8in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower in May. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[2, 177]. Firm and sub-acid[82]. The fruit can be used in making pies, preserves, etc. and can also be dried for later use. The fruit is borne in small clusters and is up to 17mm in diameter[229]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers

of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrrakta Central N. America - Illinois and Missouri to Kansas, Oklahoma and Arkansas. ksacta Dry thickets and calcareous hills[43].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwnatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Hybridizes freely with other members of this genus[200]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

5.2.34 Eryngium maritimum

Sea Holly, Seaside eryngo

4 tlin 8 cyuc 3 kcaak 2 tcan 3 dwat m hkuc htut cyutli hgatkyuctcup hwicli hyishrasjlut hpa7tli flatprikhwissliphsom hpa7tmwatli fyfjxre7t hjonli

drutta Eryngium maritimum is an evergreen Perennial growing to 0.5 m (1ft 8in) by 0.4 m (1ft 4in). See above for USDA hardiness. It is hardy to UK zone 5. It is in leaf all year, in flower from July to October. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees, flies, beetles. The plant is self-fertile. It is noted for attracting wildlife. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline and saline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

kcakta Edible Parts: Leaves Root ShootsEdible Uses: Young shoots - cooked[46, 61, 66]. They are normally blanched by excluding light from the growing plant, and are then used as an asparagus substitute[2, 115, 183]. They are said to be palatable and nourishing[4]. Root - cooked[2]. Used as a vegetable or candied and used as a sweetmeat[5, 66, 115]. Palatable and nutritious[4], it is slightly sweet and

rienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a runner spreading indefinitely by rhizomes or stolons [1-2]. The root pattern is fibrous dividing into a large number of fine roots [1-2]. The root pattern is rhizomatous with underground stems sending roots and shoots along their length [1-2].

5.2.31 Pinus ponderosa

Ponderosa Pine, Washoe pine

4 tin 8 cyuc 3 kcak 0 tcan 2 dwat 25 m hkuc

htut cyutli hgatykuctup hwicli hyishrasjut hpa7tli flatprik hpa7tmwatli dyat hjonli

drutta Pinus ponderosa is an evergreen Tree growing to 25 m (82ft) by 7 m (23ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 4. It is in leaf all year, in flower in June, and the seeds ripen in October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. The plant is not self-fertile. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista The wood, sawdust and resins from various species of pine can cause dermatitis in sensitive people[222].

kcakta Edible Parts: Inner bark SeedEdible Uses: Condiment GumInner bark - raw or cooked[257]. Mucilaginous[105, 161, 213]. Best harvested in the spring[257]. The inner bark can be eaten fresh, but is more often dried, ground into a powder and either used as a thickener in soups or is mixed with flour for making bread etc[K]. Seed - raw or cooked[63, 64, 105, 226, 257]. Rich in oil, the seed has a slightly resinous flavour. Quite small, it is only about 8mm long[200]. The seed can be crushed into a meal and used in making bread etc[213]. The resin has been chewed as a gum[226, 257]. Young male cones have been chewed for the juice[257]. A vanillin flavouring is obtained as a by-product of other resins that are released from the pulpwood[200].

tcanta Basketry Cosmetic Dye Fuel Gum Herbicide Insulation Resin Shelterbelt Strewing Tinder WoodA tan or green dye is obtained from the needles[168]. A yellow dye can be made from the pollen[226]. A blue dye can be made from the roots[257]. The needles contain a substance called terpene, this is released when rain washes over the needles and it has a negative effect on the germination of some plants, including wheat[201]. The branches are used as a strewing herb[99]. A decoction of the plant tops has been used as a conditioning wash to give a person a fair and smooth skin[257]. A fairly wind-tolerant tree, it can be used in shelterbelt plantings[200]. This tree is a source of resin, though it is not exploited commercially[64, 171]. Oleo-resins are present in the tissues of all species of pines, but these are often not present in sufficient quantity to make their extraction economically worthwhile[64]. The resins are obtained by tapping the trunk, or by destructive distillation of the wood[4, 64]. In general, trees from warmer areas of distribution give the higher yields[64]. Turpentine consists of an average of 20% of the oleo-resin[64] and is separated by distillation[4, 64]. Turpentine has a wide range of uses including as a solvent for waxes etc, for making varnish, medicinal etc[4]. Rosin is the substance left after turpentine is removed. This is used by violinists on their bows and also in making sealing wax, varnish etc[4]. Pitch can also be obtained from the resin and is used for waterproofing, as a wood preservative, adhesive etc[257]. It burns well and so has been used to make torches[257]. The root fibres have been used in making baskets[257]. Material for insulation and a tinder are also obtained from the tree[99]. The cones make a quick fire, whilst the scales from the trunk bark burn easily, give off no smoke and cool quickly[213]. Wood - light, strong, fine-grained and pleasantly aromatic, the wood can vary from soft

to hard[1, 46, 82, 171, 226, 229]. An important lumber tree, it is used for making furniture, boxes, toys etc[1, 46, 82, 171, 226, 229], and it is also used for fuel[99]. For reasons that are unclear, some tree stumps contain high concentrations of pitch - this makes them very rot-resistant and inflammable and therefore useful for fence posts and kindling[226].

dwatta Antiseptic Diuretic Febrifuge Ophthalmic Pectoral Poultice Rubefacient Salve Skin Vermifuge Vulnery-Ponderosa pine was employed medicinally by several native North American Indian tribes, who valued it especially for its antiseptic and vulnery properties, using it to treat a range of skin problems, cuts, wounds, burns etc[257]. It was also valued for its beneficial effect upon the respiratory system and was used to treat various chest and lung complaints[257]. The turpentine obtained from the resin of all pine trees is antiseptic, diuretic, rubefacient and vermifuge[4]. It is a valuable remedy used internally in the treatment of kidney and bladder complaints and is used both internally and as a rub and steam bath in the treatment of rheumatic affections[4]. It is also very beneficial to the respiratory system and so is useful in treating diseases of the mucous membranes and respiratory complaints such as coughs, colds, influenza and TB[4]. Externally it is a very beneficial treatment for a variety of skin complaints, wounds, sores, burns, boils etc and is used in the form of liniment plasters, poultices, herbal steam baths and inhalers[4]. The branches are used in herbal steam baths as a treatment for muscular pains[257]. A decoction of the plant tops has been used in the treatment of internal bleeding and high fevers[257]. An infusion of the dried buds has been used as an eye wash[257].

nrakta Western N. America - British Columbia to N. Mexico. ksacta Found in a variety of soils from sea level to 2800 metres[229], though mainly inland and in drier areas[60]. The best growth is from trees growing in deep well-drained soils[229].

propta It is best to sow the seed in individual pots in a cold frame as soon as it is ripe if this is possible otherwise in late winter. A short stratification of 6 weeks at 4°C can improve the germination of stored seed[80]. Plant seedlings out into their permanent positions as soon as possible and protect them for their first winter or two[11]. Plants have a very sparse root system and the sooner they are planted into their permanent positions the better they will grow[K]. Trees should be planted into their permanent positions when they are quite small, between 30 and 90cm[200]. We actually plant them out when they are about 5 - 10cm tall. So long as they are given a very good weed-excluding mulch they establish very well[K]. Larger trees will check badly and hardly put on any growth for several years. This also badly affects root development and wind resistance[200]. Cuttings. This method only works when taken from very young trees less than 10 years old. Use single leaf fascicles with the base of the short shoot. Disbudding the shoots some weeks before taking the cuttings can help. Cuttings are normally slow to grow away[81].

nwatta Industrial Crop: Hydrocarbon Management: Standard Regional TimberThrives in a light well-drained sandy or gravelly loam[1, 11]. Dislikes poorly drained moorland soils[1]. Established plants tolerate drought[200]. Seedlings strongly dislike growing in the shade[60] and are unable to succeed under the canopy of the parent trees[226]. Plants are fairly wind tolerant[200]. Extensively used in cool temperate forestry[200], this species is occasionally planted for timber in central and southern Europe[50]. Growth can be quite fast when young but it soon drops of and averages around 30cm per year[185]. The best trees in Britain are found in a belt running from Kent through the Midlands to N. Wales and also in S. Scotland[185]. Trees live 300 - 600 years in the wild[229], they seem to be long-lived and healthy in Britain[185]. Seed production commences when the tree is about 20 years old[229]. There are usually several years of low to medium yields between each year of high yields[229]. The cones are 8 - 15cm long, they open and shed their seed whilst still attached to the tree and then soon fall from the tree[82, 226]. Plants are strongly outbreeding, self-fertilized seed usually grows poorly[200]. They hybridize freely with other members of this genus[200]. Leaf secretions inhibit the germination of seeds, thereby reducing the amount of plants that can grow under the trees[18]. Plants in this genus are notably susceptible to honey fungus[200].

walls, floor etc[99]. The bark is employed as a tinder and is also made into a slow match[216]. The dried seeds have been used as beads or as the 'rattle' in rattles[99, 216]. The fruits and the leaves are used as an insect repellent[169]. A strong infusion of the cones is used to kill ticks[99]. Plants can be grown as a ground cover; the cultivar 'Repens' is especially suitable[208]. A fairly wind resistant tree, it can be grown as part of a shelterbelt planting[200]. In N. America it is used to some extent in re-forestation and shelterbelt plantings on the prairies[227]. Wood - extremely tough, aromatic, close grained, light, fairly strong in endwise compression but moderately weak in bending, hard, durable in the soil. Used for interior finishes, bows, hoops, hafts, wheels etc[99, 149, 227].

dwatta Antidandruff Appetizer Diaphoretic Disinfectant Diuretic Haemostatic Kidney Laxative Parasiticide Poultice Sedative Stomachic Tonic VDRocky Mountain juniper was widely employed medicinally by many native North American Indian tribes who used it in particular to treat problems connected with the chest and kidneys[257]. It is little, if at all, used in modern herbalism. A tea made from the terminal shoots has been used in the treatment of VD by some N. American Indian tribes[213]. The treatment has to be taken over a long period of time[257]. The fruits are appetizer, diuretic and stomachic[257]. An infusion has been used in the treatment of stomach, kidney and bladder problems[213, 257]. An infusion of the twigs has been used in the treatment of fevers, pneumonia, coughs and colds[257]. A poultice of the mashed and dampened branches has been applied to skin sores[257]. The leaves are diaphoretic, disinfectant, febrifuge, haemostatic, laxative, sedative and tonic[99, 216, 257]. A decoction has been used in the treatment of internal bleeding, constipation and constant coughing[257]. The leaves have been boiled, then mixed with turpentine and used as an external treatment on rheumatic joints[257]. The leaves have been rubbed into the hair in order to treat dandruff[213, 257].

nrakta Western N. America - British Columbia to Mexico and California. ksacta Scattered singly on dry rocky ridges, foothills and bluffs[82, 85] in montane areas or in dry habitats of the coastal forest region[226]. The best specimens are found on slightly alkaline soils[229].

propta The seed requires a period of cold stratification. The seed has a hard seedcoat and can be very slow to germinate, requiring a cold period followed by a warm period and then another cold spell, each of 2 - 3 months duration[78, 81]. Soaking the seed for 3 - 6 seconds in boiling water may speed up the germination process[11]. The seed is best sown as soon as it is ripe in a cold frame. Some might germinate in the following spring, though most will take another year. Another possibility is to harvest the seed 'green' (when the embryo has fully formed but before the seedcoat has hardened). The seedlings can be potted up into individual pots when they are large enough to handle. Grow on in pots until large enough, then plant out in early summer. When stored dry, the seed can remain viable for several years[1]. Cuttings of mature wood, 5 - 10cm with a heel, September/October in a cold frame. Plant out in the following autumn[1, 78]. Layering in September/October. Takes 12 months[78].

nwatta Landscape Uses:Alpine garden, Border, Screen, Specimen, Street tree. Succeeds in most soils, including chalk[200], so long as they are well drained, preferring a neutral or slightly alkaline soil[1, 11]. A drought tolerant species once established, succeeding in hot dry positions[200]. Plants are fairly wind-resistant[200]. A long-lived but slow-growing tree in its native range[227], it is very slow growing in Britain where it only makes a shrub[185]. Closely allied to J. virginiana[1, 81] and hybridising with it where the ranges meet[226]. It differs mainly in the fruit, which takes two years to mature in this species instead of one[226]. Plants are resistant to honey fungus[88]. This tree is apparently resistant to the rust fungus that attacks the closely related J. virginiana[149]. Dioecious. Male and female plants must be grown if seed is required. Special Features:North American native, Fragrant foliage, Inconspicuous flowers or blooms. In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is flat with shallow roots spreading near the soil surface [2-1].

4.2.19 Pinus pumila

Dwarf Siberian Pine

3 tin 7 cyuc 3 kcak 3 tcan 2 dwat 3 m hkuc

htut cyutli hgatykuctup hwicli hyishrasjut hpa7tli flatprik hpa7tmwatli dyat hjonli

drutta Pinus pumila is an evergreen Shrub growing to 3 m (9ft) by 5 m (16ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 1. It is in leaf all year, and the seeds ripen in September. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. The plant is not self-fertile. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista The wood, sawdust and resins from various species of pine can cause dermatitis in sensitive people[222].

kcakta Edible Parts: SeedEdible Uses: CondimentSeed - raw or cooked[81, 105, 177]. Rich in oil, it has a slightly resinous flavour and a pleasant soft texture[K]. A reasonable size, the seed is up to 10mm x 7mm[200]. A vanillin flavouring is obtained as a by-product of other resins that are released from the pulpwood[200].

tcanta Charcoal Dye HerbicideA tan or green dye is obtained from the needles[168]. The needles contain a substance called terpene, this is released when rain washes over the needles and it has a negative effect on the germination of some plants, including wheat[201]. Oleo-resins are present in the tissues of all species of pines, but these are often not present in sufficient quantity to make their extraction economically worthwhile[64]. The resins are obtained by tapping the trunk, or by destructive distillation of the wood[4, 64]. In general, trees from warmer areas of distribution give the higher yields[64]. Turpentine consists of an average of 20% of the oleo-resin[64] and is separated by distillation[4, 64]. Turpentine has a wide range of uses including as a solvent for waxes etc, for making varnish, medicinal etc[4]. Rosin is the substance left after turpentine is removed. This is used by violinists on their bows and also in making sealing wax, varnish etc[4]. Pitch can also be obtained from the resin and is used for waterproofing, as a wood preservative etc. The wood is a source of charcoal[46].

dwatta The turpentine obtained from the resin of all pine trees is antiseptic, diuretic, rubefacient and vermifuge[4]. It is a valuable remedy used internally in the treatment of kidney and bladder complaints and is used both internally and as a rub and steam bath in the treatment of rheumatic affections[4]. It is also very beneficial to the respiratory system and so is useful in treating diseases of the mucous membranes and respiratory complaints such as coughs, colds, influenza and TB[4]. Externally it is a very beneficial treatment for a variety of skin complaints, wounds, sores, burns, boils etc and is used in the form of liniment plasters, poultices, herbal steam baths and inhalers[4].

nrakta N.E. Asia - China, Japan, Korea, Mongolia and Siberia. ksacta Often forms extensive thickets in exposed situations or above the tree line[11]. Mountains at elevations of 1000 - 2300 metres in northern China[266].

propta It is best to sow the seed in individual pots in a cold frame as soon as it is ripe if this is possible otherwise in late winter. A short stratification of 6 weeks at 4°C can improve the germination of stored seed[80]. Plant seedlings out into their permanent positions as soon as possible and protect them for their first winter or two[11]. Plants have a very sparse root system and the sooner they are planted into their permanent positions the better they will grow[K]. Trees should be planted into their permanent positions when they are quite small, between 30 and 90cm[200]. We actually plant them out when they are about 5 - 10cm tall. So long as they are given a very good weed-excluding mulch they establish very well[K]. Larger trees will check badly and hardly put on any growth for several years. This also badly affects root development and wind resistance[200]. Cuttings. This method only works when taken from very young trees less than 10 years old. Use single leaf fascicles with the base of the short shoot. Disbudding the shoots some weeks before taking the cuttings can help. Cuttings are normally slow to grow away[81].

nwatta Thrives in a light well-drained sandy or gravelly loam[1, 11]. Dislikes poorly drained moorland soils[1]. Established plants tolerate drought[200]. Very wind resistant[11]. An exceedingly cold-hardy tree, tolerating temperatures down to about -70°C[200]. This species is closely related to *P. cembra*[1]. Plants are strongly outbreeding, self-fertilized seed usually grows poorly[200]. They hybridize freely with other members of this genus[200]. The cones do not open on the tree, the seed is extracted by breaking up the soft scales of the cone[200]. Leaf secretions inhibit the germination of seeds, thereby reducing the amount of plants that can grow under the trees[18]. Plants in this genus are notably susceptible to honey fungus[200]. The plant is heat tolerant in zones 7 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2]. An evergreen. The root pattern is a heart root, dividing from the crown into several primary roots going down and out [1-2].

4.2.20 Opuntia polyacantha

Plains Prickly Pear, El Paso pricklypear, Grizzlybear pricklypear, Navajo Bridge pricklypear, Hairsp
3 lin 7 cyuc 3 kcaak 0 tcan 1 dwat 0.2 m hkuc
htuc cyutli hgatkycup hwicli hrsajlut hpa7tli flatpricklwis hpa7tmwatli xre7t hjonli

drutta *Opuntia polyacantha* is an evergreen Perennial growing to 0.2 m (0ft 8in) by 1 m (3ft 3in). See above for USDA hardiness. It is hardy to UK zone 3 and is not frost tender. It is in leaf all year. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry soil and can tolerate drought.

pcista The plant has numerous minutely barbed glochids (hairs) that are easily dislodged when the plant is touched and they then become stuck to the skin where they are difficult to see and remove. They can cause considerable discomfort[200].

kcakta Edible Parts: Fruit Seed Stem Edible Uses: Gum-Fruit - raw or dried for later use[216, 257]. The dried fruit can be mixed into stews or used to thicken soups[183]. The fruit is dry and spiny[200]. It is up to 3cm long[235]. Young pads are boiled and fried[183, 257]. The large hairs are burnt off, the pads are boiled and the remaining thorns washed off. The pads are then dipped in a syrup made from boiling sweetcorn seeds and then eaten[216]. Seed - dried, parched and ground into a meal, then added to flour and used in making cakes etc[183].

tcanta Dye Gum Mordant The peeled stems have been used as a mordant in fixing dyes[257]. A pink to red dye is obtained from the fruit[257]. A gum is obtained from the stem that can be used as an adhesive[257].

dwatta Astringent Diuretic The stems are astringent and diuretic[257]. An infusion is used in the treatment of diarrhoea[257]. A poultice of the flesh has been used to treat skin sores, infections, wounds and back aches[257].

nrakta N. America - British Columbia to Oregon and Texas ksacta Dry prairies, sand hills and rocks[204].

propta Seed - sow early spring in a very well-drained compost in a greenhouse. When they are large enough to handle, prick the seedlings out into individual pots and grow them on in the greenhouse for at least their first two winters. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. Give the plants some protection from winter wet. Make sure you have some reserve plants in case those outdoors do not overwinter. Cuttings of leaf pads at any time in the growing sea-

son. Remove a pad from the plant and then leave it in a dry sunny place for a couple of days to ensure that the base is thoroughly dry and has begun to callous. Pot up into a sandy compost. Very easy, rooting quickly.

nwatta Requires a sandy or very well-drained soil[160]. Prefers a pH in the range 6 to 7.5[200]. Must be kept fairly dry in winter but likes a reasonable supply of water in the growing season[200]. A position at the base of a south-facing wall or somewhere that can be protected from winter rain is best for this plant. Requires warmth and plenty of sun. Plants tolerate considerable neglect. This species is very cold tolerant and can succeed outdoors in a selected site in many areas of the country[200].

