





# Plants For a Future 2021CE

## Hardiness Zone 3, Acidic, Sandy Soil, Edibility 4/5+

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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 your 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 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 herbaceous, 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

## 1.1 Pronunciation guide

a /a/, b /b/, c /ʃ/ "sh", d /d/, e /e/, f /f/, g /g/, h /h/, i /i/, j /ʒ/ "zh", k /k/, l /l/, m /m/, n /n/, o /o/, p /p/, q /q/ "ng", r /r/, s /s/, t /t/, u /u/, v /v/, w /w/, x /x/ /ʒ/ "gh", y /j/, z /z/, 2 /ɹ/ (low tone), 6 /ə/ "uh", 7 /ɹ/ (high tone).

## 1.2 vocabulary

tlin/tlin/ cold hardiness, cyuc /ʃju/ heat hardiness, kcak/kjak/ food (rating), tcan /tʃan/ other (uses rating), dwat /dwat/ medicinal (rating), hku /hku/ (adult) height, hsi2n /hsi.n/ (adult) width, ksan /ksan/ least (minimum).

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

hgat /hgat/ drought (tolerant), kyuc /kju/ dry, tcup /tʃup/ damp, hja7n /hʒa.n/ wet, hs6s /hsəs/ puddle, hwic /hwij/ water (requirement).

hyis /hjis/ poor (soil), hras /hras/ sandy, jlut /ʒlut/ loamy, nyik /njik/ mud (silt/clay loam), frip /frip/ pottery (heavy clay), hpa7t /hpa.t/ 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 /hpa.tmwat/ topsoil taste.

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

huc /huc/ purpose, pcis /pjs/ danger, trot /trot/ temperature, prop /prop/ fertile, tcan /tjan/ other, hyum /hjum/ uses, dwat /dwat/ medicine, drut /drut/ description, kcec /kcej/ region, tfo2n /tfojn/ nitrogen-fixing, xlutkfam /glut,kfam/ plant quantity, bwon /bwon/ bean, mran /mran/ corn/grain non-nitrogen-fixing plant, nrak /nrak/ continent (of origin), ksac /ksaj/ circumstances/habitat.

5 hmuctrotkcec, tcup hmuchwic, 5 ksankcak, hras hmuchpa7t, flat hmuchpa7tmwat, 92 xlutkfam.

## 2 2 tlin

### 2.1 bwon

#### 2.1.1 Caragana arborescens

Siberian Pea Tree, Siberian peashrub  
tfo2n 2 tlin 7 cyuc 5 kcak 4 tcan 1 dwat 6 m hkuc  
htut cyutli hgatyuctcup hwicli hyishrasjlut hpa7tli flatprikli-wisslip 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 Seedpod Edible 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 stabilization A 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 Emmenagogue The 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]. Cut-

ttings 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: Wind-break Industrial Crop: Biomass Management: Coppice Management: Standard Minor Global Crop Staple Crop: Protein 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]. 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].

## 2.2 mran

### 2.2.1 Brassica oleracea italica

Broccoli

2 tlin 11 cyuc 5 kcak 2 tcan 0 dwat 0.9 m hkuc  
hmimhtut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprikli-wisslip hpa7tmwatli fyixre7t hjonli

drutta *Brassica oleracea italica* is a BIENNIAL growing to 0.9 m (3ft). See above for USDA hardiness. It is hardy to UK zone 3 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 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. The plant can tolerate maritime exposure.

kcakta Edible Parts: Flowers Leaves Edible Uses: Young flowering stems and leaves - raw or cooked[33, 46]. The shoots of sprouting broccoli are harvested when about 10cm long, and before the flowers open, the shoots look somewhat like a small white or purple cauliflower and have a delicious flavour[K]. They are considered to be a gourmet vegetable. When picking the stems, make sure that you leave behind a section of the stem with leaves on it, since the plants will often produce new side shoots from the leaf axils[K]. Calabrese

and Romanesco plants produce a central inflorescence rather like a small cauliflower, which are sometimes followed by a number of smaller flowering shoots. They usually come into bearing in the late summer or autumn and are very productive if they are regularly harvested. Sprouting broccoli plants come into production in late winter to early spring and can be very heavy bearing over a period of two months or more so long as all the flowering stems are harvested before coming into flower.

tcanta Companion A good companion for celery and other aromatic plants since these seem to reduce insect predations[18, 20]. Grows badly with potatoes, beet and onions[20]. Grows well with potatoes, beet and onions according to another report[201].