4.2.21 Amaranthus retroflexus

Pigweed, Redroot amaranth, Wild Beet
3 lin 11 cyuc 3 kcaak 2 tcan 2 dwat 0.9 m hkuc
htuc cyutli hgatkycup hwicli hrsajlutnyik hpa7tli frusflatprickl-wisslip hpa7tmwatli fyif hjonli

drutta *Amaranthus retroflexus* is an ANNUAL growing to 0.9 m (3ft). See above for USDA hardiness. It is hardy to UK zone 4 and is frost tender. It is in flower from July to September, and the seeds ripen from August to October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. The plant is self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid and very alkaline soils. It cannot grow in the shade. It prefers moist soil and can tolerate drought.

pcista No members of this genus are known to be poisonous, but when grown on nitrogen-rich soils they are known to concentrate nitrates in the leaves. This is especially noticeable on land where chemical fertilizers are used. Nitrates are implicated in stomach cancers, blue babies and some other health problems. It is inadvisable, therefore, to eat this plant if it is grown inorganically.

kcakta Edible Parts: Leaves Seed Edible Uses: Young leaves - raw or cooked as a spinach[2, 5, 62, 85, 159]. A mild flavour, it is often mixed with stronger flavoured leaves[183]. Very rich in iron, it is also a good source of vitamins A and C[201]. Seed - raw or cooked[2, 46, 61, 85]. Ground into a powder and used as a cereal substitute[5], it can also be sprouted and added to salads. The seed is very small, about 1mm in diameter[266], but easy to harvest and very nutritious. The flavour is greatly improved by roasting the seed before grinding it[183]. It is often added to maize meal[183]. The seed can be cooked whole, and becomes very gelatinous like this, but it is rather difficult to crush all of the small seeds in the mouth and thus some of the seed will pass right through the digestive system without being assimilated[K].

tcanta Dye Fodder Yellow and green dyes can be obtained from the whole plant[168]. Like many other species of *Amaranthus*, this plant may be harmful and even deadly when fed to cattle and pigs in large amounts. However, when supplied in moderation, it is regarded as an exceptionally nutritious fodder.

dwatta Astringent A tea made from the leaves is astringent[222]. It is used in the treatment of profuse menstruation, intestinal bleeding, diarrhoea etc[222, 238, 257]. An infusion has been used to treat hoarseness[257].

nrakta Tropical America. A casual in Britain[17]. ksacta A casual of cultivated land and waste places in Britain[17].

propta Seed - sow late spring in situ. An earlier sowing can be made in a greenhouse and the plants put out after the last expected frosts. Germination is usually rapid and good if the soil is warm[133]. A drop in temperature overnight aids germination[133]. Cuttings of growing plants root easily[206].

nwatta Prefers a well-drained fertile soil in a sunny position[200]. Requires a hot sheltered position if it is to do well[K]. Plants should not be given inorganic fertilizers, see notes above on toxicity. A good companion for potatoes, onions, corn, tomatoes, peppers and aubergines[20, 201]. A deep rooted plant, bringing up minerals from lower levels of the soil[201]. Formerly cultivated as a food crop by the N. American Indians[85]. Most if not all members of this genus photosynthesize by a more efficient method than most plants.

to be allelopathic. Adapts well to prairies, wildflower/native plant gardens, naturalized areas, meadows or moist, open woodland areas. Attracts birds and butterflies

dwatta Native American peoples used the roots to treat pain from injuries [4].

nrakta Native to eastern North America, including Ontario in Canada and the eastern and central United States as far west as New Mexico. ksacta Meso to dry black soil prairies, gravel prairies, clay prairies, hill prairies, openings in rocky upland forests, limestone glades, and areas along railroads, particularly where prairie remnants occur. This plant can survive significant degradation, and recovers readily from occasional wildfires. It competes well against most prairie grasses and forbs in mesic to dry areas.

propta Seed. Plants may be slow to establish in the garden, particularly when grown from seed. Plants often self-seed in optimum growing conditions. Plants develop taproots. Once established, division is not recommended.

nwatta Management: Standard Staple Crop: Protein-oil Under Development Climate: boreal to warm temperate. Humidity: semi-arid to humid. It needs full sun, poor to loamy soils, and mesic to dry conditions. Average, medium moisture, well-drained soils. Tolerates some light shade. Also tolerates some drought once established. Will grow in a variety of soils including sandy, loamy or clay ones. Cultivation: under development. Management: standard (Describes the non-destructive management systems that are used in cultivation) [1-1].

5.2.30 Achillea millefolium

Yarrow, Boreal yarrow, California yarrow, Giant yarrow, Coast yarrow, Western yarrow, Pacific yarrow
4 lin 8 cyuc 3 kcaak 4 tcan 4 dwat m hkuc
hmimhtuc cyuti hgatkycup hwicli hyshrasjlutnyik hpa7tli flatpricklwisslip hpa7tmwatli xre7t hjonli

drutta *Achillea millefolium* is a PERENNIAL growing to 0.6 m (2ft) by 0.6 m (2ft in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 2 and is not frost tender. It is in flower from June to August, and the seeds ripen from July to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

pcista Extended use of this plant, either medicinally or in the diet, can cause allergic skin rashes or lead to photosensitivity in some people[21, 238]. Theoretically yarrow can enhance the sedative effects of other herbs (e.g. valerian, kava, German chamomile, hops) and sedative drugs. Possible sedative and diuretic effects from ingesting large amounts [301].

kcakta Edible Parts: Leaves Edible Uses: Condiment Tea Leaves - raw or cooked[4, 5, 46, 52]. A rather bitter flavour, they make an acceptable addition to mixed salads and are best used when young[9, 183, K]. The leaves are also used as a hop-substitute for flavouring and as a preservative for beer etc[2, 9, 53, 183]. Although in general yarrow is a very nutritious and beneficial plant to add to the diet, some caution should be exercised[K]. See the notes above on possible toxicity. An aromatic tea is made from the flowers and leaves[183]. An essential oil from the flowering heads is used as a flavouring for soft drinks[183].

tcanta Companion Compost Cosmetic Dye Essential Hair Liquid feed Repellent The growing plant repels beetles, ants and flies[14, 99, 172]. The plant has been burnt in order to ward off mosquitoes[257]. A liquid plant feed can be made from the leaves[54]. You fill a container with the leaves and then add some water. Leave it to soak for a week or two and then dilute the rather smelly dark liquid, perhaps 10 - 1 with water though this figure is not crucial[K]. This plant is an essential ingredient of 'Quick Return' herbal compost activator[32]. This is a dried and powdered mixture of several herbs that can be added to a compost heap in order to speed up bacterial activity and thus shorten the time needed to make the compost[K]. The fragrant seeds have

been used to impart a pleasant smell indoors[257]. An essential oil obtained from the leaves is used medicinally[17, 46, 61]. The leaves contain from 0.6 to 0.85% essential oil[240]. The leaves have been used as a cosmetic cleanser for greasy skin[268]. Yellow and green dyes are obtained from the flowers[168]. A good ground cover plant, spreading quickly by its roots[208]. A dynamic accumulator gathering minerals or nutrients from the soil and storing them in a more bioavailable form - used as fertilizer or to improve mulch. Nectary, invertebrate shelter.

dwatta Antidiarrhoeal Antiinflammatory Antiseptic Antispasmodic Appetizer Aromatic Astringent Carminative Cholagogue Diaphoretic Digestive Emmenagogue Odontalgic Stimulant Tonic Vasodilator Vulnerary Yarrow has a high reputation and is widely employed in herbal medicine, administered both internally and externally. It is used in the treatment of a very wide range of disorders but is particularly valuable for treating wounds, stopping the flow of blood, treating colds, fevers, kidney diseases, menstrual pain etc[218, 238, 254, 257]. The whole plant is used, both fresh and dried, and is best harvested when in flower[222]. Some caution should be exercised in the use of this herb since large or frequent doses taken over a long period may be potentially harmful[222], causing allergic rashes and making the skin more sensitive to sunlight[238]. The herb combines well with *Sambucus nigra* flowers (Elder) and *Mentha x piperita* vulgaris (Peppermint) for treating colds and influenza[268]. The herb is antiseptic, antispasmodic, mildly aromatic, astringent, carminative, cholagogue, diaphoretic, digestive, emmenagogue, odontalgic, stimulant, bitter tonic, vasodilator and vulnerary[4, 9, 14, 21, 54, 145, 165, 172, 238, 240, 254]. It also contains the anti-inflammatory agent azulene, though the content of this varies even between plants in the same habitat[238]. The herb is harvested in the summer when in flower and can be dried for later use[4]. The fresh leaf can be applied direct to an aching tooth in order to relieve the pain[268].

nrakta Europe, including Britain, north to 71°, and east to western Asia. ksacta Meadows, pastures, lawns etc. on all but the poorest soils[17].

propta Seed - sow spring or early autumn in a cold frame[133]. The seed usually germinates in 1 - 3 months[133]. When large enough to handle, prick the seedlings out into individual pots and plant them out in the summer. Division in spring or autumn. Very easy, the divisions can be planted direct into their permanent positions. Divisions succeed at any time of the year. Basal cuttings of new shoots in spring. Very easy, collect the shoots when they are about 10cm tall, potting them up individually in pots and keeping them in a warm but lightly shaded position. They should root within 3 weeks and will be ready to plant out in the summer.

nwatta Landscape Uses: Container, Ground cover, Massing, Seashore, Woodland garden. Succeeds in most soils and situations but prefers a well-drained soil in a sunny position[1, 14]. Shade tolerant[13]. Plants live longer when grown in a poor soil[200] and also do well on lime[208]. Established plants are very drought tolerant[200], they can show distress in very severe droughts but usually recover[190]. It remains green after grass has turned brown in a drought[187]. Plants succeed in maritime gardens[233]. The plant has a very spreading root system and is usually quite invasive[233, K]. A very hardy plant, tolerating temperatures down to about -25°C[187]. Yarrow is an excellent plant for growing in lawns, meadows, orchards etc., it is tolerant of repeated close cutting and of being walked on[20, 54]. It works to improve the soil fertility[20, 54]. A very good companion plant, it improves the health of plants growing nearby and enhances their essential oil content thus making them more resistant to insect predations[14, 18, 20, 53]. There are some named forms, selected for their ornamental value[183, 238]. 'Pink' (syn. 'Rosea') has very aromatic foliage and deep pink flowers[183]. Hybridizes freely with other members of this genus[200]. A good bee plant, it is an important nectar source for many insects[24]. Special Features: Attractive foliage, Edible, Fragrant foliage, Invasive, Naturalizing, Attracts butterflies, Suitable for cut flowers, Suitable for dried flowers. The plant is heat tolerant in zones 9 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experi-

When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. In heavier shade they quickly become drawn and leggy, eventually dying[186]. An important food plant for the caterpillars of many lepidoptera species[30], there are 149 insect species associated with this tree[24]. Plants are susceptible to firelight[200]. In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is branching: a heart root, dividing from the crown into several primary roots going down and out [2-1].

5.2.28 Melissa officinalis

Lemon Balm, Common balm, Bee Balm, Sweet Balm, Lemon Balm

4 tin 8 cyuc 3 kcaak 3 tcan 5 dwat 0.7 m hkuc
hmimhtut cyutli hgatyuctup hwicli hrasjut hpa7tli flat-prikkwis hpa7tmwatli xre7t hjonli

drutta Melissa officinalis is a PERENNIAL growing to 0.7 m (2ft 4in) by 0.4 m (1ft 4in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 4 and is not frost tender. It is in flower from June to October, and the seeds ripen from August to October. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. It is noted for attracting wildlife. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought.

pcista Can cause irritation in high concentrations. Avoid during pregnancy. Care if sensitive skin [301].

kcaakta Edible Parts: LeavesEdible Uses: Condiment TeaLeaves - raw or cooked. A pleasant lemon-like aroma and flavour, they are used mainly as a flavouring in salads and cooked foods[5, 7, 8, 9, 14, 27, 183]. A lemon-flavoured tea can be made from the fresh or dried leaves[21, 183]. A bunch of the leaves can be added to china tea, much improving the flavour, the leaves are also added to fruit cups etc[4]. They are used as a flavouring in various alcoholic beverages including Chartreuse and Benedictine[238].

tcanta Essential Pot-pourri RepellentLandscape Uses: Border, Container, Rock garden. The growing plant is said to repel flies and ants[14]. It is also rubbed on the skin as a repellent[238], though the essential oil would be more effective here[K]. An essential oil is obtained from the plant[100] (the exact part is not specified, it is probably the entire plant and especially the flowering stems). It is used medicinally. The whole plant is very pleasantly aromatic, the aroma lasting for a long time after the plant has been harvested. It is therefore a very useful ingredient in pot-pourri[4]. A dynamic accumulator gathering minerals or nutrients from the soil and storing them in a more bioavailable form - used as fertilizer or to improve mulch.

dwatta Antianxiety Antibacterial Antidepressant Antiemetic Antispasmodic Antiviral Aromatherapy Carminative Diaphoretic Digestive Emmenagogue Febrifuge Sedative TonicLemon balm is a commonly grown household remedy with a long tradition as a tonic remedy that raises the spirits and lifts the heart[254]. Modern research has shown that it can help significantly in the treatment of cold sores[254]. The leaves and young flowering shoots are antibacterial, antispasmodic, antiviral, carminative, diaphoretic, digestive, emmenagogue, febrifuge, sedative, and tonic[4, 7, 9, 21, 165, 238]. It also acts to inhibit thyroid activity[238]. An infusion of the leaves is used in the treatment of fevers and colds, indigestion associated with nervous tension, excitability and digestive upsets in children, hyperthyroidism, depression, mild insomnia, headaches etc[4, 9, 238]. Externally, it is used to treat herpes, sores, gout, insect bites and as an insect repellent[238]. The plant can be used fresh or dried, for drying it is harvested just before or just after flowering[9]. The essential oil contains citral and citronella, which act to calm the central nervous system and are strongly antispasmodic[254]. The plant also contains polyphenols, in particular these combat the herpes simplex virus which produces cold sores[254]. The essential oil is used in aromatherapy. Its keyword is 'Female aspects'[210].

It is used to relax and rejuvenate, especially in cases of depression and nervous tension[238]. The German Commission E Monographs, a therapeutic guide to herbal medicine, approve Melissa officinalis for nervousness and insomnia (see [302] for critics of commission E).

nrakta C. and S. Europe, W. Asia and N. Africa. Naturalized in Britain. ksacta Waste places and derelict land near human habitations[9].

propta Seed - sow spring or autumn in a cold frame. Germination can be slow[200]. Prick out the seedlings into individual pots as soon as they are large enough to handle and plant out into their permanent positions when the plants are at least 15cm tall[K]. If there is plenty of seed it can be sown in an outdoor seed bed in April. Plant out into their permanent positions the following spring. Division in spring or autumn[111]. Very easy, larger clumps can be replanted direct into their permanent positions, though it is best to pot up smaller clumps and grow them on in a cold frame until they are rooting well. Plant them out in the spring. Cuttings in July/August.

nwatta A very easy growing plant, it succeeds in any well-drained soil in a sunny sheltered position[200]. It prefers a light rich moist soil[37, 52], a warm position[27, 37] and partial shade[4]. Once established, this is a drought tolerant species[190, 200], it is a useful plant to try in difficult dry places[187], usually succeeding in the dustiest of soils once it is established[190]. Lemon balm is often grown in the herb garden, and sometimes also commercially[46], there are some named varieties[183]. Plants can often self-sow so freely as to become a menace[187]. If the plants are cut back hard after flowering, they will produce a fresh flush of leaves[238]. Members of this genus are rarely if ever troubled by browsing deer or rabbits[233]. A good bee plant[4, 8, 24]. A good companion plant, especially for brassicas[14]. Special Features:Attractive foliage, Edible, Fragrant foliage, Not North American native, Invasive, Naturalizing, Suitable for cut flowers, Suitable for dried flowers. The plant is heat tolerant in zones 12 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a clumper with limited spread [1-2]. The root pattern is fibrous dividing into a large number of fine roots [1-2]. The root pattern is stoliferous rooting from creeping stems above the ground [1-2].

5.2.29 Silphium integrifolium

Prairie Rosinweed

4 tin 8 cyuc 3 kcaak 2 tcan 1 dwat 1.8 m hkuc
htut cyutli hgatyuctup hwicli hyishrasjutnykfrp hpa7tli flatprikkwis hpa7tmwatli hjonli

drutta Silphium integrifolium is a PERENNIAL growing to 1.8 m (6ft) by 0.9 m (3ft in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 4. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay and nutritionally poor soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

kcaakta Edible Parts: OilEdible Uses: OilCarbon Farming Solutions - Staple Crop: protein-oil (The term staple crop typically refers to a food that is eaten routinely and accounts for a dominant part of people's diets in a particular region of the world) [1-1]. Under development at the Land Institute to domesticate this species for use as an oilseed crop. Trials yielded 1.1t/ha of seed [1-1].

tcanta OilGarden Ornamental. Compared to other Silphium species, it is shorter, less likely to topple over, and faster from seed to flower. More manageable than most perennial sunflowers as it spreads slowly, and it is not known

Called the 'C4 carbon-fixation pathway', this process is particularly efficient at high temperatures, in bright sunlight and under dry conditions[196]. In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is clumping, giving the plant a clumping habit. The predictable growth behaviour makes it easier to maintain without having to apply containment methods[2-1].

4.2.22 Quercus macrocarpa

Burr Oak, Mossy Cup Oak

3 tin 8 cyuc 3 kcaak 4 tcan 2 dwat m hkuc
hmimhtut cyutli hgatyuctup hwicli jlutnykfrp hpa7tli flat-prikkwis hpa7tmwatli hjonli

drutta Quercus macrocarpa is a deciduous Tree growing to 15.0 m (49ft) by 8 m (26ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 3 and is not frost tender. It is in flower in May, and the seeds ripen in October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. Suitable for: medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcaakta Edible Parts: SeedEdible Uses: Seed - cooked[101, 105, 161, 257]. Very large, the seed can be up to 5cm x 4cm[82, 200], though it is somewhat variable in size and shape[227]. The seed can be ground into a powder and used in making bread, dumplings etc and as a thickener in soups[183]. The seed of this species is considered to be one of the most palatable of all the oaks[159, 183]. Many trees have sweet seeds with little tannin and the seed can be eaten raw or cooked. If the seed is bitter then this is due to the presence of tannins, these can be leached out by thoroughly washing the dried and ground up seed in water, though many minerals will also be lost. The traditional method of preparing the seed was to bury it in boggy ground overwinter. The germinating seed was dug up in the spring when it would have lost most of its astringency. The roasted seed is a coffee substitute.

tcanta Mordant Repellent Tannin WoodAgroforestry Uses: The tree has been widely tested for use in rehabilitation of the soil. It has been successfully planted on coal spoils in the north-central and northern Great Plains, and in the Western Interior Coal Province which encompasses Missouri, Kansas, and Oklahoma. It may be either seeded or transplanted onto disturbed areas[1050]. Other Uses: The leaves of most species in this genus are more or less rich in tannins. A mulch of the leaves can be placed around vulnerable plants in order to repel slugs, snails, grubs etc. Fresh leaves should be used with caution, since these can utilize some of the nitrogen in the soil and this inhibit plant growth[20, K]. Oak galls are excrescences that are sometimes produced in great numbers on the tree and are caused by the activity of the larvae of different insects. The insects live inside these galls, obtaining their nutrient therein. When the insect pupates and leaves, the gall can be used as a rich source of tannin, that can also be used as a dyestuff[4]. The bark has been used as a mordant for fixing dyes[257]. The wood is hard, heavy, strong, tough, very durable, close grained. It weighs about 46lb per cubic metre[227]. This species is of considerable importance as a timber tree, it is used for all types of construction, in making baskets, flooring, cabinet making, ship building, cooperagem fence posts etc[46, 61, 82, 149, 171, 227, 229, 338]. The wood is a good fuel[82].

dwatta Antispasmodic Astringent Dysentery TonicThe bark is astringent and tonic[61]. An infusion has been used in the treatment of diarrhoea[257]. A decoction of the root or inner bark has been used in the treatment of cramps[257]. Any galls produced on the tree are strongly astringent and can be used in the treatment of haemorrhages, chronic diarrhoea, dysentery etc[4].

nrakta Eastern N. America - Nova Scotia to Manitoba, Wyoming, Massachusetts, Georgia, Kansas and Texas. ksacta Found in a variety of habitats from dry hillsides to moist

bottomlands, rich woods and fertile slopes, mainly on limestone soils[43, 229].

propta Seed - it quickly loses viability if it is allowed to dry out. It can be stored moist and cool overwinter but is best sown as soon as it is ripe in an outdoor seed bed, though it must be protected from mice, squirrels etc. Small quantities of seed can be sown in deep pots in a cold frame. Plants produce a deep taproot and need to be planted out into their permanent positions as soon as possible, in fact seed sown in situ will produce the best trees[111]. Trees should not be left in a nursery bed for more than 2 growing seasons without being moved or they will transplant very badly.

nwatta Landscape Uses:Firewood, Pest tolerant, Aggressive surface roots possible, Specimen. Prefers a good deep fertile loam which can be on the stiff side[111]. Lime tolerant[188]. Succeeds in a hot dry position. Young plants tolerate reasonable levels of side shade[200]. Tolerates moderate exposure, surviving well but being somewhat stunted[200]. A slow-growing tree[188]. Established plants are drought resistant[229] and tolerant of atmospheric pollution[226]. Trees have a thick, fire-resistant bark[274]. Occasionally cultivated for its edible seed, there are some named varieties[183]. Slow growing in the wild, it takes about 30 years to start producing seed, though it then continues to crop for the next 200 - 300 years with large crops being produced every 2 - 3 years[229]. The tree flowers on new growth produced in spring, the seed ripening in its first year[200, 229]. Prefers warmer summers than are usually experienced in Britain, often growing poorly in this country and failing to properly ripen its wood, resulting in frost damage overwinter[11, 200]. A tree at the Hillier Arboretum in Hampshire was growing well in September 1993. It was 9 metres tall but had a lot of mildew, there was no sign of seeds[K]. There is a dwarf form of this species:- Q. macrocarpa depressa (Nutt.)Engelm. grows about 2 metres tall with corky branches and smaller seeds than the species, usually about 1cm long[227]. Hybridizes freely with other members of the genus[200]. Plants in this genus are notably resistant to honey fungus[200]. Special Features:North American native, Inconspicuous flowers or blooms. The plant is heat tolerant in zones 9 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2]. The root pattern is a tap root similar to a carrot going directly down [1-2].

4.2.23 Amaranthus tricolor

Chinese Spinach, Joseph's-coat, Fountain Plant, Tampala, Summer Poinsettia

3 tin 11 cyuc 3 kcaak 2 tcan 1 dwat 1 m hkuc
htut cyutli hgattucp hwicli hyishrasjutnyk hpa7tli frusflat-prikkwis hpa7tmwatli fyf hjonli

drutta Amaranthus tricolor is a ANNUAL growing to 1 m (3ft 3in) by 0.5 m (1ft 8in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 4 and is not frost tender. It is in leaf from April to October, in flower from June to August, and the seeds ripen from July to September. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. The plant is self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid soils. It cannot grow in the shade. It prefers moist soil and can tolerate drought.

pcista No members of this genus are known to be poisonous, but when grown on nitrogen-rich soils they are known to concentrate nitrates in the leaves. This is especially noticeable on land where chemical fertilizers are used.

Nitrates are implicated in stomach cancers, blue babies and some other health problems. It is inadvisable, therefore, to eat this plant if it is grown inorganically.

kcakta Edible Parts: Leaves Seed Stem**Edible Uses:** Leaves - raw or cooked. Often used at the young seedling stage[2, 46, 61], they are also cooked as a spinach and have a very mild flavour[183]. An excellent hot weather substitute for spinach[183]. The leaves contain about 3.5% protein, 0.25% fat, 6.6% carbohydrate, 3.1% ash, 24mg iron per 100g, 464mg calcium per 100g, they are rich in vitamin A and have a fair content of vitamins B1 and C[179]. On a zero moisture basis 100g of the leaves contains up to 2441mg calcium, 1008mg phosphorus, 51mg iron, 34mg sodium, 4475mg potassium, 37,623 micrograms beta-carotene equivalent, 0.68mg thiamine, 2.37mg riboflavin, 11.48mg niacin and 730mg ascorbic acid[218]. The crisp interior of large stems makes a tasty vegetable[183]. It can be eaten raw or cooked as an asparagus substitute[2, 61]. Seed - cooked[22, 177]. Very small, about 1mm in diameter[266], but easy to harvest and very nutritious. The seed can be cooked whole, and becomes very gelatinous like this, but it is rather difficult to crush all of the small seeds in the mouth and thus some of the seed will pass right through the digestive system without being assimilated[K]. The seed contains saponins[218]. If this is the case it is probably best to either soak the seed for at least 12 hours and then rinse thoroughly before cooking or to give the seed a long slow cooking in order to destroy the saponins[K].

tcanta DyeYellow and green dyes can be obtained from the whole plant[168].

dwatta AstringentThe whole plant is astringent[240]. A decoction of the root is used with *Cucurbita moschata* to control haemorrhage following abortion[218]. A decoction of very old plants is taken internally to improve vision and strengthen the liver.

nrakta Tropical Asia ksacta A widely cultivated plant, it is not known in a truly wild situation.

propta Seed - sow late spring in situ. An earlier sowing can be made in a greenhouse and the plants put out after the last expected frosts. Germination is usually rapid and good if the soil is warm[133]. A minimum soil temperature of 10°C is required for germination, germination is better at temperatures above 20°C[206]. A drop in temperature overnight aids germination[133]. Cuttings of growing plants root easily[206].

nwatta Landscape Uses:Border, Container, Foundation, Specimen. Prefers a light well-drained fertile soil in a sunny position[200, 206], though it does succeed in heavier soils[206]. Tolerates fairly acid soils[206]. Tolerates a pH in the range 4.3 to 7.8. This is basically a tropical plant and so requires a hot sheltered position in temperate climates if it is to do well[206, K]. Plants should not be given inorganic fertilizers, see notes above on toxicity. A polymorphic species[1], it is often cultivated for its edible leaves, there are many named varieties[206]. This species is often cultivated in Asia for its edible leaves and seed[46, 58]. It is a very ornamental plant and is often grown in the flower garden[200]. Most if not all members of this genus photosynthesize by a more efficient method than most plants. Called the 'C4 carbon-fixation pathway', this process is particularly efficient at high temperatures, in bright sunlight and under dry conditions[196]. **Special Features:**Attractive foliage, Edible, Suitable for cut flowers, Suitable for dried flowers. In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is clumping, giving the plant a clumping habit. The predictable growth behaviour makes it easier to maintain without having to apply containment methods[2-1].

5 4 tlin

5.1 bwon

5.1.1 Hippophae rhamnoides turkestanica

Sea Buckthorn
tfo2n 4 tlin 7 cyuc 5 kcaak 5 tcan 5 dwat 6 m hkuac
htut cyutli hgatkyuctuphja7n hwicli hyhshrasjltutnyk hpa7tli
flatprikwis hpa7tmwatli nyanhjen hjonli

drutta Hippophae rhamnoides turkestanica is a deciduous Shrub growing to 6 m (19ft) by 2.5 m (8ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 3. It is in flower in April, and the seeds ripen from September to October. The species is dioecious (individual flowers are either male or female, but only one sex is to be found on any one plant so both male and female plants must be grown if seed is required), and is pollinated by Wind. The plant is not self-fertile. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry moist or wet soil and can tolerate drought. The plant can tolerate maritime exposure.

pcista Some reports suggest that the fruit is poisonous[13, 100], whilst it may be very acid it is most definitely not poisonous[65]. Avoid during pregnancy.

kcakta Edible Parts: Fruit**Edible Uses:** Fruit - raw or cooked. Very rich in vitamin C (120mg per 100g)[74] and vitamin A[183], but too acid when raw for most peoples tastes[11, 158]. Used for making fruit juice, it is high in vitamins and has an attractive aroma[141]. It is being increasingly used in making fruit juices, especially when mixed with other fruits, because of its reputed health benefits[214]. The fruits of some species and cultivars (not specified) contain up to 9.2% oil[214]. The fruit is very freely borne along the stems[K] and is about 6 - 8mm in diameter[200]. The fruit becomes less acid after a frost or if cooked[74]. The fruit is ripe from late September and usually hangs on the plants all winter if not eaten by the birds. It is best used before any frosts since the taste and quality of frosted berries quickly deteriorates[214].

tcanta Charcoal Dye Fuel Soil stabilization WoodVery tolerant of maritime exposure[29, 49, 75, 182], it can be used as a shelter hedge. It dislikes much trimming[75]. A very thorny plant, it quickly makes an impenetrable barrier. Sea buckthorn has an extensive root system and suckers vigorously and so has been used in soil conservation schemes, especially on sandy soils. The fibrous and suckering root system acts to bind the sand[186, 244]. Because the plant grows quickly, even in very exposed conditions, and also adds nitrogen to the soil, it can be used as a pioneer species to help the re-establishment of woodland in difficult areas. Because the plant is very light-demanding it will eventually be out-competed by the woodland trees and so will not outstay its welcome[K]. The seeds contain 12 - 13% of a slow-drying oil[240]. The vitamin-rich fruit juice is used cosmetically in face-masks etc[9]. A yellow dye is obtained from the fruit[74]. A yellow dye is obtained from the stems, root and foliage[4]. A blackish-brown dye is obtained from the young leaves and shoots[74]. Wood - tough, hard, very durable, fine-grained. Used for fine carpentry, turning etc[46, 61, 74]. The wood is also used for fuel and charcoal[146].

dwatta Astringent Cancer Cardiac Eczema Poulitce Tonic Vermifuge Vitamin CThe twigs and leaves contain 4 - 5% tannin[240]. They are astringent and vermifuge[7, 100]. The tender branches and leaves contain bio-active substances which are used to produce an oil that is quite distinct from the oil produced from the fruit. This oil is used as an ointment for treating burns[214]. A high-quality medicinal oil is made from the fruit and used in the treatment of cardiac disorders, it is also said to be particularly effective when applied to the skin to heal burns, eczema and radiation injury, and is taken internally in the treatment of stomach and intestinal diseases[214]. The fruit is used as a tonic[9]. The freshly-pressed juice is used in the treatment of colds, febrile conditions, exhaustion etc[9]. The fruit is a very rich source of vitamins and minerals, especially in vitamins A, C and E, flavanoids and other bio-active compounds. It is also a fairly

promote expectoration[213, 257]. The infusion has also been used in the treatment of whooping cough but modern opinion is that the leaves are no more than a mild astringent[213].

nrakta Eastern N. America - Maine and Ontario to Michigan, Georgia and Arkansas. ksacta Dry, gravelly or rocky, mostly acid soils[43]. This species is virtually extinct in America due to chestnut blight[11].

propta Seed - where possible sow the seed as soon as it is ripe in a cold frame or in a seed bed outdoors[78]. The seed must be protected from mice and squirrels. The seed has a short viability and must not be allowed to become dry. It can be stored in a cool place, such as the salad compartment of a fridge, for a few months if it is kept moist, but check regularly for signs of germination. The seed should germinate in late winter or early spring. If sown in an outdoor seedbed, the plants can be left in situ for 1 - 2 years before planting them out in their permanent positions. If grown in pots, the plants can be put out into their permanent positions in the summer or autumn, making sure to give them some protection from the cold in their first winter[K].

nwatta Prefers a good well-drained slightly acid loam but succeeds in dry soils and in hot sunny sites[1, 11, 188, 200]. Once established, it is very drought tolerant[11, 200]. Very tolerant of highly acid, infertile dry sands[200]. Averse to calcareous soils but succeeds on harder limestones[11, 200]. Although it is very winter-hardy, this species only really thrives in areas with hot summers[200]. A tree at Kew in 1985 was 15 metres tall and thriving[11]. At one time widely cultivated in N. America for its edible seed, it is now virtually extinct in the wild due to chestnut blight[11]. There are some named varieties[183]. Trees are possibly becoming resistant, some suckering stands in America are producing fruit[11]. Suckers often reach 4 - 6 metres tall before succumbing to blight, but they rarely manage to produce fruit[229]. An excellent soil-enriching understorey in pine forests[200]. Flowers are produced on wood of the current year's growth[229]. Plants are fairly self-sterile[200]. They hybridize freely with other members of this genus[200]. Plants in this genus are notably resistant to honey fungus[200]. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2]. The root pattern is a tap root similar to a carrot going directly down [1-2].

5.2.27 Crataegus monogyna

Hawthorn, Oneseed hawthorn
4 tlin 8 cyuc 3 kcaak 3 tcan 5 dwat m hkuac
hmimhtut cyutli hgattcuphja7n hwicli hyhshrasjltutnykfrp
hpa7tli frusflatprikwis hpa7tmwatli xre7t hjonli

drutta Crataegus monogyna is a deciduous Shrub growing to 6 m (19ft) by 6 m (19ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from May to June, and the seeds ripen from September to November. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay and nutritionally poor soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid and very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate maritime exposure. It can tolerate atmospheric pollution.

kcakta Edible Parts: Flowers Fruit Leaves**Edible Uses:** Coffee TeaFruit - raw or cooked[2, 12]. Not very appetizing raw[9, K], it is normally used for making jams and preserves[9, 183]. The fruit can be dried, ground, mixed with flour and used for making bread etc[46]. The fruit is about 1cm in diameter[200]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K]. Young shoots - raw[5, 177]. A pleasant nutty flavour[144], they are a good addition to the salad bowl[183]. A tea is made from the dried leaves[21, 46, 177, 183], it is a china tea substitute. The roasted seeds are a coffee substitute[12, 21, 46, 177]. The flowers are used in syrups and sweet puddings[183].

tcanta Fuel Hedge Hedge WoodA good hedge plant, it is very tolerant of being cut and of neglect and is able to regenerate if cut back severely, it makes a good thorny stock-proof barrier[186] and resists very strong winds. It is often used in layered hedges[11, 29]. The cultivar 'Stricta' has made a very good hedge 3.5 metres tall in an exposed maritime position at Rosewarne in N. Cornwall[K]. Wood - very hard and tough, difficult to work. Used for tool handles etc. Valued in turning[7, 46, 61]. A good fuel, giving out a lot of heat[4].

dwatta Antispasmodic Astringent Cardiotonic Diuretic Hypotensive Malaria Sedative Tonic VasodilatorHawthorn is an extremely valuable medicinal herb. It is used mainly for treating disorders of the heart and circulation system, especially angina[254]. Western herbalists consider it a 'food for the heart', it increases the blood flow to the heart muscles and restores normal heart beat[254]. This effect is brought about by the presence of bioflavonoids in the fruit, these bioflavonoids are also strongly antioxidant, helping to prevent or reduce degeneration of the blood vessels[254]. The fruit is antispasmodic, cardiac, diuretic, sedative, tonic and vasodilator[4, 9, 21, 46, 165]. Both the fruits and flowers of hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222], they are also used to treat a heart muscle weakened by age, for inflammation of the heart muscle, arteriosclerosis and for nervous heart problems[21]. Prolonged use is necessary for the treatment to be efficacious[222]. It is normally used either as a tea or a tincture[222]. Hawthorn is combined with ginkgo (*Ginkgo biloba*) to enhance poor memory, working by improving the blood supply to the brain[254]. The bark is astringent and has been used in the treatment of malaria and other fevers[7]. The roots are said to stimulate the arteries of the heart[218].

nrakta Europe, including Britain, absent from Iceland, south and west the the Mediterranean and Afghanistan ksacta Woods, hedges, thickets etc, on most soils except wet peat and poor acid sands[9, 17].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Succeeds in all but the very poorest acid soils[186]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. A very hardy plant, tolerating temperatures down to at least -18°C[202]. Hybridizes freely with other members of this genus and with *C. laevigata* in the wild[186, 200]. There are many named forms selected for their ornamental value[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization.

peratures, in bright sunlight and under dry conditions[196]. In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is clumping, giving the plant a clumping habit. The predictable growth behaviour makes it easier to maintain without having to apply containment methods[2-1].

5.2.24 *Astrebala squarrosa*

Bull Mitchell grass
4 tlin 12 cyuc 4 kcaak 1 tcan 0 dwat 1.5 m hkuc
htut cyutli hgatkyuctcup hwicli hyhshrasjlutnyikfrp hpa7tli flatprikliw hpa7tmwatli hjonli

drutta *Astrebala squarrosa* is a PERENNIAL growing to 1.5 m (5ft) by 0.1 m (0ft 4in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay and nutritionally poor soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

kcakta Edible Parts: SeedEdible Uses: Carbon Farming Solutions - Staple Crop: balanced carb (The term staple crop typically refers to a food that is eaten routinely and accounts for a dominant part of people's diets in a particular region of the world) [1-1]. Cultivated in the past but largely or completely abandoned.

tcanta Providing habitat for organisms such as mammals.

nrakta Australasia. ksacta Heavy, cracking clays on plains and river flats, sometimes with *Lysiphylum* or *Excoecaria*, or in *Dicanthium-Eulalia* grassland and cleared Brigalow areas; in dicans after rain.

propta Wild. Seed.

nwatta Historic Crop Management: Standard Staple Crop: Balanced carbClimate: subtropical to tropical. Humidity: semi-arid. Grow on clay soils, mainly between an upper limit of 600 mm average annual rainfall, and a lower limit of 200 mm, and even below in depressions where the water concentrates following rains e.g. in Sturt's Stony Desert. Mitchell grasses are deep rooted and become dormant during drought, allowing them to survive extended periods without rainfall. Carbon Farming Solutions - Cultivation: historic crop. Cultivated in the past but largely or completely abandoned. Management: standard (Describes the non-destructive management systems that are used in cultivation) [1-1].

5.2.25 *Allium senescens*

German Garlic
4 tlin 10 cyuc 4 kcaak 0 tcan 2 dwat 0.5 m hkuc
htut cyutli hgatkyuctcup hwicli hrasjlut hpa7tli flatprikliw hpa7tmwatli fyfixre7t hjonli

drutta *Allium senescens* is a BULB growing to 0.5 m (1ft 8in) by 0.2 m (0ft 8in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from June to July. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees, flies, beetles, Lepidoptera (Moths and Butterflies). The plant is self-fertile. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

pcasta Although no individual reports regarding this species have been seen, there have been cases of poisoning caused by the consumption, in very large quantities and by some mammals, of certain members of this genus. Dogs seem to be particularly susceptible[76].

kcakta Edible Parts: Flowers Leaves RootEdible Uses: Bulb - raw or cooked[2, 46, 61, 105]. An onion substitute[22, 177]. The small bulbs are formed in clusters on a rhizome and are up to 10mm in diameter[200]. Leaves - raw or cooked[105, 177]. A fairly strong onion flavour with a slight bitterness, but acceptable raw[K]. We use them in salads or

as a flavouring in cooked foods[K]. Flowers - raw or cooked. An attractive garnish in salads[K].

tcanta RepellentThe juice of the plant is used as a moth repellent. The whole plant is said to repel insects and moles[20].

dwatta Although no specific mention of medicinal uses has been seen for this species, members of this genus are in general very healthy additions to the diet. They contain sulphur compounds (which give them their onion flavour) and when added to the diet on a regular basis they help reduce blood cholesterol levels, act as a tonic to the digestive system and also tonify the circulatory system[K].

nrakta C. Europe to Siberia, China and Korea. ksacta Dry, usually rocky places[50]. Forests, dry stony slopes, steppes, saline meadows and gravelly places at elevations of 500 - 800 metres in northern China[266].

propta Seed - sow spring in a cold frame. Prick out the seedlings into individual pots when they are large enough to handle - if you want to produce clumps more quickly then put three plants in each pot. Grow them on in the greenhouse for at least their first winter and plant them out into their permanent positions in spring once they are growing vigorously and are large enough. Division in spring. Very easy, the plants divide successfully at any time in the growing season and the divisions can be planted straight out into their permanent positions if required.

nwatta Landscape Uses:Alpine garden, Border, Container, Massing, Rock garden, Specimen. Prefers a sunny position in a light well-drained soil[1]. Established plants are fairly drought tolerant[190]. A very ornamental plant[42], it is frequently confused with *A. montanum*[1]. The bulbs should be planted fairly deeply[1]. Most members of this genus are intolerant of competition from other growing plants[203]. Grows well with most plants, especially roses, carrots, beet and chamomile, but it inhibits the growth of legumes[18, 20, 54]. This plant is a bad companion for alfalfa, each species negatively affecting the other[201]. Members of this genus are rarely if ever troubled by browsing deer[233]. Special Features: Attractive foliage, Fragrant foliage, Attracts butterflies, Suitable for cut flowers, Suitable for dried flowers.

5.2.26 *Castanea dentata*

American Sweet Chestnut
4 tlin 8 cyuc 3 kcaak 3 tcan 1 dwat 30 m hkuc
hmimhtut cyutli hgatkyuctcup hwicli hyhshrasjlutnyik hpa7tli frusflatprik hpa7tmwatli hjonli

drutta *Castanea dentata* is a deciduous Tree growing to 30 m (98ft) by 15 m (49ft). See above for USDA hardiness. It is hardy to UK zone 4. It is in flower in July, and the seeds ripen in October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought.

kcakta Edible Parts: Oil SeedEdible Uses: Chocolate Coffee OilSeed - raw or cooked[2, 62, 63, 102, 117]. Rather on the small side, but these are the sweetest seeds of any species in this genus[183]. The seed contains about 7% fat, 11% protein[159]. It can be dried, ground into powder and then be added to cereals when making bread, cakes etc[213]. A delicious oil can be extracted from the seed by crushing the nuts, boiling them in water and then skimming off the oil as it comes to the surface[213]. It can be used as a topping for various puddings[213]. The roasted nut can be used as a coffee substitute and a chocolate substitute can also be made from it[183] (no further details).

tcanta Dye Oil Tannin WoodThe bark is a good source of tannin[46, 61, 171, 223]. The dried leaves contain 9% tannin[213]. The wood and the seed husks also contain tannin[223]. The husks contain 10 - 13% tannin[223]. A brown dye is obtained from the bark[257]. Wood - soft, not strong, light, very durable, liable to warp. It weighs 28lb per cubic foot. Easy to split, it is used for making cheap furniture, fence posts, in construction etc[61, 82, 117, 171, 229, 235].

dwatta Astringent ExpectorantA warm water infusion of the leaves has been used to calm the respiratory nerves and

good source of essential fatty acids, which is fairly unusual for a fruit. It is being investigated as a food that is capable of reducing the incidence of cancer and also as a means of halting or reversing the growth of cancers[214].

nrakta E. Asia - Himalayas in the higher Tibetan plateau. ksacta Uper subalpine to lower alpine zones.

propta Seed - sow spring in a sunny position in a cold frame[78]. Germination is usually quick and good although 3 months cold stratification may improve the germination rate. Alternatively the seed can be sown in a cold frame as soon as it is ripe in the autumn. Prick out the seedlings into individual pots when they are large enough to handle and grow on in a greenhouse for their first winter. Plant out in late spring into their permanent positions. Male seedlings, in spring, have very prominent axillary buds whilst females are clear and smooth at this time[78]. Cuttings of half-ripe wood, June/July in a frame[200]. Difficult[113]. This is the easiest method of vegetative propagation[214]. Cuttings of mature wood in autumn[200]. Difficult[113]. The cuttings should be taken at the end of autumn or very early in the spring before the buds burst. Store them in sand and peat until April, cut into 7 - 9cm lengths and plant them in a plastic tent with bottom heat[214]. Rooting should take place within 2 months and they can be put in their permanent positions in the autumn[214]. Division of suckers in the winter. They can be planted out direct into their permanent positions and usually establish well and quickly[K]. Layering in autumn[200].

nwatta Landscape Uses:Border, Seashore, Specimen. Succeeds in most soils[200], including poor ones[186], so long as they are not too dry[182, 200]. Grows well by water and in fairly wet soils[182]. Established plants are very drought resistant[186]. Requires a sunny position[3], seedlings failing to grow in a shady position and mature shrubs quickly dying if overshadowed by taller plants[186]. Does well in very sandy soils[1, 186]. Plants are very tolerant of maritime exposure[75], though they are fairly slow growing[75]. Although usually found near the coast in the wild, they thrive when grown inland[11] and are hardy to about -25°C[184]. A very ornamental plant[1, 11], it is occasionally cultivated, especially in N. Europe, for its edible fruit[183]. Members of this genus are attracting considerable interest from breeding institutes for their nutrient-rich fruits that can promote the general health of the body (see edible and medicinal uses below)[214]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[113, 186, 200]. Plants produce abundant suckers, especially when grown on sandy soils[186]. Dioecious. Male and female plants must be grown if seed is required. The sexes of plants cannot be distinguished before flowering, but on flowering plants the buds of male plants in winter are conical and conspicuous whilst female buds are smaller and rounded[11]. Plants in this genus are notably resistant to honey fungus[200]. Special Features:Not North American native, Naturalizing, Inconspicuous flowers or blooms.

5.1.2 *Caragana brevispina*

Long-Stalked Pea-shrub
tfo2n 4 tlin 9 cyuc 4 kcaak 3 tcan 1 dwat 2.5 m hkuc
htut cyutli hgatkyuctcup hwicli hyhshrasjlut hpa7tli flatprikliw hpa7tmwatli xre7t hjonli

drutta *Caragana brevispina* is a deciduous Shrub growing to 2.5 m (8ft) by 1.8 m (6ft). See above for USDA hardiness. It is hardy to UK zone 6. It is in flower in June, and the seeds ripen in September. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. It can fix Nitrogen. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcasta Reports that this plant contains toxins have not been substantiated[65]. The occurrence of cystine in the seeds is doubtful[65].

kcakta Edible Parts: Leaves SeedEdible Uses: Seed - cooked[160]. Small but produced in abundance. The seed of a plant seen at the Royal Horticultural Gardens, Wisley

in Surrey in September 1993 was about twice the size of *C. arborescens* but it had a distinctly bitter taste[K]. High in protein, it has been recommended as an emergency food for humans. Young buds - cooked as a green vegetable[272].

tcanta Hedge Hedge Soil stabilization WoodPlants can be grown as a hedge, they are very spiny and provide an impenetrable barrier. The extensive root system of this plant makes it useful for planting to control soil erosion. Wood - hard, close grained[146]. An important fuel wood for people living at high elevations[272].

dwatta A decoction of the plant is taken in the treatment of aching joints[272].

nrakta E. Asia - N.W. Himalayas. ksacta Higher forests, in the undergrowth of fir and oak forests or in open glades on dry ridges from 1500 - 2700 metres[146].

propta Seed - best sown as soon as it is ripe in a cold frame[200]. It usually germinates in 2 weeks[K]. Stored seed should be pre-soaked for 24 hours in warm water then sown in a cold frame[78, 113, 200]. If the seed has not swollen then scarify it and re-soak for another 12 hours before sowing[138]. Germination usually takes place within 2 - 3 weeks at 20°C[138]. Good percentage[11]. As soon as they are large enough to handle, prick the seedlings out into individual pots and grow them on in a greenhouse for at least their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. Cuttings of half-ripe wood, 7 - 10cm with a heel, July/August in a frame[113]. Layering in spring.

nwatta Succeeds in most well-drained soils, but prefers full sun and a light sandy dry or well-drained soil[1, 11, 200]. Does not require a rich soil[11], succeeding on marginal land[160]. Succeeds in acid or alkaline soils[160]. Established plants are drought resistant[160]. This species is hardy to at least -20°C[184], it prefers a continental climate with hot summers and cold winters so it does not grow so well in the milder western half of Britain[200]. Plants in this genus are notably resistant to honey fungus[200]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[200].

5.1.3 *Elaeagnus orientalis*

Trebizonid Date
tfo2n 4 tlin 8 cyuc 4 kcaak 2 tcan 2 dwat 12 m hkuc
htut cyutli hgatkyuctcup hwicli hyhshrasjlutnyik hpa7tli flatprikliw hpa7tmwatli xre7t hjonli

drutta *Elaeagnus orientalis* is a deciduous Shrub growing to 12 m (39ft) by 6 m (19ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 4 and is not frost tender. It is in flower in June. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. It can fix Nitrogen. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

kcakta Edible Parts: Fruit SeedEdible Uses: Fruit - raw or cooked[3, 105]. Sweet and mealy but of better quality than the closely related *E. angustifolia*[183]. Eaten fresh or made into sherbet and preserves. The fruit must be fully ripe before it can be enjoyed raw, if even slightly under-ripe it will be quite astringent[K]. The oval fruit is about 10mm long and contains a single large seed[K]. Seed - raw or cooked. It can be eaten with the fruit though the seed case is rather fibrous[K].

tcanta Hedge HedgePlants can be grown as a hedge in exposed positions, tolerating maritime exposure.

dwatta CancerThe fruit of many members of this genus is a very rich source of vitamins and minerals, especially in vitamins A, C and E, flavanoids and other bio-active compounds. It is also a fairly good source of essential fatty acids, which is fairly unusual for a fruit. It is being investigated as a food that is capable of reducing the incidence of cancer and also as a means of halting or reversing the growth of cancers[214].

nrakta W. Asia. ksacta By streams and on river banks, to elevations of 3000 metres in Turkey[93].

propta Seed - best sown as soon as it is ripe in a cold frame[78]. It should germinate in late winter or early spring, though it may take 18 months[K]. Stored seed can be very slow to germinate, often taking more than 18 months. A warm stratification for 4 weeks followed by 12 weeks cold stratification can help[98]. The seed usually (eventually) germinates quite well[78]. Prick out the seedlings into individual pot as soon as they are large enough to handle and plant out when they are at least 15cm tall. Cuttings of half-ripe wood, 7 - 10cm with a heel, July/August in a frame. Cuttings of mature wood of the current year's growth, 10 - 12cm with a heel, October/November in a frame[200]. The cuttings are rather slow and difficult to root, leave them for 12 months[113]. Layering in September/October. Takes 12 months[78].

nwatta Succeeds in most soils that are well-drained[11, 200]. Prefers a soil that is only moderately fertile, succeeding in very poor soils and in dry soils[11, 200]. Established plants are very drought resistant[1]. Prefers a light sandy loam and a sunny position[11, 200]. Dislikes shallow chalk soils[98]. Very closely related to *E. angustifolia* and often considered to be no more than a sub-species of it[183], it does not flower so freely in Britain as that species[11]. This species is notably resistant to honey fungus[88, 200]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[200]. An excellent companion plant, when grown in orchards it can increase yields from the fruit trees by up to 10%. The flowers are very fragrant and are rich in nectar[183], they are much visited by bees. Occasionally cultivated for its edible fruit, there are some named varieties[183]. The fruit used to be commonly sold in the markets of Iran and Turkey but is rarely found there nowadays[183].

5.1.4 Vicia faba major

Broad Bean, Fava Bean

tfo2n 4 tlin 10 cyuc 4 kcaak 3 tcan 1 dwat m hkuc hmimhtut cyutiil hgattcup hwicli hrsajlutnyikfripr hpa7tli flat-prikrlwis hpa7tmwatli fyifxre7t hjonli

drutta *Vicia faba major* is a ANNUAL growing to 1 m (3ft 3in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from May to August, and the seeds ripen from July to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. The plant is self-fertile. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista Although often used as an edible seed, there are reports that eating the seed of this plant can cause the disease 'Favism' in susceptible people[7, 76]. Inhaling the pollen can also cause the disease[7, 218]. Favism, which is a severe haemolytic anaemia due to an inherited enzymatic deficiency[218], only occurs in cases of excessive consumption of the raw seed (no more details are given[K]) and when the person is genetically inclined towards the disease[7, 213]. About 1% of Caucasians and 15% of Negroids are susceptible to the disease[218].

kcaakta Edible Parts: Leaves SeedEdible Uses: Immature seed - raw or cooked. Broad bean seeds are very nutritious and are frequently used as items of food. The seeds can be eaten raw when they are small and tender, and the young older they can be cooked as a vegetable[2, 7, 16, 132, 183]. They have a very pleasant floury taste[K]. There are some potential problems to the use of these seeds if they are consumed in large quantities[7] - see the notes above on toxicity. Mature seeds can be eaten cooked as a vegetable or added to soups etc[2, 7, 16, 183]. They are best soaked for 12 - 24 hours prior to cooking in order to soften them and reduce the cooking time[K]. They will also become more nutritious this way[K]. The flavour is mild and pleasant with a floury texture[K]. They can also be dried and ground into a flour for use

in making bread etc with cereal flours[183]. The seed can also be fermented to make tempeh[183]. Made into a paste, they can be used as a sandwich filling[299]. The seed can be sprouted before being cooked[183]. Popped seeds can be salted and eaten as a snack or roasted like peanuts[183]. Young pods - cooked and eaten as a vegetable[183]. They quickly become fibrous as they grow larger[183], and also develop a hairy coating inside the pods that can become unpleasant as the pods get larger[K]. Young leaves - cooked. They are very nutritious and can be used like spinach[105 , 183].

tcanta Fibre Soap makingAgroforestry Uses: The stems and leaves are sometimes used as a green manure[299]. Broad beans grow well with carrots, cauliflower, beet, cucumber, cabbages, leeks, celeriac, corn and potatoes, but is inhibited by onions, garlic and shallots[18 , 20]. Other Uses: A fibre is obtained from the stems. The burnt stems are rich in potassium and can be used in making soap. The dried stems can be burnt as a fuel[299].

dwatta DiureticThe seedpods are diuretic and lithontriptic[7].

nrakta Long cultivated for its seed, the original habitat is obscure. ksacta Not known in a truly wild situation.

propta Pre-soak the seed for 24 hours in warm water and then sow in situ in succession from late winter until early summer. Germination should take place in about 7 - 10 days. The earlier sowings should be of suitably hardy varieties such as the 'Longpods' whilst later sowings can be of the tastier varieties such as the 'Windsors'. By making fresh sowings every 3 weeks you will have a continuous supply of fresh young seeds from early summer until early autumn. If you want to grow the beans to maturity then the seed needs to be sown by the middle of spring. You may need to protect the seed from the ravages of mice. Another sowing can be made in middle to late autumn. This has to be timed according to the area where the plants are being grown. The idea is that the plants will make some growth in the autumn and be perhaps 15 - 20cm tall by the time the colder part of winter sets in. As long as the winter is not too severe, the plants should stand well and will grow away rapidly in the spring to produce an earlier crop. The plants will also be less likely to be attacked by blackfly. Make sure you choose a suitably hardy variety for this sowing.

nwatta Broad beans originated in warm temperate areas and can be cultivated from the cold temperate zone to the subtropics, and also at higher elevations from 1,300 - 3,800 metres in the tropics. It may flower well in the lowland tropics, but usually does not produce pods[299

]. The ideal temperature range in the growing season is between 18 - 27°C, at higher temperatures the flowers are often aborted[200

]. The plant requires an annual rainfall of 700 - 1,000mm, of which more than 60% should occur during the growing period[299

]. Prefers a fairly heavy loam but succeeds in a sunny position in most soils that are well-drained[1

, 200

]. Grows well in heavy clay soils. Dislikes dry conditions according to some reports[87

, 200

], whilst another says that it is drought tolerant once established[132

]. Prefers a pH in the range 5.5 to 7[200

]. There are two main forms of this species - small seeded forms that are more commonly grown for feeding livestock and as a green manure, and larger seeded forms that are usually grown for human food. Of the larger seeded forms there are two main types:- 'Longpod' beans are the more hardy and can be sown in the autumn in cool temperate areas. 'Windsor' beans, which are considered to be finer flavoured, are less tolerant of the cold and so are best sown in spring[132

]. Autumn sown varieties are more susceptible to 'chocolate spot' fungus, this problem can be alleviated by the addition of potash to the soil[87

]. Black fly can be a major problem. Autumn sown crops are less likely to be affected. Pinching out the soft tips of the plants, one they are tall enough and are beginning to flower, can reduce the problem since the blackfly always start on the soft shoots and then spread to the older stems. This species has a symbiotic relationship with certain soil bacteria, these

advised in the use of the leaves and stems of this plant, see the notes above on toxicity.

nrakta Eastern N. America - Maine to Florida, west to Texas and Illinois. ksacta Generally found in dry soils on hillsides, along the margins of woodlands and roads, and in abandoned fields[229].

propta Seed - best sown in a cold frame as soon as it is ripe. Pre-soak the seed for 24 hours in hot water (starting at a temperature of 80 - 90c and allowing it to cool) prior to sowing in order to leach out any germination inhibitors[200]. This soak water can be drunk and has a delicious lemon-flavour. The stored seed also needs hot water treatment and can be sown in early spring in a cold frame[200]. When they are large enough to handle, prick the seedlings out into individual pots and grow them on in the greenhouse for their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. Cuttings of half-ripe wood, 10cm with a heel, July/August in a frame[200]. Root cuttings 4cm long taken in December and potted up vertically in a greenhouse. Good percentage[78, 200]. Suckers in late autumn to winter[200].

nwatta Experimental Crop Industrial Crop: Dye Industrial Crop: Hydrocarbon Industrial Crop: Tannin Management: Coppice/Landscape Uses:Border, Erosion control, Pest tolerant, Massing, Specimen. Succeeds in a well-drained fertile soil in full sun[11, 200]. Tolerates poor soils[169, 200]. Established plants are drought resistant[169]. A very hardy species, when fully dormant it can tolerate temperatures down to about -25°C[200]. However, the young growth in spring can be damaged by late frosts. A very ornamental plant[1]. It is quite fast-growing but short-lived in the wild[229]. In the north of its range plants are dwarf, around 1.2 metres tall, but in the south they can be up to 7 metres tall[182]. Some botanists divide this species into separate species, whilst others see it as a single species with geographical forms. *R. copallina* is usually a shrub and is found in moist soils in sun or shade[227]. *R. copallina lanceolata*. Gray. is more tree-like and is found in drier soils[227]. Transplants easily[169]. Plants have brittle branches and these can be broken off in strong winds[200]. Plants are also susceptible to coral spot fungus[11]. Many of the species in this genus are highly toxic and can also cause severe irritation to the skin of some people, whilst other species such as this one are not poisonous. It is relatively simple to distinguish which is which, the poisonous species have axillary panicles and smooth fruits whilst non-poisonous species have compound terminal panicles and fruits covered with acid crimson hairs[1, 4]. The toxic species are sometimes separated into their own genus, *Toxicodendron*, by some botanists[200]. Plants in this genus are notably resistant to honey fungus[200]. Dioecious. Male and female plants must be grown if seed is required. Special Features:Attracts birds, North American native, Attracts butterflies, Attractive flowers or blooms. Carbon Farming - Cultivation: experimental. Management: coppice. The plant is heat tolerant in zones 9 through 5. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone 11 -11 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a running thicket former forming a colony from shoots away from the crown spreading indefinitely [1-2]. The root pattern is flat with shallow roots forming a plate near the soil surface [1-2]. The root pattern is suckering with new plants from underground runners away from the plant [1-2].

5.2.23 Amaranthus caudatus

Love Lies Bleeding

4 tlin 8 cyuc 4 kcaak 2 tcan 1 dwat 2 m hkuc htut cyutiil hgattkyuctcup hwicli hyishrsajlutnyik hpa7tli frus-flatprikrlwissliphsom hpa7tmwatli fyif hjonli

drutta *Amaranthus caudatus* is a ANNUAL growing to 2 m (6ft) by 0.5 m (1ft 8in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from July to September, and the seeds ripen from August to September. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. The plant is self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid, very alkaline and saline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

pcista No members of this genus are known to be poisonous, but when grown on nitrogen-rich soils they are known to concentrate nitrates in the leaves. This is especially noticeable on land where chemical fertilizers are used. Nitrates are implicated in stomach cancers, blue babies and some other health problems. It is inadvisable, therefore, to eat this plant if it is grown inorganically.

kcaakta Edible Parts: Leaves SeedEdible Uses: Colouring/Leaves - raw or cooked as a spinach or added to soups etc[22, 46, 61, 105, 183]. The mild flavoured leaves are rich in vitamins and minerals[183, K]. Seed - cooked[22, 46, 57, 105]. Very small but easy to harvest and very nutritious, individual plants can bear up to 100,000 seeds[196]. It is eaten cooked or ground into a powder and used in baking[61, 183, 196]. The seed can also be popped in much the same way as popcorn[97, 183]. The seed can be cooked whole, and becomes very gelatinous like this, but it is rather difficult to crush all of the small seeds in the mouth and thus some of the seed will pass right through the digestive system without being assimilated[K]. The seed is very nutritious and contains 13 - 18% of a very high quality protein that is rich in the amino acid lysine[196]. It also contains good quantities of calcium, phosphorus, iron, potassium, zinc, vitamin E and the vitamin B complex[196]. A red food colouring called 'betalaina' is obtained from red cultivars[196].

tcanta DyeYellow and green dyes can be obtained from the whole plant[168].

dwatta Anthelmintic AstringentThe plant is astringent, anthelmintic and diuretic[4, 240]. It is used in the treatment of stranguary and is applied externally to scrofulous sores[240].

nrakta Tropics. ksacta A weed of cultivated ground[145].

propta Seed - sow late spring in situ. An earlier sowing can be made in a greenhouse and the plants put out after the last expected frosts. Germination is usually rapid and good if the soil is warm[133]. A drop in temperature overnight aids germination[133]. Cuttings of growing plants root easily[206].

nwatta Prefers a well-drained fertile soil in a sunny position[196, 200]. Grows moderately well in poor soils[200]. Requires a hot sheltered position if it is to do well[K]. Plants are drought resistant though reasonable moisture levels are required for germination and also at pollination[196]. Some forms can tolerate a pH up to 8.5, there are also some that can tolerate mild salinity[196]. It is likely that they will also tolerate acid soils and aluminium toxicity[196]. Plants are not frost-hardy, the most cold tolerant cultivars can tolerate temperatures down to about 4°C[196]. Plants should not be given inorganic fertilizers, see notes above on toxicity. This species is cultivated for its edible seed and leaves in the Andes and various other parts of S. America[46, 61, 97]. It probably arose through cultivation from *A. quitensis*. There are some named varieties[196]. Plants take 4 - 6 months from sowing to harvesting the seed, but up to 10 months in some Andean highland regions[196]. Yields from 1 - 3 tonnes per hectare are common, 5 tonnes has been achieved and research sites have produced the equivalent of 6 tonnes per hectare[196]. The seed is usually harvested just before maturity otherwise some of the seed will be lost during harvesting[196]. Plants usually have downward facing seedheads but varieties have been developed with upward facing heads that can be harvested mechanically[196]. This species is sensitive to day-length most cultivars are short-day and have not done well in northern latitudes, but there are some varieties that flower at day-lengths up to 16 hours[196]. Most if not all members of this genus photosynthesize by a more efficient method than most plants. Called the 'C4 carbon-fixation pathway', this process is particularly efficient at high tem-

htut cyutli hgatyuctup hwicli hyishrasjlutnyik hpa7tli frus-flatprik hpa7tmwatli hjonli

drutta Castanea pumila is a deciduous Shrub growing to 4 m (13ft 1in) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower in July, and the seeds ripen in October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

kcakta Edible Parts: SeedEdible Uses: Seed - raw or cooked[2, 61, 105]. Sweet with a nice nutty flavour[46, 82, 183], it is very acceptable raw and has a superior flavour to sweet chestnuts (*C. sativa*) [142, 161, KJ]. When baked it becomes even sweeter and develops a floury texture, it makes an excellent potato or cereal substitute[K]. The seed is quite small, about 2cm thick[270], which is about half the size of *C. dentata*[183]. It is sold in local markets in America[82]. The seed husks only contain one (rarely two) seed[235]. The seed contains 45% starch and 2.5% protein[213].

tcanta Tannin WoodThe bark, leaves, wood and seed husks all contain tannin. Wood - coarse-grained, hard, strong, light, durable, easy to split. It weighs 37lb per cubic foot. Too small for commercial use, but it is occasionally used for fence posts, fuel etc[46, 61, 229, 229].

dwatta Antiperiodic Astringent TonicThe leaves contain tannin and are antiperiodic, astringent and tonic[46, 61, 213]. An infusion of the leaves has been used as an external wash for the feverish condition common to colds[213, 257].

nrakta Eastern N. America - New Jersey and Pennsylvania to Florida, Missouri and Texas. ksacata Dry sandy ridges and rich hillsides where it forms thickets, also in woods and on the borders of swamps[43, 82].

propta Seed - where possible sow the seed as soon as it is ripe in a cold frame or in a seed bed outdoors[78]. The seed must be protected from mice and squirrels. The seed has a short viability and must not be allowed to become dry. It can be stored in a cool place, such as the salad compartment of a fridge, for a few months if it is kept moist, but check regularly for signs of germination. The seed should germinate in late winter or early spring. If sown in an outdoor seedbed, the plants can be left in situ for 1 - 2 years before planting them out in their permanent positions. If grown in pots, the plants can be put out into their permanent positions in the summer or autumn, making sure to give them some protection from the cold in their first winter[K]. Division of suckers in winter[200]. They can be planted straight out into their permanent positions.

nwatta Prefers a good well-drained slightly acid loam but succeeds in dry soils[1, 11, 200]. Once established, it is very drought tolerant[1, 11, 200]. Very tolerant of highly acid, infertile dry sands[200]. Averse to calcareous soils but succeeds on harder limestones[11, 200]. This species is an excellent soil-enriching understorey in pine forests[200], growing and fruiting well so long as the canopy of pines is fairly light. Although it is very winter-hardy, this species only really thrives in areas with hot summers[200]. The young growth in spring, even on mature plants, is frost-tender and so it is best to grow the plants in a position sheltered from the early morning sun[K]. Plants can spread widely by means of underground suckers[11]. Flowers are produced on wood of the current year's growth[229]. Other are fairly self-sterile[200]. They hybridize freely with other members of this genus[200]. Fruits are produced in 2 - 3 years from seed[117]. One report says that plants never fruit in Britain[11], but a 2 metre tall plant at Wisley fruits most years[K]. Trees on our Cornish trial grounds produced a few female flowers when 1 metre tall and 4 years old[K]. This species is occasionally cultivated for its edible seed in N. America, there are some named varieties[183]. The plants produce seeds abundantly in the wild[183]. The sub-species *C. pumila ashei*. Sudw. (Zone 7) is a coastal form, found from Virginia to Texas[200]. Plants in this genus are notably resistant to honey fungus[200]. The plant is heat tolerant in zones 9 through 5. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over

86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is multistemmed with multiple stems from the crown [1-2]. The root pattern is flat with shallow roots forming a plate near the soil surface [1-2]. The root pattern is a heart root, dividing from the crown into several primary roots going down and out [1-2]. The root pattern is suckering with new plants from underground runners away from the plant [1-2].

5.2.22 *Rhus copallina*

Dwarf Sumach, Winged sumac, Flameleaf Sumac, Winged Sumac, Shining Sumac

4 tin 10 cyuc 4 kcaak 3 tcan 2 dwat 2 m hkuc
htut cyutli hgatyuctup hwicli hyishrasjlutnyik hpa7tli flat-prikliwis hpa7tmwatli nyanhjen hjonli

drutta *Rhus copallina* is a deciduous Shrub growing to 2 m (6ft) by 2 m (6ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from July to September, and the seeds ripen from October to December. The species is dioecious (individual flowers are either male or female, but only one sex is to be found on any one plant so both male and female plants must be grown if seed is required), and is pollinated by Bees. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista There are some suggestions that the sap of this species can cause a skin rash in susceptible people, but this has not been substantiated. See also notes in 'Cultivation Details'.

kcakta Edible Parts: Fruit OilEdible Uses: Drink Oil-Fruit - raw or cooked[22, 46, 161]. An agreeable acid flavour[2]. The fruit is only 3 - 5mm long with very little flesh, but it is borne on dense panicles and is thus easily harvested[229]. When soaked for 10 - 30 minutes in hot or cold water it makes a very refreshing lemonade-like drink (without any fizz of course)[95, 105, 149, 159, 183]. The mixture should not be boiled since this will release tannic acids and make the drink astringent.

tcanta Dye Hedge Hedge Mordant Oil Resin Soil stabilization Tannin Varnish WoodThe leaves are rich in tannin[46, 82, 169], so is the bark[149] and the fruit[169]. The leaves can be collected as they fall in the autumn and used as a brown dye or as a mordant[169, 171]. The leaves contain 10 - 25% tannin[171]. Up to 35.8% has been obtained from some plants[223]. An oil is extracted from the seeds[4]. It attains a tallow-like consistency on standing and is used to make candles. These burn brilliantly, though they emit a pungent smoke[4]. The plants extensive root system makes it useful for stabilizing soils. A black dye is obtained from the fruit[149, 257]. A resin, 'copal resin', is obtained from the sap of this plant. When dissolved in any volatile liquid, such as oil of turpentine, it makes a beautiful varnish[4]. (Is this a mistaken entry? Perhaps it belongs with one of the toxic species[K]). Wood - light, soft, coarse grained[82]. It weighs 32lb per cubic foot[227]. Sometimes used for small posts[149].

dwatta Astringent Dysentery Enuresis Galactogogue Poultrice SalveA decoction of the root has been used in the treatment of dysentery[222]. An infusion of the roots has been used in the treatment of VD[257]. A poultice of the root has been applied to sores and skin eruptions[257]. A tea made from the bark has been drunk to stimulate milk flow in nursing mothers. A decoction of the bark has been used as a wash for blisters and sunburn blisters[222, 257]. An infusion of the leaves has been used to cleanse and purify skin eruptions[257]. The berries were chewed in the treatment of bed-wetting and mouth sores[222, 257]. Some caution is

bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[200]

J. When removing plant remains at the end of the growing season, it is best to only remove the aerial parts of the plant, leaving the roots in the ground to decay and release their nitrogen.

5.1.5 *Medicago sativa*

Alfalfa, Yellow alfalfa

tfo2n 4 tin 8 cyuc 4 kcaak 4 tcan 3 dwat 1 m hkuc
htut cyutli hgatyuctup hwicli hyishrasjlutnyik hpa7tli flat-prikliwis hpa7tmwatli fyfkrx7t hjonli

drutta *Medicago sativa* is a PERENNIAL growing to 1 m (3ft 3in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 5. It is in flower from June to July, and the seeds ripen from July to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees, Lepidoptera (Moths and Butterflies). The plant is self-fertile. It can fix Nitrogen. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

pcista The plant contains saponin-like substances[222]. Eating large quantities of the leaves may cause the breakdown of red blood cells[222]. However, although they are potentially harmful, saponins are poorly absorbed by the human body and so most pass through without harm. Saponins are quite bitter and can be found in many common foods such as some beans. Thorough cooking, and perhaps changing the cooking water once, will normally remove most of them from the food. Saponins are much more toxic to some creatures, such as fish, and hunting tribes have traditionally put large quantities of them in streams, lakes etc in order to stupefy or kill the fish[K]. Alfalfa sprouts (and especially the seeds) contain canavanine. Recent reports suggest that ingestion of this substance can cause the recurrence of systemic lupus erythematosus (an ulcerous disease of the skin) in patients where the disease had become dormant[222]. The FDA advises that children, the elderly and people with compromised immune systems should avoid eating alfalfa sprouts due to bacterial contamination. Avoid during pregnancy and lactation. Avoid for people with hormone sensitive cancer. Avoid for people with gout (due to purines). Possible antagonism of the anticoagulant effect of warfarin (due to vit K) and interfere with the immunosuppressant effect of corticosteroids [301].

kcakta Edible Parts: Leaves Oil SeedEdible Uses: Oil TeaLeaves and young shoots - raw or cooked[2, 8, 52, 145]. The leaves can also be dried for later use[55]. Very rich in vitamins[183], especially A, B and C[201], they are also a good source of protein[206]. The leaves are a rich source of vitamin K[213]. A very nutritious food in moderation, though it can trigger attacks in patients with systemic lupus erythematosus and large quantities can affect liver function and cause photosensitization[238]. A nutritional analysis is available[218]. The seed is commonly used as a sprouted seed which is added to salads[2, 20, 52], used in sandwiches etc or cooked in soups[183]. The seed is soaked in warm water for 12 hours, then kept moist in a container in a warm place to sprout. It is ready in about 4 - 6 days[244]. The seeds can also be ground into a powder and used as a mush, or mixed with cereal flours for making a nutritionally improved bread etc[183, 213, 244]. Seed yields average around 186 - 280 kilos per hectare[269]. An appetite-stimulating tea is made from the leaves[21, 55], it has a flavour somewhat reminiscent of boiled socks[144] and is slightly laxative[159].

tcanta Biomass Companion Dye Green manure Hedge Oil PaperOften grown as a green manure. It is a bit slow to establish in its first year so is generally only recommended for positions where it can remain for 2 or more years. Alfalfa is very vigorous from its second year, producing a huge bulk of material that can be cut down 2 or 3 times during the season[20, 87]. Plants are very deep rooting, descending 6 metres or more into the soil[200], and are able to fix large quantities of atmospheric nitrogen, this makes them one of the very best green manures. Plants are rather intolerant of competition from grass etc, however, and there is the drawback of needing to leave them in the soil for more

than 2 years to fully achieve their potential[K]. Alfalfa is a potentially excellent source of biomass. It is possible to produce more than 2 tonnes of protein from the leaves (suitable for human use) per hectare per year. In addition, the plant residues remaining could be used to produce the equivalent of about 10 barrels of oil per year[269]. A yellow dye is obtained from the seed[269]. The fibre of the plant has been used in making paper[269]. The seed yields about 8.5 - 11% of a drying oil. It is used in paints, varnish etc[46, 57, 61, 269]. The plant can be grown as a low dividing hedge in the vegetable garden[52, 206]. A dynamic accumulator gathering minerals or nutrients from the soil and storing them in a more bioavailable form - used as fertilizer or to improve mulch.

dwatta Anodyne Antibacterial Antiscorbutic Aperient Diuretic Emetic Febrifuge Haemostatic Hypoglycaemic Nutritive Stimulant TonicAlfalfa leaves, either fresh or dried, have traditionally been used as a nutritive tonic to stimulate the appetite and promote weight gain[222]. The plant has an oestrogenic action and could prove useful in treating problems related to menstruation and the menopause[254]. Some caution is advised in the use of this plant, however. It should not be prescribed to people with auto-immune diseases such as rheumatoid arthritis[238]. See also the notes above on toxicity. The plant is antiscorbutic, aperient, diuretic, oxyctic, haemostatic, nutritive, stimulant and tonic[55, 165, 218]. The expressed juice is emetic and is also anodyne in the treatment of gravel[218]. The plant is taken internally for debility in convalescence or anaemia, haemorrhage, menopausal complaints, pre-menstrual tension, fibroids etc[238]. A poultice of the heated leaves has been applied to the ear in the treatment of earache[257]. The leaves can be used fresh or dried[238]. The leaves are rich in vitamin K which is used medicinally to encourage the clotting of blood[213]. This is valuable in the treatment of jaundice[213]. The plant is grown commercially as a source of chlorophyll and carotene, both of which have proven health benefits[222]. The leaves also contain the anti-oxidant triclin[222]. The root is febrifuge and is also prescribed in cases of highly coloured urine[218]. Extracts of the plant are antibacterials[218]. Used for asthma, diabetes, gastrointestinal disorders (anti-ulcer) [301].

nrakta Europe - Mediterranean. More or less naturalized in Britain[17]. ksacata Waste ground, avoiding acid soils[17].

propta Pre-soak the seed for 12 hours in warm water and then sow in spring in situ. The seed can also be sown in situ in autumn[52]. Seed can be obtained that has been inoculated with Rhizobium bacteria, enabling the plant to succeed in soils where the bacteria is not already present.

nwatta Global Crop Management: Hay Staple Crop: ProteinAlfalfa is a very versatile plant that can adapt to a wide range of climatic conditions from cold temperate to warm sub-tropical.[269]. It succeeds on a wide variety of soils[52, 269], but thrives best on a rich, friable, well-drained loamy soil with loose topsoil supplied with lime[269]. It does not tolerate waterlogging and fails to grow on acid soils[269]. Grows well on light soils[206]. The plant has a deep taproot and, once established, tolerates drought and extremely dry conditions[52, 269]. Prefers a neutral fertile soil[87] but succeeds in relatively poor soils so long as the appropriate Rhizobium bacteria is present[200]. A good bee plant[46] and a food plant for many caterpillars[30]. Alfalfa is a very deep rooting plant, bringing up nutrients from deep in the soil and making them available for other plants with shallower root systems. It is a good companion plant for growing near fruit trees and grape vines so long as it is in a reasonably sunny position, but it does not grow well with onions or other members of the Allium genus[201]. Growing alfalfa encourages the growth of dandelions[201]. Alfalfa has long been cultivated for its edible seed, which can be sprouted and eaten in salads. It is also grown as a green manure and soil restorer. There are many named varieties[183]. Botanists divide the species into a number of sub-species - these are briefly described below:- *M. sativa caerulea* (Less. ex Ledeb.)Schmalh. This sub-species is likely to be of value in breeding programmes for giving cold tolerance, drought resistance and salt tolerance to alfalfa. *M. sativa falcata* (L.)Arcang. This sub-species is likely to be of value in breeding programmes for giving cold tolerance, drought and disease resistance plus salt and water-logging tolerance to alfalfa. *M. sativa sativa*. The commonly cultivated form of alfalfa. *M. sativa varia* (Martyn.)Arcang. This sub-species is likely to be of value in breed-

ing programmes for giving cold tolerance, drought resistance and high yields to alfalfa. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[200]. The plant is heat tolerant in zones 8 through 5. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a clumper with limited spread [1-2]. The root pattern is a tap root similar to a carrot going directly down [1-2].

5.1.6 Robinia pseudoacacia

Black Locust, Yellow Locust
tfo2n 4 tlin 9 cyuc 3 kcaak 4 tcan 2 dwat 25 m hkuc
htuc cyutli hgatkuyctcup hwicli hyishrasjltjnyik hpa7tli flat-
priklwis hpa7tmwatli xre7t hjonli

drutta Robinia pseudoacacia is a deciduous Tree growing to 25 m (82ft) by 15 m (49ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 3. It is in flower in June, and the seeds ripen from November to March. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. It can fix Nitrogen. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. It can tolerate atmospheric pollution.

pista All parts of the plant (except the flowers) and especially the bark, should be considered to be toxic[4, 65, 76]. The toxins are destroyed by heat[65].

kcakta Edible Parts: Flowers Oil Seed SeedpodEdible Uses: Condiment Drink OilSeed - cooked[2, 55, 61]. Oily[161]. They are boiled and used like peas[183]. After boiling the seeds lose their acid taste[213]. The seed is about 4mm long and is produced in pods up to 10cm long that contain 4 - 8 seeds[82]. A nutritional analysis is available[218]. Young seedpods - cooked[105]. The pods contain a sweetish pulp that is safe to eat and is relished by small children[201]. (This report is quite probably mistaken, having been confused with the honey locust, *Gleditsia spp*[K].) A strong, narcotic and intoxicating drink is made from the skin of the fruit[13]. Piperonal is extracted from the plant, it is used as a vanilla substitute[105]. No further details. All the above entries should be treated with some caution, see the notes at the top of the page regarding toxicity. Flowers - cooked. A fragrant aroma, they are used in making jams and pancakes[7, 183]. They can also be made into a pleasant drink[183].

tcanta Dye Essential Fibre Fodder Fuel Oil Soil stabilization WoodAgroforestry Uses: This species has been widely planted for shelterbelts and windbreaks, and is also used to produce woody biomass for energy production[1050] . It suckers freely, especially if coppiced, and can be used for stabilizing banks etc[200 , 226] . It is used in restoration and rehabilitation projects because its extensive root system holds and stabilizes the soil surface, it sprouts vigorously and prolifically, it increases soil fertility through nitrogen fixation, and it forms a leaf litter that protects the soil. Its main use has been in the rehabilitation of former surface mine sites and for erosion control, but it is also used to rehabilitate contaminated soils, depleted soils, gravel pits, and logged areas, and to stabilize railroad embankments and highway edges[1050] . The plant is often found as a pioneer on old fields, burned areas, and lands strip-mined for coal[418] . The leaves are rich in tannin and other substances which inhibit the growth of other plants[13] . The flowers are a rich source of nectar. Honey produced from this nectar is consid-

ered to be of high quality and fetches a price premium. Other Uses: A drying oil is obtained from the seed[2 , 7] . An essential oil is obtained from the flowers. Highly valued, it is used in perfumery[7 , 57 , 100] . A yellow dye is obtained from the bark[223] . Robinetin is a strong dyestuff yielding with different mordants different shades similar to those obtained with fisetin, quercetin, and myricetin; with aluminum mordant, it dyes cotton to a brown-orange shade[269] . The bark contains tannin, but not in sufficient quantity for utilization[223] . On a 10% moisture basis, the bark contains 7.2% tannin and the heartwood of young trees 5.7%[223] . The bark is used to make paper and is a substitute for silk and wool[13] . The wood is close-grained, exceedingly hard, heavy, very strong (due to a high lignin content), resists shock and is very durable in contact with the soil. It weighs 45lb per cubic foot. It does not shrink much when drying. The wood is used in shipbuilding and for making fence posts, tree nails, flooring, furniture, woodenware etc[4 , 7 , 11 , 13 , 46 , 61 , 82 , 149 , 171 , 227 , 418 , 1050] . The wood of *Robinia pseudoacacia* var. *rectissima*, the so called 'Long Island' or 'Shipmast' locust, has a greater resistance to decay and wood borers, outlasting other locust species and stakes by 50 - 100%[269] . A very good fuel[82 , 418] , but it should be used with caution because it flares up and projects sparks[226] . The wood is also used for making charcoal[418] . A dynamic accumulator gathering minerals or nutrients from the soil and storing them in a more bioavailable form - used as fertilizer or to improve mulch.

dwatta Antispasmodic Antiviral Aromatic Cancer Cholagogue Diuretic Emetic Emollient Febrifuge Laxative Narcotic Purgative TonicFebrifuge[13, 46]. The flowers are antispasmodic, aromatic, diuretic, emollient and laxative[218]. They are cooked and eaten for the treatment of eye ailments[218]. The flower is said to contain the antitumor compound benzaldehyde[269]. The inner bark and the root bark are emetic, purgative and tonic[4, 7, 218, 257]. The root bark has been chewed to induce vomiting, or held in the mouth to allay toothache[222, 257], though it is rarely if ever prescribed as a therapeutic agent in Britain[4]. The fruit is narcotic[13]. This probably refers to the seedpod. The leaves are cholagogue and emetic[7]. The leaf juice inhibits viruses[218].

nrakta Eastern N. America - Appalachian and Ozark mountain ranges. Naturalized in Britain[17]. ksacta Woods and thickets[43], especially in deep well-drained calcareous soils[149].

propta Seed - pre-soak for 48 hours in warm water and sow the seed in late winter in a cold frame[80]. A short stratification improves germination rates and time[80]. Prick out the seedlings into individual pots when they are large enough to handle and grow them on in the greenhouse for their first winter. Plant them out into their permanent positions in the following summer. Other reports say that the seed can be sown in an outdoor seedbed in spring[78, 98]. The seed stores for over 10 years[113]. Suckers taken during the dormant season.

nwatta Agroforestry Services: Nitrogen Agroforestry Services: Windbreak Fodder: Bank Industrial Crop: Biomass Management: Coppice Management: Standard Minor Global Crop Other Systems: SRCLandscape Uses:Erosion control, Firewood, Aggressive surface roots possible. Succeeds in any well-drained soil, preferring one that is not too rich[1, 200]. Succeeds in dry barren sites, tolerating drought and atmospheric pollution[60, 200]. Succeeds in a hot dry position. The plant is reported to tolerate an annual precipitation in the range of 61 to 191cm, an annual temperature in the range of 7.6 to 20.3°C and a pH of 6.0 to 7.0[269]. A fast-growing tree for the first 30 years of its life[188, 269], it can begin to flower when only 6 years old, though 10 - 12 years is more normal[229]. The flowers are a rich source of nectar and are very fragrant[82] with a vanilla-like scent[245]. The branches are brittle and very liable to wind damage[200]. When plants are grown in rich soils they produce coarse and rank growth which is even more liable to wind damage[11, 200]. The plants sucker freely and often form dense thickets, the suckers have vicious thorns[226]. There are some named varieties selected for their ornamental value[188], some of these are thornless[226]. Any pruning should be done in late summer in order to reduce the risk of bleeding[200]. The leaves are rich in tannin and other substances which inhibit the growth of other plants[13]. A very greedy tree, tending to impoverish the soil[13]. (Although a legume, I believe it does not fix atmospheric nitrogen[K]) A

make them less bitter[61, 264]. Two or three crops can usually be harvested each year[264]. There are some named varieties[183]. The roots are sometimes brought into a greenhouse in the winter and grown on there in order to produce an early crop of shoots[183]. A deep-rooted and very long-lived plant[233, 264], it dislikes root disturbance[164]. The seed is dispersed by seawater, on which it can float for several days without loss of viability[17]. A good bee plant[115]. The plant is heat tolerant in zones 9 through 6. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a clumper with limited spread [1-2]. The root pattern is a tap root similar to a carrot going directly down [1-2].

5.2.19 Pyrus bretschneideri

4 tlin 8 cyuc 4 kcaak 0 tcan 0 dwat 6 m hkuc
hmimhtut cyutli hgattcup hwicli hrasjltjnyikfrip hpa7tli flat-
priklwis hpa7tmwatli xre7t hjonli

drutta Pyrus bretschneideri is a deciduous Tree growing to 6 m (19ft 8in). See above for USDA hardiness. It is hardy to UK zone 5. It is in flower in May, and the seeds ripen from September to October. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought. It can tolerate atmospheric pollution.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[177, 200]. The fruit is up to 3cm in diameter[200]. nrakta E. Asia - N. China. ksacta Slopes, dry cold regions at elevations of 100 - 2000 metres[266].

propta Seed - best sown in a cold frame as soon as it is ripe in the autumn, it will then usually germinate in mid to late winter. Stored seed requires 8 - 10 weeks cold stratification at 1°C and should be sown as early in the year as possible[200]. Temperatures over 15 - 20°C induce a secondary dormancy in the seed[200]. Prick out the seedlings into individual pots when they are large enough to handle and grow them on in light shade in a cold frame or greenhouse for their first year. Plant them out in late spring or early summer of the following year.

nwatta Prefers a good well-drained loam in full sun[200]. Grows well in heavy clay soils. Tolerates light shade but does not fruit so well in such a position. Tolerates atmospheric pollution, excessive moisture and a range of soil types if they are moderately fertile[200]. Established plants are drought tolerant[200]. Plants are hardy to at least -15°C[200]. This species is closely related to *P. ussuriensis ovoidea*[200]. This species is commonly cultivated in northern China, preferring sunny, dry, loamy soils. It includes many important forms with excellent fruit[266]. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2].

5.2.20 Crataegus durobrivensis

Caughawaga Hawthorn
4 tlin 8 cyuc 4 kcaak 2 tcan 2 dwat 5 m hkuc
hmimhtut cyutli hgattcuphja7n hwicli hrasjltjnyikfrip hpa7tli flatpriklwisslip hpa7tmwatli xre7t hjonli

drutta *Crataegus durobrivensis* is a deciduous Shrub growing to 5 m (16ft) by 5 m (16ft). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender.

The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked. A reasonable size, it is up to 15mm in diameter[200], and is very acceptable for raw eating[K]. It is sweet and fairly juicy when fully ripe with a hint of apple in its flavour[K]. The fruit can be used in making pies, preserves, etc, and can also be dried for later use. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and small items[82].

dwatta Cardiotoxic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta North-eastern N. America. ksacta Not known in a truly wild situation, it is possibly a hybrid *C. pruinosa* x *C. suborbiculata*[43].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. A very hardy plant, tolerating temperatures down to about -18°C[202]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. Probably a natural hybrid, *C. pruinosa* x *C. suborbiculata*[43].

5.2.21 Castanea pumila

Chinquapin, Ozark chinkapin
4 tlin 8 cyuc 4 kcaak 2 tcan 1 dwat 4 m hkuc

5.2.17 *Crataegus succulenta*

Fleshy hawthorn

4 tlin 8 cyuc 4 kcaak 2 tcan 2 dwat 6 m hkuc
hmmihtut cyutli hgatyuctuphja7n hwicli hrasjlutnyikfrp
hpa7tli flatprikhwisslip hpa7tmwatli xre7t hjonli

drutta *Crataegus succulenta* is a deciduous Shrub growing to 6 m (19ft 8in). See above for USDA hardiness. It is hardy to UK zone 4 and is not frost tender. It is in flower from May to June. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[62, 101, 105]. Excellent for making jellies[183], it can also be dried for later use. A small fruit with a sweet, juicy and pulpy flesh[82, 183], it is up to 17mm in diameter[235]. Another report says that the fruit is large for a *Crataegus* species, it is about 35mm in diameter and is borne in small clusters[200]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta Eastern N. America - Nova Scotia to North Carolina, west to Montana, Colorado and Utah. ksacta Thickets, pastures and woodland edges, especially in dry or rocky soils[43].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly

open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. This species is closely related to *C. tomentosa*[11].

5.2.18 *Crambe maritima*

Sea Kale

4 tlin 8 cyuc 4 kcaak 3 tcan 0 dwat m hkuc
hmmihtut cyutli hgatyuctup hwclicl hyshrasjlutnyik hpa7tli
prikhwissom hpa7tmwatli fyfjxre7t hjonli

drutta *Crambe maritima* is a PERENNIAL growing to 0.6 m (2ft) by 0.6 m (2ft in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from June to August. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees, flies. The plant is self-fertile. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in nutritionally poor soil. Suitable pH: neutral and basic (mildly alkaline) soils and can grow in saline soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

kcakta Edible Parts: Flowers Leaves Root ShootsEdible Uses: Young leaves - raw or cooked like spinach[9, 12, 37, 52, 183]. They have a pleasant almost nutty flavour and go well in a mixed salad[K]. They also make a very pleasant cooked vegetable[K]. Older leaves develop a bitterness and are not so pleasant[K]. Young shoots - raw or cooked[2, 5, 37, 46, 183]. Available in the spring, they have a delicate nutty flavour with a crisp texture[200, 264]. The shoots are usually blanched and can be cooked like asparagus[9, 183]. When properly cooked they retain their crispness and have a very agreeable flavour, somewhat like hazelnuts but with a slight bitterness[183]. Root - cooked. Rich in starch and sugars[74]. Young flower buds - raw or cooked[264]. The flowering shoots are harvested when about 10 - 15cm long and before the flowers have opened. Used like sprouting broccoli, they are quite nice raw and delicious when lightly steamed[K].

tcanta Plants can be used for ground cover when spaced about 60cm apart each way[208].

nrakta Atlantic coast of Europe, including Britain, along the Baltic coast and around the Black Sea. ksacta Coastal sands, shingle, rocks and cliffs near the sea, often on the drift line[17].

propta Seed - sow March/April in a seedbed outdoors and either thin the plants out or move them to their permanent positions when about 10cm tall[111]. Plants can be cropped once they are more than 12 months old[264]. The young plants are very attractive to slugs so some protection will often be needed. Germination can be slow so it is best to sow the seed in pots in a cold frame[164]. Germination usually takes place in 3 - 26 weeks at 15°C[164]. Prick out the seedlings into individual pots as soon as they are large enough to handle and plant out into their permanent positions when they are at least 10cm tall. Division in spring or autumn[1, 111]. Dig up the root clump and cut off as many sections as you require, making sure they all have at least one growing point. The larger of these divisions can be planted out straight into their permanent positions, though small ones are best potted up and grown on in a cold frame until they are established. Root cuttings, 3 - 10 cm long, in spring[104]. These can be planted straight into the open ground or you can pot them up in the greenhouse and plant them out once they are growing strongly.

nwatta An easily grown plant, succeeding in a good loam and an open sunny position[1, 111, 200] but also tolerating some shade[188]. Prefers a slightly alkaline soil in a position sheltered from strong winds[200] (this report totally conflicts with the plants native habitat which is on sea shores - we have found this species to be very tolerant of strong maritime winds though it does not like cold northerlies much[K]). Tolerates poor soil and some shade[200]. Dislikes acid[1] and very stiff soils[37]. Prefers a rich, well-drained very deep sandy loam and a pH of 7[104, 264]. Established plants are very drought tolerant[190]. This species is hardy to about -20°C[187]. It grows best in a cool maritime climate[200]. Seakale is sometimes cultivated for its edible young shoots in the spring which are blanched by excluding light in order to

very good bee plant[7, 13, 20, 201]. This species is notably resistant to honey fungus[88, 200]. Special Features: North American native, Invasive, Naturalizing, All or parts of this plant are poisonous, Attracts butterflies, Fragrant flowers, Blooms are very showy. The plant is heat tolerant in zones 9 through 3. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. A sprouting standard sending up shoots from the base [1-2]. The root pattern is flat with shallow roots forming a plate near the soil surface [1-2]. The root pattern is suckering with new plants from underground runners away from the plant [1-2].

5.2 mran

5.2.1 *Crataegus pedicellata*

Scarlet Haw, Scarlet hawthorn

4 tlin 8 cyuc 5 kcaak 2 tcan 2 dwat 7 m hkuc
hmmihtut cyutli hgattcuphja7n hwicli hrasjlutnyikfrp hpa7tli
flatprikhwisslip hpa7tmwatli xre7t hjonli

drutta *Crataegus pedicellata* is a deciduous Shrub growing to 7 m (23ft) by 7 m (23ft). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from April to May, and the seeds ripen in October. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[K]. A very variable species, especially in its fruit which ranges considerable in size and quality[K]. Up to 10mm long and pear shaped, the flesh is sweet but dry and mealy[200]. Another report says that the fruit is up to 20mm in diameter[235] and we have often seen fruits this size, or even a bit larger[K]. We find the fruits of the best forms to have an excellent flavour and juicy texture when fully ripe, but with a hint of bitterness before then[K]. They are one of the later members of this genus to ripen their fruit[K]. The fruit can be used in making pies, preserves, etc, and can also be dried for later use. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta Northeastern N. America - Connecticut to Ontario, Illinois and Pennsylvania. Naturalized in Britain. ksacta Self-sown in hedges and rough ground in south-eastern England.

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take

another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Plants are hardy to at least -18°C[202]. A very variable species, it has been divided up into several different species by some botanists[82]. The sub-species *C. pedicellata gloriosa*. Sarg. has larger fruits than the type[11]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. A user in Poland says that *Crataegus pedicellata* exists in the wild in Eastern Poland and can support winter temperatures at least until -30C.

5.2.2 *Pyrus communis sativa*

Pear

4 tlin 8 cyuc 5 kcaak 3 tcan 0 dwat 5 m hkuc
hmmihtut cyutli hgattcup hwclicl hrasjlutnyikfrp hpa7tli flat-
prikhwisslip hpa7tmwatli dyatxre7t hjonli

drutta *Pyrus communis sativa* is a deciduous Tree growing to 5 m (16ft 5in). See above for USDA hardiness. It is hardy to UK zone 4 and is not frost tender. It is in flower from April to May. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought. It can tolerate atmospheric pollution.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked. The flavour ranges from rather harsh and astringent (cultivars used for making alcoholic drinks) through to soft, sweet and very juicy. The best dessert fruits have an exquisite sweet flavour, usually with a very soft flesh, whilst cooking varieties have harder less sweet flesh[K].

tcanta Dye WoodA yellow-tan dye is obtained from the leaves[106, 115]. Wood - heavy, tough, durable, fine grained, hard. Used by cabinet and instrument makers[11, 61, 100, 149]. When covered with black varnish it is an excellent ebony substitute[74].

nrakta A garden cultivar, probably derived from *P. communis*, *P. cordata* and *P. nivalis*[11]. ksacta Not known in the wild.

propta Seed - best sown in a cold frame as soon as it is ripe in the autumn, it will then usually germinate in mid to late winter. Stored seed requires 8 - 10 weeks cold stratification at 1 °C and should be sown as early in the year as possible[200]. Temperatures over 15 - 20°C induce a secondary dormancy in the seed[200]. Prick out the seedlings into individual pots when they are large enough to handle and grow

them on in light shade in a cold frame or greenhouse for their first year. Plant them out in late spring or early summer of the following year. The seed of pear cultivars will not usually breed true to type.

nwatta Prefers a good well-drained loam in full sun[200]. Grows well in heavy clay soils[200]. Tolerates light shade but does not fruit so well in such a position. Tolerates atmospheric pollution, excessive moisture and a range of soil types if they are moderately fertile, though plants can become chlorotic on very alkaline soils[200]. Established plants are drought tolerant[200]. Very hardy, tolerating temperatures down to below -15°C[200]. Widely cultivated for its edible fruit in temperate areas, there are many named varieties that can provide fruit from late July to April or May of the following year. This is the collective name for all the pear cultivars that have been derived from *P. communis*, probably through hybridization with *P. cordata* and *P. nivalis*. Where space is at a premium, or at the limits of their climatic range, pears can be grown against a wall. Most cultivars will grow well against a sunny south or west facing wall but, because of their relatively early flowering, they are not really suitable for north or east facing walls[219]. Most cultivars are not self-fertile and a number of cultivars have incompatible pollen, so care must be taken to ensure the provision of a suitable pollen partner[200]. Trees grow less well in grass, root secretions from the grass inhibiting the root growth of the pear[201]. In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is branching: a heart root, dividing from the crown into several primary roots going down and out [2-1].

5.2.3 *Chenopodium* spp.

Perennial quinoa

4 tlin 10 cyuc 5 kcaak 2 tcan 3 dwat 2 m hkuc
htut cyuti hgatkuyctcup hwicli hyhshrasljutnyik hpa7tli frusflatprikliwssilphsom hpa7tmwatli hjonli

drutta *Chenopodium* spp. is a PERENNIAL growing to 2 m (6ft) by 0.3 m (1ft in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 4. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid, very alkaline and saline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcasta The leaves and seeds of all members of this genus are more or less edible. However, many of the species in this genus contain saponins, though usually in quantities too small to do any harm. Although toxic, saponins are poorly absorbed by the body and most pass straight through without any problem. They are also broken down to a large extent in the cooking process. Saponins are found in many foods, such as some beans. Saponins are much more toxic to some creatures, such as fish, and hunting tribes have traditionally put large quantities of them in streams, lakes etc in order to stupefy or kill the fish[K]. The plants also contain some oxalic acid, which in large quantities can lock up some of the nutrients in the food. However, even considering this, they are very nutritious vegetables in reasonable quantities. Cooking the plants will reduce their content of oxalic acid. People with a tendency to rheumatism, arthritis, gout, kidney stones or hyperacidity should take especial caution if including this plant in their diet since it can aggravate their condition[238].

kcaakta Edible Parts: Leaves SeedEdible Uses: Edible portion: Leaves, Seeds, Vegetable. Seed - cooked[1 , 2 , 4 , 27 , 57 , 97]. A pleasant mild flavour, the seed can absorb the flavour of other foods that are cooked with it and so it can be used in a wide variety of ways[K]. The protein is good quality because of its amino acid balance. It has 2-6% more protein and better amino acid balance than wheat. It should be thoroughly soaked and rinsed to remove a coating of saponins on the seed surface. The seed can be used in all the ways that rice is used, as a savoury or sweet dish. It can also be ground into a powder and used as a porridge[37 , 183]. The seed can also be sprouted and used in salads[183] though many people find the sprouted seed unpleasant[K]. The seed contains a very high quality protein that is

rich in the amino acids lysine, methionine and cystine, it has the same biological value as milk[196]. The seed contains about 38% carbohydrate, 19% protein, 5% fat, 5% sugar[171]. Leaves - raw or cooked[2 , 4 , 37 , 57]. The young leaves are cooked like spinach[183]. It is best not to eat large quantities of the raw leaves, see the notes above on toxicity.

tcanta Gold/green dyes can be obtained from the whole plant[168]. Saponins on the seed can be used as a bird and insect deterrent by spraying them on growing plants[141]. The saponins are obtained by saving the soak-water used when preparing the seed for eating. The spray remains effective for a few weeks or until washed off by rain[K].

dwatta Some medical properties. See individual plants for example: *Chenopodium* album, *Chenopodium* ambrosioides, *Chenopodium* ambrosioides anthelminticum

nrakta *Chenopodium* is a genus of numerous species of perennial or annual herbaceous flowering plants known as the goosefoots, which occur almost anywhere in the world including Africa, Australasia, North America, Europe, and Oceania, (even, apparently in Antarctica). ksacta Varied depending on species.

propta Seed - sow April in situ. The seed can either be sown broadcast or in rows about 25cm apart, thinning the plants to about every 10cm. Germination is rapid, even in fairly dry conditions. Be careful not to weed out the seedlings because they look very similar to some common garden weeds[K].

nwatta Hypothetical Crop Management: StandardClimate: cold temperate to subtropical, tropical highlands. Humidity: humid. A cultivated food crop. A plant of higher elevations in the tropics, it has also been successfully grown in the temperate and subtropical zones. Plants tolerate light frosts at any stage in their development except when flowering[57 , 196]. An easily grown plant, it requires a rich moist well-drained soil and a warm position if it is to do really well, but it also succeeds in less than optimum conditions[27 , 37]. Tolerates a pH range from 6 to 8.5 and moderate soil salinity[196]. Plants are quite wind resistant[K]. Plants are drought tolerant once they are established[196]. The plant is day-length sensitive and many varieties fail to flower properly away from equatorial regions, however those varieties coming from the south of its range in Chile are more likely to do well in Britain[196]. Different cultivars take from 90 - 220 days from seed sowing to harvest[196]. Yields as high as 5 tonnes per hectare have been recorded in the Andes, which compares favourably with wheat in that area[196]. Young plants look remarkably like the common garden weed fat hen (*Chenopodium* album). Be careful not to weed the seedlings out in error[K]. The seed is not attacked by birds because it has a coating of bitter tasting saponins[141 , K]. These saponins are very easily removed by soaking the seed overnight and then thoroughly rinsing it until there is no sign of any soapiness in the water. The seed itself is very easy to harvest by hand on a small scale and is usually ripe in August. Cut down the plants when the first ripe seeds are falling easily from the flower head, lay out the stems on a sheet in a warm dry position for a few days and then simply beat the stems against a wall or some other surface, the seed will fall out easily if it is fully ripe and then merely requires winnowing to get rid of the chaff. Carbon Farming Solutions - Cultivation: hypothetical. Management: standard (Describes the non-destructive management systems that are used in cultivation) [1-1].

5.2.4 *Allium tuberosum*

Garlic Chives, Chinese chives, Oriental Chives,

4 tlin 8 cyuc 5 kcaak 3 tcan 2 dwat 0.3 m hkuc
htut cyuti hgatkuyctcup hwicli hrasljutnyik hpa7tli flatprikliwssilip hpa7tmwatli xre7t hjonli

drutta *Allium tuberosum* is a BULB growing to 0.3 m (1ft) by 0.3 m (1ft in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 7 and is not frost tender. It is in flower from August to September, and the seeds ripen from September to October. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees, insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

nwatta Landscape Uses:Border, Massing, Specimen. Succeeds in a well-drained fertile soil in full sun[11, 200]. Tolerates poor soils[169, 200]. Succeeds in dry soils and is drought resistant once it is established[169]. A fairly wind hardy plant, though the branches are brittle and can be broken off in very high winds[200, K]. A very hardy plant, when fully dormant it can tolerate temperatures down to at least -25°C[200]. However, the young growth in spring can be damaged by late frosts. A fast growing but short-lived tree[159], it can sucker freely, forming thickets and becoming quite anti-social when grown in small areas[11]. Single-stem plants are short-lived in cultivation, but if the plants are coppiced regularly and allowed to form thickets, then they will live longer and also be more ornamental with larger leaves[238]. Any coppicing is best carried out in early spring[238]. A very ornamental plant, there are some named varieties[182]. It is susceptible to coral spot fungus[11] but is notably resistant to honey fungus[88, 200]. It transplants easily[169]. This is a very good bee plant, the flowers producing an abundance of pollen and nectar[226]. There is some doubt over the validity of this name and the earlier *R. hirta*. [L.] has been proposed as the correct name. However, it seems likely that *R. typhina* will be retained because it is so well known[214]. This species is closely related to and hybridizes with *R. glabra*[101]. Many of the species in this genus are highly toxic and can also cause severe irritation to the skin of some people, whilst other species such as this one are not poisonous. It is relatively simple to distinguish which is which, the poisonous species have axillary panicles and smooth fruits whilst non-poisonous species have compound terminal panicles and fruits covered with acid crimson hairs[1, 4]. The toxic species are sometimes separated into their own genus, *Toxicodendron*, by some botanists[200]. Dioecious. Male and female plants must be grown if seed is required. Special Features: Attracts birds, North American native, Attractive flowers or blooms. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a running thicket former forming a colony from shoots away from the crown spreading indefinitely [1-2]. The root pattern is flat with shallow roots forming a plate near the soil surface [1-2]. The root pattern is suckering with new plants from underground runners away from the plant [1-2].

5.2.16 *Crataegus mollis*

Red Haw, Downy hawthorn

4 tlin 8 cyuc 4 kcaak 2 tcan 2 dwat m hkuc
hmimhtut cyuti hgattcuphja7n hwicli hrasljutnyikfrp hpa7tli flatprikliwssilip hpa7tmwatli xre7t hjonli

drutta *Crataegus mollis* is a deciduous Tree growing to 9 m (29ft) by 12 m (39ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from May to June, and the seeds ripen in September. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcaakta Edible Parts: FruitEdible Uses: TeaFruit - raw or cooked[22, 46, 62, 101, 183]. Sub-acid, dry and mealy[82, 227]. The fruit is also used for making jellies and preserves[61, 95, 183]. Fairly large, it is about 20 - 25mm in diameter[200], with a thick flesh[229]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K]. A tea-like beverage can be made from the twigs[257].

tcanta Hedge HedgeThe plant is tolerant of being trimmed and will even resprout if cut back into very old wood. It can be used as a hedge[50]. Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers

of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta Eastern and Central N. America - Ontario to Alabama, west to Oklahoma. ksacta Open woods, usually in alluvial or fertile soils[43]. Frequently found in limestone soils[229].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta Landscape Uses:Espalier, Pollard, Specimen, Street tree. A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. A very hardy plant, tolerating temperatures down to at least -18°C[202]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. A very ornamental plant[11], the branches are almost thornless[229]. A rather variable species, it has been separated into several different species by some botanists[82]. This species is much confused with *C. chrysocarpa*[11] and with *C. coccinea*[50]. It is very closely related to *C. submollis*, differing in having 20 stamens to a flower (as compared to 10 in *C. submollis*)[202]. Special Features: North American native, Attractive flowers or blooms. The plant is heat tolerant in zones 6 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (20 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2]. The root pattern is a tap root similar to a carrot going directly down [1-2].

acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta North-eastern N. America - Quebec to Ontario, Massachusetts and New York. ksacta Wooded hillsides and open fertile ground[43]. Rich damp hillsides and the borders of woods and roads[82].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Plants are hardy to about -18°C[202]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. This species is sometimes confused with *C. coccinea*[50]. It is also very close to *C. mollis*, differing in having 10 stamens to a flower (as compared to 20 in *C. mollis*)[202]. It is considered to be part of *C. mollis* by some botanists[229].

5.2.15 *Rhus typhina*

Stag's Horn Sumach, Velvet Sumac, Staghorn Sumac

4 tlin 8 cyuc 4 kcaak 3 tcan 2 dwat 6 m hkuc htut cytuli hgatykuycrup hwilci hyishrasjnutnyik hpa7tli flat-prikjkwis hpa7tmwattli nyanhjen hjonli

drutta *Rhus typhina* is a deciduous Shrub growing to 6 m (19ft) by 6 m (19ft) at a fast rate. See above for USDA hardness. It is hardy to UK zone 3 and is not frost tender. It is in flower from June to August, and the seeds ripen from October to December. The species is dioecious (individual flowers are either male or female, but only one sex is to be found on any one plant so both male and female plants must be grown if seed is required), and is pollinated by Bees. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista There are some suggestions that the sap of this species can cause a skin rash in susceptible people, but this has not been substantiated. See also notes in 'Cultivation Details'.

koakta Edible Parts: Fruit OilEdible Uses: Drink Oil-Fruit - cooked[22, 62]. A very sour flavour, they are used in pies[183]. The fruit is rather small and with very little flesh, but it is produced in quite large clusters and so is easily harvested. When soaked for 10 - 30 minutes in hot or cold water it makes a very refreshing lemonade-like drink (without any fizz of course)[55, 85, 95, 101, 102, 183]. The mixture should not be boiled since this will release tannic acids and make the drink astringent.

tcanta Dye Hedge Hedge Ink Mordant Musical Oil Pipes Shelterbelt Soil stabilization Tannin WoodThe leaves are rich in tannin, up to 48% has been obtained in a controlled plantation[223]. They can be collected as they fall in the autumn and used as a brown dye or as a mordant[169, 171]. The bark, especially the root bark, and the fruits are also very rich in tannin[82, 159, 169]. A yellow dye can be obtained from the roots[257]. An orange dye can be obtained from the inner bark and central pith of the stem, mixed with bloodroot (*Sanguinaria canadensis*)[257]. A black ink can be made by boiling the leaves and the fruit[226]. An oil is extracted from the seeds[4]. It attains a tallow-like consistency on standing and is used to make candles. These burn brilliantly, though they emit a pungent smoke[4]. Pipes are made from the young shoots and are used for drawing the sap of sugar maples (*Acer spp*)[82]. They are also used as flutes[159]. The plant has an extensive root system and is planted as a windbreak screen and to prevent soil erosion[200]. Wood - soft, light, brittle, coarse grained[82, 101]. It weighs 27lb per cubic foot[235]. Of no commercial value, though it is sometimes used as a rough construction wood or is employed in turning[226].

dwatta Antihæmorrhoidal Antiseptic Astringent Blood purifier Diuretic Emetic Galactogogue Poultice Stomachic Tonic VD WartsStag's horn sumach was often employed medicinally by several native North American Indian tribes who valued it especially for its astringent qualities[257]. It is little used in modern herbalism. Some caution is advised in the use of the leaves and stems of this plant, see the notes above on toxicity. The bark is antiseptic, astringent, galactogogue and tonic[222, 257]. An infusion is used in the treatment of diarrhoea, fevers, piles, general debility, uterine prolapse etc[213, 222]. An infusion is also said to greatly increase the milk flow of a nursing mother - small pieces of the wood were also eaten for this purpose[257]. The inner bark is said to be a valuable remedy for piles[257]. The roots are astringent, blood purifier, diuretic and emetic[222]. An infusion of the roots, combined with purple coneflower (*Echinacea purpurea*) has been used in the treatment of venereal disease[257]. A poultice of the roots has been used to treat boils[257]. The leaves are astringent. They have been used in the treatment of asthma, diarrhoea and stomatitis[222]. An infusion of the fruits has been used as a tonic to improve the appetite and as a treatment for diarrhoea[257]. The berries are astringent and blood purifier[257]. They were chewed as a remedy for bed-wetting[22, 257]. A tea made from the berries has been used to treat sore throats[213]. The flowers are astringent and stomachic. An infusion has been used to treat stomach pains[257]. The sap has been applied externally as a treatment of warts[226]. Some caution is advised here since the sap can cause a rash on many people[K].

nrakta Eastern N. America - New Brunswick to the southern Appalachian mountains and west to Iowa. ksacta Usually found in upland sites on rich soils, but it is also found in gravel and sandy nutrient-poor soils. It grows by streams and swamps, along roadsides, railway embankments and edges of woods[229].

propta Seed - best sown in a cold frame as soon as it is ripe. Pre-soak the seed for 24 hours in hot water (starting at a temperature of 80 - 90c and allowing it to cool) prior to sowing in order to leach out any germination inhibitors[200]. This soak water can be drunk and has a delicious lemon-flavour. The stored seed also needs hot water treatment and can be sown in early spring in a cold frame[200]. When they are large enough to handle, prick the seedlings out into individual pots and grow them on in the greenhouse for their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. Cuttings of half-ripe wood, 10cm with a heel, July/August in a frame[200]. Root cuttings 4cm long taken in December and potted up vertically in a greenhouse. Good percentage[78, 200]. Suckers in late autumn to winter[200].

pcista Although no individual reports regarding this species have been seen, there have been cases of poisoning caused by the consumption, in very large quantities and by some mammals, of certain members of this genus. Dogs seem to be particularly susceptible[76].

ksacta Edible Parts: Flowers Leaves Oil RootEdible Uses: OilLeaves - raw or cooked[1, 15, 46, 52, 88]. A mild flavour, somewhat like a cross between garlic and chives[K], they are delicious in salads[183]. The flavour is destroyed by lengthy cooking[238]. The leaves are available from early spring until late in the autumn[K]. They contain about 2.6% protein, 0.6% fat, 2.4% carbohydrate, 0.95% ash. They also contain small amounts of vitamins A, B1 and C[179]. The rather small bulbs are about 10mm in diameter and are produced in clusters on a short rhizome[200]. Flowers and flower buds - raw or cooked[52, 88, 183]. A delicious flavouring and pretty garnish for the autumn salad bowl[K]. Root - raw or cooked. An edible oil is obtained from the seed[183].

tcanta Oil RepellentThe juice of the plant is used as a moth repellent. The whole plant is said to repel insects and moles[20].

dwatta Antibacterial Cardiac Digestive Stomachic Tonic UrinaryThe whole plant is antibacterial, cardiac, depurative, digestive, stimulant, stomachic and tonic[61, 174, 218]. It is an anti-emetic herb that improves kidney function[238]. It is used internally to treat urinary incontinence, kidney and bladder weaknesses etc[238]. The seed is carminative and stomachic[218]. They are used in India in the treatment of spermatorrhoea[240]. The leaves and the bulbs are applied to bites, cuts and wounds[218].

nrakta E. Asia? Original habitat is obscure. ksacta Not known in a truly wild situation.

propta Seed - sow spring in a cold frame. The seed has a fairly short viability and should not be used when more than 1 year old[206]. Prick out the seedlings into individual pots when they are large enough to handle - if you want to produce clumps more quickly then put three plants in each pot. Plant out in late summer if the plants have developed sufficiently, otherwise plant them out the following spring. Division in early spring. Very easy, the plants divide successfully at almost any time of the year. The divisions can be planted straight out into their permanent positions if required.

nwatta Landscape Uses:Border, Container, Ground cover, Rock garden. An easily grown plant[203], it prefers a sunny position in a rich moist but well-drained soil[1, 88]. Tolerates most soils[52, 88], including clay[203, 206]. Tolerant of dry soils, established plants also resist drought[190]. Tolerates some shade, even in N.W. England[203]. The roots penetrate up to 50cm into the soil[206]. Tolerates a pH in the range 5.2 to 8.3. This plant succeeds in temperate and tropical climates[90]. It appears to be fully hardy in Britain[90]. Plants tolerate 40 degrees of frost in Manchuria (the report does not say if this is fahrenheit or centigrade)[206]. Plants remain green until temperatures fall below 4 - 5°C, they come into new growth in spring when temperatures go above 2 - 3°C[206]. Often cultivated for its edible leaves and bulb in the Orient, there are many named varieties[90, 183]. There are two main types of cultivar, one is grown for its leaves and the other for its flowering stem[200, 206]. This species is becoming increasingly grown as a garden vegetable in Britain[K]. A very ornamental plant, it grows well as an edging plant in the flower garden[K]. Closely related to *A. ramosum*[203]. The bulbs should be planted fairly deeply[1]. Grows well with most plants, especially roses, carrots, beet and chamomile, but it inhibits the growth of legumes[18, 20, 54]. This plant is a bad companion for alfalfa, each species negatively affecting the other[201]. Members of this genus are rarely if ever troubled by browsing deer[233]. Special Features: Edible, Fragrant foliage, Not North American native, Invasive, Suitable for cut flowers, Suitable for dried flowers, Fragrant flowers. The plant is heat tolerant in zones 9 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the

habit and root pattern is also useful and given here if available. The plant growth habit is a clumper with limited spread [1-2]. The root pattern is a bulb.

5.2.5 *Crataegus missouriensis*

4 tlin 8 cyuc 5 kcaak 0 tcan 2 dwat m hkuc hmimhtut cytuli hgattcuphja7n hwilci hrasjnutnyikfrip hpa7tli flatprikjkwis hpa7tmwattli xre7t hjonli

drutta *Crataegus missouriensis* is a deciduous Tree growing to 6 m (19ft 8in). See above for USDA hardness. It is hardy to UK zone 5 and is not frost tender. The seeds ripen in September. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

ksacta Edible Parts: FruitEdible Uses: Fruit - raw or cooked. The size of a large cherry, the flesh is sweet, soft and fairly juicy[K]. The fruit is only about 10mm thick according to another report[235]. The fruit ripens in mid to late September in southern Britain[K], it makes a delicious dessert fruit and can also be used in making pies, preserves etc[K]. The fruit can be dried for later use. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles,allets and other small items[82].

dwatta Cardiotonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta South-eastern N. America - Virginia to North Carolina and Missouri. ksacta Rocky bluffs and river banks[235].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. This species has a good potential as a fruit crop in Britain. It regularly produces heavy crops of high quality, the tree is very easily grown and is little troubled by pests or diseases. It also requires very little attention, once the trees are established virtually the only work

needed is to harvest the fruit each year[K]. A plant growing at Hillier Arboretum was about 3 metres tall (with a trunk 2 metres long) and 3 metres wide, it was fruiting well in 1993 and 1994[K]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

5.2.6 Castanea species

Chestnut Hybrids

4 tlin 9 cyuc 4 kcaak 4 tcan 2 dwat 30 m hkuc
hmmihtut cyutli hgactyucup hwicli hyhshrasljutnyik hpa7ti
flatprik hpa7tmwatli hjonli

drutta Castanea species is a deciduous Tree growing to 30 m (98ft) by 25 m (82ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 4. It is in flower in July, and the seeds ripen in October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought.

ksakta Edible Parts: SeedEdible Uses: Seed - raw or cooked[183]. Eaten raw, there is a distinct astringency, especially if the fleshy inner skin beneath the outer shell of the seed is not removed[K]. When cooked, however, and especially when baked, the seed becomes much sweeter and has a floury texture[K]. It then makes an excellent food and can be used as a staple food in much the same way as potatoes or cereals[K]. The seed is low in fats and oils but high in carbohydrates[183]. Carbon Farming Solutions - Staple Crop: balanced carb (The term staple crop typically refers to a food that is eaten routinely and accounts for a dominant part of people's diets in a particular region of the world) [1-1].

tcanta The bark, leaves, wood and seed husks all contain tannin. Wood - hard, strong, light. Carbon Farming Solutions - Industrial Crop: biomass, tannin (Crops growing for non-food uses. Industrial crops provide resources in three main categories: materials, chemicals, and energy. Traditional materials include lumber and thatch, paper and cardboard, and textiles) [1-1]. Other Systems: woody agriculture.

dwatta Some see for example the individual entries for Castanea dentata, Castanea mollissima, Castanea pumila
nrakta Hybrid origin ksakta Not known in a wild situation.

propta Seed - where possible sow the seed as soon as it is ripe in a cold frame or in a seed bed outdoors[78]. The seed must be protected from mice and squirrels. The seed has a short viability and must not be allowed to become dry. It can be stored in a cool place, such as the salad compartment of a fridge, for a few months if it is kept moist, but check regularly for signs of germination. The seed should germinate in late winter or early spring. If sown in an outdoor seedbed, the plants can be left in situ for 1 - 2 years before planting them out in their permanent positions. If grown in pots, the plants can be put out into their permanent positions in the summer or autumn, making sure to give them some protection from the cold in their first winter[K]. These plants are of hybrid origin, so seed is unlikely to breed true[K].

nwatta Industrial Crop: Biomass Industrial Crop: Tannin Management: Coppice Management: Standard New Crop Other Systems: Woody agriculture Staple Crop: Balanced carbClimate: cold to warm temperate. Humidity: humid. This record includes a number of garden hybrids involving various species - the origin of each hybrid will be mentioned in the individual cultivar notes. To date, these different hybrids have not been assigned their own specific name. The following notes are based on the general needs of the genus. Prefers a good well-drained slightly acid loam but succeeds in dry soils[1, 11, 200]. Once established, it is very drought tolerant[1, 11, 200]. Very tolerant of highly acid, infertile dry sands[200]. Averse to calcareous soils but

succeeds on harder limestones[11, 200]. An excellent soil-enriching understorey in pine forests[200]. Flowers are produced on wood of the current year's growth[229]. Plants are fairly self-sterile[200]. They hybridize freely with other members of this genus[200]. Plants in this genus are notably resistant to honey fungus[200]. Carbon Farming Solutions - Cultivation: new crop. Management: standard, coppice (Describes the non-destructive management systems that are used in cultivation) [1-1].

5.2.7 Quercus robur

Pedunculate Oak, English oak

4 tlin 8 cyuc 4 kcaak 5 tcan 3 dwat 30 m hkuc
hmmihtut cyutli hgactyucup hpa7n hwicli jlutnyikfrip hpa7ti flat-
prikliwis hpa7tmwatli hjonli

drutta Quercus robur is a deciduous Tree growing to 30 m (98ft) by 30 m (98ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 4. It is in flower from April to May, and the seeds ripen from September to October. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. It is noted for attracting wildlife. Suitable for: medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista Possible digestive complaints. May delay absorption of alkaloids and other alkaline drugs [301].

ksakta Edible Parts: SeedEdible Uses: Coffee Gum-Seed - cooked[2, 5, 8, 13]. Nourishing but indigestible[4]. Chopped and roasted, the seed is used as an almond substitute[8]. It can be dried, ground into a powder and used as a thickening in stews etc or mixed with cereals for making bread[183]. The seed contains bitter tannins, these can be leached out by thoroughly washing the seed in running water though many minerals will also be lost[63]. Either the whole seed can be used or the seed can be dried and ground it into a powder. It can take several days or even weeks to properly leach whole seeds, one method was to wrap them in a cloth bag and place them in a stream. Leaching the powder is quicker. A simple taste test can tell when the tannin has been leached. The traditional method of preparing the seed was to bury it in boggy ground overwinter. The germinating seed was dug up in the spring when it would have lost most of its astringency. The roasted seed is a coffee substitute[21, 61]. An edible gum is obtained from the bark[177]. Another report says that an edible manna is obtained from the plant and that it is used instead of butter in cooking[183]. This report probably refers to the gum[K].

tcanta Basketry Charcoal Compost Fuel Gum Ink Repellent Tannin WoodA mulch of the leaves repels slugs, grubs etc, though fresh leaves should not be used as these can inhibit plant growth[20, 201]. The bark is an ingredient of 'Quick Return' herbal compost activator[32]. This is a dried and powdered mixture of several herbs that can be added to a compost heap in order to speed up bacterial activity and thus shorten the time needed to make the compost[K]. The bark is very rich in calcium[18]. Oak galls are excrecences that are sometimes produced in great numbers on the tree and are caused by the activity of the larvae of different insects. The insects live inside these galls, obtaining their nutrient therein. When the insect pupates and leaves, the gall can be used as a rich source of tannin, that can also be used as a dyestuff[4]. A black dye and an excellent long-lasting ink is made from the oak galls, mixed with salts of iron[4, 7, 66]. The colour is not very durable[4]. When mixed with alum, the dye is brown and with salts of tin it is yellow[4]. Trees can be coppiced to provide material for basket making, fuel, construction etc[23]. The wood is a source of tar, quaiacol, acetic acid, creosote and tannin[123]. Tannin is extracted commercially from the bark and is also found in the leaves[223]. On a 10% moisture basis, the bark contains 11.6% tannin and the wood 9.2%[223]. The bark strips easily from the wood in April and May[4]. A purplish dye is obtained from an infusion of the bark with a small quantity of copperas[4]. It is not bright, but is said to be durable[4]. Wood - hard, tough, durable even under water - highly valued

another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

5.2.13 Crataegus acclivis

4 tlin 8 cyuc 4 kcaak 0 tcan 2 dwat 8 m hkuc
hmmihtut cyutli hgactyucup hpa7n hwicli hrasljutnyikfrip hpa7ti
flatprikliwsslip hpa7tmwatli xre7t hjonli

drutta Crataegus acclivis is a deciduous Tree growing to 8 m (26ft) by 7 m (23ft). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from April to May, and the seeds ripen in September. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

ksakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[K]. The fruit ripens in early September, it is about 18mm long with a pleasantly sweet juicy flesh and makes an excellent dessert fruit[K]. The fruit contains up to 5 seeds in the centre, these usually stick together and so the effect is like eating a cherry with its single large seed[K].

dwatta Cardiac HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta North-eastern N. America - New York to the borders of southern Canada. ksakta Banks of streams and steep gorges[235].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting

the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Plants are hardy to at least -18°C[202]. We have very little specific information on this plant, and it is regarded as no more than a form of *C. pedicellata* by most botanists[235]. However, a tree seen at Kew in early September 1997 had a good crop of almost ripe fruit. This fruit was more elongated than *C. pedicellata* and was also ripe about 4 weeks before that species[K]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

5.2.14 Crataegus submollis

Quebec Hawthorn

4 tlin 8 cyuc 4 kcaak 0 tcan 2 dwat 7 m hkuc
hmmihtut cyutli hgactyucup hpa7n hwicli hrasljutnyikfrip hpa7ti
flatprikliwsslip hpa7tmwatli xre7t hjonli

drutta Crataegus submollis is a deciduous Tree growing to 7 m (23ft) by 7 m (23ft). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower in June, and the seeds ripen in September. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

ksakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[105, 161]. Sub-acid, dry and mealy[82]. Our experience has been that the fruit is sweet and somewhat juicy, it has a thick flesh with a nice flavour and makes an acceptable dessert fruit[K]. The fruit can also be used in making pies, preserves etc, and can be dried for later use[257]. It is about 20mm in diameter, is borne in large clusters and is easily harvested[K]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Hedge HedgePlants are very tolerant of trimming and will soon resprout even if cut back into very old wood. They can be used as a hedge[50]. Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as

Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2].

5.2.11 Crataegus holmesiana

Holmes' hawthorn
4 tin 8 cyuc 4 kcaak 0 tcan 2 dwat 10 m hkuc
hmmihhut cyutli hgattcuphja7n hwicli hraşljutnykrip hpa7tli flatprikwissiip hpa7tmwati xre7t hjonli

drutta Crataegus holmesiana is a deciduous Tree growing to 10 m (32ft) by 8 m (26ft). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower in May, and the seeds ripen from August to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kaakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked. An excellent dessert fruit, it has an acid yet sweet flavour, is juicy but with a mealy texture, it makes very pleasant eating[K]. Some forms have fruits with a disagreeable flavour[82]. The fruit can also be used in making pies, preserves etc, and can be dried for later use. The fruit is about 10mm in diameter[200]. A specimen at Cambridge Botanical garden has fruits up to 20mm in diameter[K]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiac HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta Eastern N. America - Ontario to Maine, south to New York and Pennsylvania. ksacta Rich moist hillsides and the borders of streams and swamps[82].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit,

they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hawthorns in general hybridize freely with other members of the genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. A very ornamental plant[11].

5.2.12 Crataegus douglasii

Black Hawthorn

4 tin 8 cyuc 4 kcaak 0 tcan 2 dwat 9 m hkuc
hmmihhut cyutli hgattcuphja7n hwicli hraşljutnykrip hpa7tli flatprikwissiip hpa7tmwati xre7t hjonli

drutta Crataegus douglasii is a deciduous Tree growing to 9 m (29ft 6in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower in May, and the seeds ripen in September. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kaakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[2, 3, 95, 99, 101]. A very pleasant flavour with a sweet and juicy succulent flesh[46, 82, K], it makes an excellent dessert fruit and can be eaten in quantity[K]. The fruit can also be used for making pies, preserves etc, and can be dried for later use[183]. The fruit is about 8mm in diameter and is borne in small clusters[200]. The fruits I have eaten have been considerably larger than this[K]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Needles WoodThe spines on the branches are used as needles for lancing boils, removing splinters etc[99]. Wood - close-grained, heavy, hard and tough. Used for tool handles etc[82, 99, 101].

dwatta Antirheumatic Astringent Cardiotonic Dysentery Hypotensive Poulitce StomachicAn infusion of the shoots has been used to treat diarrhoea in children and sores in babies mouths[257]. A poultice of the chewed leaves has been applied to swellings[257]. An infusion of the bark has been used in the treatment of diarrhoea and dysentery[257]. An infusion of the sapwood, bark and roots has been used as a stomach medicine[257]. The thorns have been used as a treatment for arthritis[257]. The point of the thorn was used to pierce an area affected by arthritic pain. The other end of the thorn was ignited and burned down to the point buried into the skin. This treatment was very painful but it was said that after a scab had formed and disappeared, the arthritic pain had also disappeared[257]. The thorns have been used as probes for boils and ulcers[257]. Although no other specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta Western N. America - British Columbia to Michigan, south to California. ksacta Open woods, banks of mountain streams and on rocky banks[43, 82].

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take

for furniture, construction etc[4, 13, 61, 66]. It is also a good fuel[6] and charcoal[61].

dwatta Antiseptic Astringent Bach Decongestant Dysentery Haemostatic TonicThe oak tree has a long history of medicinal use. It is anti-inflammatory, antiseptic, astringent, decongestant, haemostatic and tonic[4, 7, 9, 13, 21, 165]. The bark is the part of the plant that is most commonly used[4], though other parts such as the galls, seeds and seed cups are also sometimes used[7]. A decoction of the bark is useful in the treatment of chronic diarrhoea, dysentery, intermittent fevers, haemorrhages etc[4]. Externally, it is used to bathe wounds, skin eruptions, sweaty feet, piles etc[9]. It is also used as a vaginal douche for genital inflammations and discharge, and also as a wash for throat and mouth infections[9]. The bark is harvested from branches 5 - 12 years old, and is dried for later use[9]. Any galls produced on the tree are strongly astringent and can be used in the treatment of haemorrhages, chronic diarrhoea, dysentery etc[4]. The plant is used in Bach flower remedies - the keywords for prescribing it are 'Despondency', 'Despair, but never ceasing effort'[209]. A homeopathic remedy is made from the bark. It is used in the treatment of disorders of the spleen and gall bladder[9]. The German Commission E Monographs, a therapeutic guide to herbal medicine, approve *Quercus robur* Pedunculate Oak for coughs/bronchitis, diarrhoea, inflammation of mouth and pharynx, inflammation of the skin (see [302] for critics of commission E).

nrakta Europe, including Britain, from Scandinavia south and east to Spain, the Urals and Crimea. ksacta Often the dominant woodland tree, especially on clay soils and in the eastern half of Britain, but avoiding acid peat and shallow limestone soils[17].

propta Seed - it quickly loses viability if it is allowed to dry out. It can be stored moist and cool overwinter but is best sown as soon as it is ripe in an outdoor seed bed, though it must be protected from mice, squirrels etc. Small quantities of seed can be sown in deep pots in a cold frame. Plants produce a deep taproot and need to be planted out into their permanent positions as soon as possible, in fact seed sown in situ will produce the best trees[11]. Trees should not be left in a nursery bed for more than 2 growing seasons without being moved or they will transplant very badly.

nwatta Prefers a good deep fertile loam which can be on the stiff side[11]. Young plants tolerate reasonable levels of side shade[200]. Succeeds in heavy clay soils[13] and in wet soils so long as the ground is not water-logged for long periods[186]. Dislikes dry or shallow soils but is otherwise drought tolerant once it is established[186]. Tolerant of exposed sites though it dislikes salt-laden winds[186]. The oak is a very important timber tree in Britain, it is also a very important food plant for the caterpillars of many species of butterfly[30], there are 284 insect species associated with this tree[24]. It has often been coppiced or pollarded for its wood in the past[23], though this should not be done too frequently[186], about once every 50 years is the average. The tree flowers on new growth produced in spring, the seed ripening in its first year[200, 229]. Older trees have a thick corky bark and this can protect them from forest fires, young trees will often regenerate from the base if cut down or killed back by a fire[186]. Intolerant of root disturbance, trees should be planted in their permanent positions whilst young[11]. Hybridizes freely with other members of the genus[200]. Immune to attacks by the tortix moth[11]. This species is notably resistant to honey fungus[88, 200].

5.2.8 Pinus koraiensis

Korean Nut Pine, Chinese pinenut

4 tin 7 cyuc 4 kcaak 3 tcan 2 dwat 20 m hkuc
htut cyutli hgatkuyctucp hwicli hyishrasljut hpa7tli flatprik hpa7tmwati dyat hjonli

drutta Pinus koraiensis is an evergreen Tree growing to 20 m (65ft 7in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 3. It is in leaf all year, in flower in May, and the seeds ripen in September. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. The plant is not self-fertile. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly

acid and neutral soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

pcista The wood, sawdust and resins from various species of pine can cause dermatitis in sensitive people[222].

ksacta Edible Parts: Oil SeedEdible Uses: Condiment OilSeed - raw or cooked. Rich in oil[2, 11, 46, 63, 74, 81]. A soft texture with a hint of resin in the flavour, it makes a delicious snack and can also be used as a staple food[K]. The seed can also be dried and ground into a powder then used as a flavouring and thickener in soups etc[183]. Fairly large, the seeds are up to 16mm x 12mm[200]. A vanilla flavouring is obtained as a by-product of other resins that are released from the pulpwood[200].

tcanta Dye Herbicide Oil Resin Tannin WoodA tan or green dye is obtained from the needles[168]. The seeds are a source of soap and lubricating oil[266]. Tannin is obtained from the bark[266]. The needles contain a substance called terpen, this is released when rain washes over the needles and it has a negative effect on the germination of some plants, including wheat[201]. Yields turpentine and tar[74]. Oleo-resins are present in the tissues of all species of pines, but these are often not present in sufficient quantity to make their extraction economically worthwhile[64]. The resins are obtained by tapping the trunk, or by destructive distillation of the wood[4, 64]. In general, trees from warmer areas of distribution give the higher yields[64]. Turpentine consists of an average of 20% of the oleo-resin[64] and is separated by distillation[4, 64]. Turpentine has a wide range of uses including as a solvent for waxes etc, for making varnish, medicinal etc[4]. Rosin is the substance left after turpentine is removed. This is used by violinists on their bows and also in making sealing wax, varnish etc[4]. Pitch can also be obtained from the resin and is used for waterproofing, as a wood preservative etc. Wood. Used for construction and carpentry[74, 81]. The timber is used for construction, bridge building, vehicles, furniture, and wood pulp[266].

dwatta Analgesic Antibacterial Antiinflammatory Galactogogue PoulitceThe seed contains several medically active compounds and is analgesic, antibacterial and antiinflammatory[279]. It is used in Korea in the treatment of earache, epistaxis and to promote milk flow in nursing mothers[279]. The turpentine obtained from the resin of all pine trees is antiseptic, diuretic, rubefacient and vermifuge[4]. It is a valuable remedy used internally in the treatment of kidney and bladder complaints and is used both internally and as a rub and steam bath in the treatment of rheumatic affections[4]. It is also very beneficial to the respiratory system and so is useful in treating diseases of the mucous membranes and respiratory complaints such as coughs, colds, influenza and TB[4]. Externally it is a very beneficial treatment for a variety of skin complaints, wounds, sores, burns, boils etc and is used in the form of liniment plasters, poultices, herbal steam baths and inhalers[4]. The stem bark is used in the treatment of burns and skin ailments[218].

nrakta E. Asia - China, Korea, Manchuria, Siberia. ksacta Dry mountain slopes, especially those facing north, to 2600 metres[74, 120].

propta It is best to sow the seed in individual pots in a cold frame as soon as it is ripe if this is possible otherwise in late winter. A short stratification of 6 weeks at 4°C can improve the germination of stored seed[80]. Plant seedlings out into their permanent positions as soon as possible and protect them for their first winter or two[11]. Plants have a very sparse root system and the sooner they are planted into their permanent positions the better they will grow[K]. Trees should be planted into their permanent positions when they are quite small, between 30 and 90cm[200]. We actually plant them out when they are about 5 - 10cm tall. So long as they are given a very good weed-excluding mulch they establish very well[K]. Larger trees will check badly and hardly put on any growth for several years. This also badly affects root development and wind resistance[200]. Cuttings. This method only works when taken from very young trees less than 10 years old. Use single leaf fascicles with the base of the short shoot. Disbudding the shoots some weeks before taking the cuttings can help. Cuttings are normally slow to grow away[81].

nwatta Management: Standard Minor Global Crop Other Systems: Irreg. Intercrop Staple Crop: Protein-oilThrives in a light well-drained sandy or gravelly loam[1, 11]. Dislikes poorly drained moorland soils[1]. Established plants tolerate drought[200]. This species prefers a cool

moist climate[81]. Leaf secretions inhibit the germination of seeds, thereby inhibiting the growth of other plants below the tree[18]. This species is sometimes cultivated for its edible seed, there are some named varieties[183]. It is one of the main species utilized for its edible seeds[200], being gathered from cultivated and wild trees. Large quantities of the seeds are exported as a food crop from N. China[183]. Plants bear cones when they are 3.5 metres tall in Cornwall[59]. Trees are slow growing when young[11, 81]. Growth in the south-east of Britain is generally poor but trees in the west and north are healthy and growing well with average annual height increases of around 25cm and girth increases of 3cm or more[185]. Plants are strongly outbreeding, self-fertilized seed usually grows poorly[200]. They hybridize freely with other members of this genus[200]. The cones do not open, seed is extracted by breaking up the soft scales of the cone[200]. Plants in this genus are notably susceptible to honey fungus[200]. The plant is heat tolerant in zones 7 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2]. An evergreen. The root pattern is flat with shallow roots forming a plate near the soil surface [1-2]. The root pattern is a tap root similar to a carrot going directly down [1-2].

5.2.9 Pinus albicaulis

White-Bark Pine
4 tlin 8 cyuc 4 kcaak 3 tcan 2 dwat 20 m hkuc
htut cyutli hgatkyuctup hwicli hyishrasjut hpa7tli flatprik hpa7tmwatli fyif hjonli

drutta Pinus albicaulis is an evergreen tree growing to 20 m (65ft 7in) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 2. It is in leaf all year, in flower from May to June, and the seeds ripen in September. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. The plant is not self-fertile. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista The wood, sawdust and resins from various species of pine can cause dermatitis in sensitive people[222].

ckakta Edible Parts: Inner bark SeedEdible Uses: CondimentSeed - raw or cooked[226]. They can also be ground into a powder and then used as a flavouring in soups etc or can be added to cereal flours when making bread, biscuits, cakes etc[226]. Large and sweetly-flavoured, the oil-rich seed is up to 9 x 7mm[200] and has a thick shell[82]. It has a pleasant slightly resinous flavour[K]. Eating the raw seeds in quantity can cause constipation[257]. Inner bark[161, 177, 257]. There are no more details but inner bark is often dried, ground into a powder and then used as a thickener in soups etc or added to cereals when making bread. A vanillin flavouring is obtained as a by-product of other resins that are released from the pulpwood[200].

tcanta Dye Herbicide WoodA tan or green dye is obtained from the needles[168]. The needles contain a substance called terpene, this is released when rain washes over the needles and it has a negative effect on the germination of some plants, including wheat[201]. Oleo-resins are present in the tissues of all species of pines, but these are often not present in sufficient quantity to make their extraction economically worthwhile[64]. The resins are obtained by tapping the trunk, or by destructive distillation of the wood[4, 64]. In general, trees from warmer areas of distribution give the higher yields[64]. Turpentine consists of an average of

20% of the oleo-resin[64] and is separated by distillation[4, 64]. Turpentine has a wide range of uses including as a solvent for waxes etc, for making varnish, medicinal etc[4]. Rosin is the substance left after turpentine is removed. This is used by violinists on their bows and also in making sealing wax, varnish etc[4]. Pitch can also be obtained from the resin and is used for waterproofing, as a wood preservative etc. Wood - soft, light, coarse grained, brittle[82]. Used occasionally for fuel[229].

dwatta The turpentine obtained from the resin of all pine trees is antiseptic, diuretic, rubefacient and vermifuge[4]. It is a valuable remedy used internally in the treatment of kidney and bladder complaints and is used both internally and as a rub and steam bath in the treatment of rheumatic affections[4]. It is also very beneficial to the respiratory system and so is useful in treating diseases of the mucous membranes and respiratory complaints such as coughs, colds, influenza and TB[4]. Externally it is a very beneficial treatment for a variety of skin complaints, wounds, sores, burns, boils etc and is used in the form of liniment plasters, poultices, herbal steam baths and inhalers[4].

nrakta Western N. America - British Columbia to California. ksacta Often found on rocky ridges and bluffs, it is reduced to a prostrate gnarled mat at the highest elevations and exposures, but the best specimens are found at lower elevations in sheltered canyons[229]

propta It is best to sow the seed in individual pots in a cold frame as soon as it is ripe if this is possible otherwise in late winter. A short stratification of 6 weeks at 4°C can improve the germination of stored seed[80]. Plant seedlings out into their permanent positions as soon as possible and protect them for their first winter or two[11]. Plants have a very sparse root system and the sooner they are planted into their permanent positions the better they will grow[K]. Trees should be planted into their permanent positions when they are quite small, between 30 and 90cm[200]. We actually plant them out when they are about 5 - 10cm tall. So long as they are given a very good weed-excluding mulch they establish very well[K]. Larger trees will check badly and hardly put on any growth for several years. This also badly affects root development and wind resistance[200]. Cuttings. This method only works when taken from very young trees less than 10 years old. Use single leaf fascicles with the base of the short shoot. Disbudding the shoots some weeks before taking the cuttings can help. Cuttings are normally slow to grow away[81].

nwatta Landscape Uses:Specimen. Thrives in a light well-drained sandy or gravelly loam in a sunny position[1, 11]. Dislikes poorly drained moorland soils[1]. Established plants tolerate drought[200]. Plants often colonise exposed mountain slopes in the wild, their root system anchoring them firmly[226]. A long-lived but slow-growing tree in the wild[229]. It grows well in Britain[81], coning regularly at Kew[11], but not doing so well in the milder parts of the country[120]. It is best suited for growing in northern areas at higher elevations[120]. Trees do not produce large numbers of cones but small numbers are formed annually[229]. The cones are up to 8cm long, they ripen in late summer and do not open on the tree but fall intact to the ground[81, 82, 200, 226]. This species is the only N. American pine with this habit and it is thus considered to be a primitive species[226]. The seed is extracted by breaking up the soft scales of the cone[200]. Birds and mammals often open the cones and eat the seeds before they mature[1]. Leaf secretions inhibit the germination of seeds, thereby inhibiting the growth of other plants below the tree[18]. Plants are strongly outbreeding, self-fertilized seed usually grows poorly[200]. They hybridize freely with other members of this genus[200]. This species is closely related to *P. flexilis*[11], differing mainly in the cones[226]. Plants in this genus are notably susceptible to honey fungus[200]. Special Features:Attracts birds, North American native, Inconspicuous flowers or blooms. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2]. An evergreen. The root pattern is a tap root similar to a carrot going directly down [1-2].

5.2.10 Morus alba

White Mulberry, Common Mulberry,
4 tlin 9 cyuc 4 kcaak 4 tcan 3 dwat 18 m hkuc
hmimhtut cyutli hgatcup hwicli hrasljutnyik hpa7tli flatprik hpa7tmwatli fyif hjonli

drutta Morus alba is a deciduous Tree growing to 18 m (59ft) by 10 m (32ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 4. It is in flower in May, and the seeds ripen from July to August. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant). The plant is self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

pcista One report suggests that the raw fruit contains hallucinogens[62]. This fruit is frequently eaten in various parts of the world, there are even some named varieties, and no such effects have been mentioned elsewhere, nor observed by the writer when he has eaten the fruit. Possibly the unripe fruit was being referred to in the report, though even this would be surprising[K].

ckakta Edible Parts: Fruit Inner bark Leaves Manna ShootsEdible Uses: TeaFruit - raw[2, 7, 158]. A sweet taste, but the fruit is usually insipid[3, 11]. It contains about 1.5% protein, 0.5% fat, 8% carbohydrate, 0.7% malic acid[179]. Fruits of the cultivar 'Pendulum' tried at Kew in July 1994 had a pleasant flavour[K]. A richer flavour develops if the fruit is dried, it can then be used as a raisin substitute. The fruit is up to 25mm long[200]. Some caution is advised, see the notes above on toxicity. Per 100 g, the fruit is reported to contain 87.5 g water, 1.5 g protein, 0.49 g fat, 8.3 g carbohydrates, 1.4 g fiber, 0.9 g ash, 80 mg Ca, 40 mg P, 1.9 mg Fe, 174 IU vit. A, 9.7 µg thiamine, 184 µg riboflavin, 0.8 mg nicotinic acid, and 13 mg ascorbic acid. Young leaves and shoots - cooked[105, 183]. A famine food, used when all else fails[177]. The leaf makes a good vegetable, it is rich in carotene and calcium[179]. Protein preparations from young mulberry leaves form an excellent supplement to protein-deficient diets[269]. The dry leaves contain 18 - 28.8% protein, 0.2 - 0.7% Magnesium, 0.8 - 13.6% soluble sugars, 0.6 - 1.4% phosphorus, 2 - 3.9% potassium, 1.4 - 2.4% calcium, 0.8 - 1.8% aluminium, 0.05 - 0.26% iron, 1.8 - 2.6% silica, and 0.3 - 0.56% sulphur[269]. The leaf also contains 10% tannin[179]. Inner bark - roasted and ground into a meal then used as a thickener in soups etc or mixed with cereals when making bread. A famine food, used when all else fails[179]. The tree is said to be a source of an edible manna[183]. Young shoots can be used as a tea substitute[183].

tcanta Biomass Dye Fibre Fodder Shelterbelt Tannin WoodA fibre is obtained from the bark of one-year old stems, it is used in weaving clothes etc[7, 74, 266]. The stem bark is fibrous and is used in China and Europe for paper making[266, 269]. The twigs are used as binding material and for making baskets[269]. A brown dye is obtained from the trunk[178]. The leaves contain 10% tannin[179]. This tree can be grown as a part of a shelterbelt. The cultivar 'Tartarica' has been especially mentioned[200], it is very suitable for northern latitudes and is much used as a shelterbelt in Russia[269]. The wood of the mulberry is a potentially excellent source of ethanol, with yields of up to 6% from sawdust treated with acid and then given four days incubation[269]. Wood - light to moderately heavy, hard, durable, fine and close-grained, though it shows a tendency to warp. Due to its elasticity and flexibility when steamed, it is valued for making sports equipment such as tennis rackets and cricket bats, being considered as good as ash (*Fraxinus excelsior*)[238, 269]. It is also used for boat building, furniture, agricultural implements etc[145, 149, 158, 269]. It furnishes a medium grade fuel wood[269].

dwatta Analgesic Anthelmintic Antiasthmatic Antibacterial Antirheumatic Antitussive Astringent Diaphoretic Diuretic Emollient Expectorant Hypoglycaemic Hypotensive Odontalgic Ophthalmic Pectoral Purgative Sedative Tonic UrinaryThe white mulberry has a long history of medicinal use in Chinese medicine, almost all parts of the plant are used in one way or another[238]. Recent research has shown improvements in elephantiasis when treated with leaf extract injections and in tetanus following oral doses of

the sap mixed with sugar[238]. The leaves are antibacterial, astringent, diaphoretic, hypoglycaemic, odontalgic and ophthalmic[176, 218, 238]. They are taken internally in the treatment of colds, influenza, eye infections and nosebleeds[176, 238]. An injected extract of the leaves can be used in the treatment of elephantiasis and purulent fistulae[176]. The leaves are collected after the first frosts of autumn and can be used fresh but are generally dried[238]. The stems are antirheumatic, antispasmodic, diuretic, hypotensive and pectoral[176, 218, 238]. They are used in the treatment of rheumatic pains and spasms, especially of the upper half of the body, high blood pressure[176]. A tincture of the bark is used to relieve toothache[7]. The branches are harvested in late spring or early summer and are dried for later use[238]. The fruit has a tonic effect on kidney energy[128, 238]. It is used in the treatment of urinary incontinence, dizziness, tinnitus, insomnia due to anaemia, neurasthenia, hypertension, diabetes, premature greying of the hair and constipation in the elderly[176, 238]. The root bark is antiasthmatic, antitussive, diuretic, expectorant, hypotensive and sedative[176, 238]. It is used internally in the treatment of asthma, coughs, bronchitis, oedema, hypertension and diabetes[176, 238]. The roots are harvested in the winter and dried for later use[238]. The bark is anthelmintic and purgative, it is used to expel tape worms[240]. Extracts of the plant have antibacterial and fungicidal activity[218].

nrakta E. Asia - central and northern China. ksacta Not known in a truly wild situation.

propta The seed germinates best if given 2 - 3 months cold stratification[80, 98]. Sow the seed as soon as it is ripe if possible, otherwise in February in a cold frame. The seed usually germinates in the first spring, though it sometimes takes another 12 months. Prick out the seedlings into individual pots when they are large enough to handle and grow them on in the cold frame for their first winter. Plant them out in late spring or early summer after the last expected frosts. Cuttings of half-ripe wood, 7 - 10cm with a heel, July/August in a frame. Plant out in spring. A good percentage take, though they sometimes fail to thrive[78, 113]. Cuttings of mature wood of the current season's growth, 25 - 30cm with a heel of 2 year old wood, autumn or early spring in a cold frame or a shady bed outside[78, 113, 200]. Bury the cuttings to threequarters of their depth. Layering in autumn[200].

nwatta Agroforestry Services: Contour hedgerow Agroforestry Services: Living fence Fodder: Bank Fodder: Insect Industrial Crop: Biomass Management: Coppice Management: Standard Minor Global Crop Other Systems: Dyke-pond-Landscape Uses:Pest tolerant, Aggressive surface roots possible, Pollard. Succeeds in a variety of soils[269], though it prefers a warm well-drained loamy soil in a sunny position[1, 11]. Plants are fairly wind-resistant[200], though the branches are often killed back when growing in strong maritime exposure[K]. At least some cultivars are drought resistant, the form 'Tatarica' has been especially mentioned[183]. The white mulberry is occasionally cultivated for its edible fruit, there are a number of varieties[183] and sub-species varying greatly in the quality of their fruit. The form *M. alba multicaulis*. (Perretot.)/Loud. (synonym *M. multicaulis*. Perretot.) has been especially mentioned for its fruit[105]. The cultivars 'Nana' and 'Fegyvernekiana' are dwarf forms only making shrub size[182]. The cultivar 'Pendulum' was seen growing at Kew in July 1994 with a heavy crop of tasty fruits, the first of which were just ripening[K]. Mulberries have brittle roots and so need to be handled with care when planting them out[238]. Any pruning should only be carried out in the winter when the plant is fully dormant because mulberries bleed badly when cut[238]. Ideally prune only badly placed branches and dead wood[238]. It is a good tree for growing grapes into[20]. The grapes are difficult to pick but always seem to be healthier and free from fungal diseases[201]. Plants in this genus are notably resistant to honey fungus[200]. Special Features:Not North American native, Naturalizing. There are no flowers or blooms. The plant is heat tolerant in zones 8 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example