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

propta Seed - sow sprouting broccoli in a seedbed outdoors in March to May. Plant out in June. Do not let the seedlings get overcrowded or they will soon become leggy and will not make such good plants. If your seedlings do get leggy, it is possible to plant them rather deeper into the soil - the buried stems will soon form roots and the plant will be better supported. Romanesco and calabrese are often sown in situ in the spring.

nwatta Succeeds in full sun in a well-drained fertile preferably alkaline soil[16, 200]. Tolerates a pH in the range 4.3 to 8.3. Prefers a heavy soil[16]. Succeeds in any reasonable soil[33]. Succeeds in maritime gardens[200]. Some forms are very cold-hardy, tolerating temperatures down to about -17°C[200]. Broccoli is closely related to the cauliflowers (*C. oleracea botrytis*) and is often grown for its edible young flowering stems which, by careful selection of varieties, can be available almost all year round from early summer right round to late spring. There are many named varieties and these can be classified into three main groups: Calabrese, which matures in summer and autumn, is the least cold-hardy form. It produces green, or sometimes purple, flowering heads[264]. Some forms will produce a number of side shoots once the main head has been harvested, though other forms seem unable to do this[264]. Romanesco matures in late summer and the autumn. It has numerous yellowish-green conical groups of buds arranged in spirals[264]. Given a little protection from the cold, it is possible to produce a crop throughout the winter. Unlike the other types of broccoli, romanesco seems unable to produce side shoots once the main head has been harvested[264]. Sprouting broccoli is the most cold-hardy group. It does not form a central head like the other two groups but instead produces a mass of side shoots from early spring until early summer. The more you harvest these shoots, especially if you do so before the flowers open, then the more shoots the plant produces[K]. A good companion for celery and other aromatic plants since these seem to reduce insect predations[18, 20]. Grows badly with potatoes, beet and onions[20]. Grows well with potatoes, beet and onions according to another report[201].

## 2.2.2 Cucurbita maxima

Winter Squash

2 tlin 11 cyuc 5 kca2 2 tcan 3 dwat m hkuc  
hmimhtut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprik  
hpa7tmwatli fyif hjonli

drutta *Cucurbita maxima* is an ANNUAL CLIMBER growing to 0.6 m (2ft) by 5 m (16ft 5in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 3 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 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 and neutral soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

pcista The sprouting seed produces a toxic substance in its embryo[65].

kcakta Edible Parts: Flowers Fruit Leaves Oil Oil SeedEdible Uses: Oil OilFruit - cooked[2, 27, 46, 97]. A delicious flavour when baked, rather like a sweet potato[K]. The

flesh can be dried, ground into a powder and used with cereals in making bread, cakes etc[7, 183]. Some varieties can be stored for up to 9 months. Seed - raw or cooked[7, 57, 183]. Rich in oil with a very pleasant nutty flavour but very fiddly to use because the seed is small and covered with a fibrous coat[K]. The seed can also be ground into a powder and used with cereals in making breads etc[183]. An oil is obtained from the seed[21, 86]. Young flowers - raw or cooked[7, 135, 183]. They are often dipped in batter and fried. Young leaves and stems - cooked[135, 183]. The leaves contain up to 5% protein[183].

tcanta Cosmetic Oil OilThe seed contains 34 - 54% of a semi-drying oil[61, 86]. Used for lighting[21]. A nourishing face-mask can be made from the fruit that is effective for dry skins[7].

dwatta Diuretic Nerve Poulitice Tonic VermifugeThe seeds are diuretic, tonic and vermifuge[7, 88, 240]. The complete seed, together with the husk, is used as a vermifuge. This is ground into a fine flour, then made into an emulsion with water and eaten. It is then necessary to take a purgative afterwards in order to expel the tapeworms or other parasites from the body[7]. As a remedy for internal parasites, the seeds are less potent than the root of *Dryopteris felix-mas*, but they are safer for pregnant women, debilitated patients and children[238]. The oil from the seed is used as a nerve tonic[240]. The fruit pulp is used as a soothing poultice on burns, inflammations and boils[240].

nrakta Origin is obscure, possibly derived in cultivation from *C. andreana*. ksacta Not known in the wild.

propta Seed - sow early to mid spring in a greenhouse in a rich soil. Germination should take place within 2 weeks. Sow 2 or 3 seeds per pot and thin out to the best plant. Grow them on fast and plant out after the last expected frosts, giving them cloche or frame protection for at least their first few weeks if you are trying them outdoors.

nwatta Requires a rich, well-drained moisture retentive soil and a very warm, sunny and sheltered position[37, 86]. Prefers a pH of 5.5 to 5.9, but tolerates up to 6.8[86]. Dry periods with a relatively low humidity favour the best growth[200]. A frost-tender annual plant, it is widely cultivated in tropical and temperate zones for its edible fruit, there are very many named varieties differing considerably in their fruits[183]. Most of the winter squashes derive from this species, including Hubbard, Butternut, Acorn, Argentine and Boston[86]. Many forms require a temperature range of 20 - 27°C during the growing season, but there are some forms that tolerate cooler conditions and these succeed outdoors most years in Britain[200, K]. Most cultivars are relatively insensitive to day-length[200]. Squashes and pumpkins can be differentiated from each other by their fruit stalk, it is angular and polygonal in pumpkins but thick, soft and round in squashes[132]. This species hybridizes readily with *C. andreana* but can only be crossed with other species under controlled conditions[86, 135]. Some modern works see *C. andreana* as being no more than a subspecies of this species, classifying it as *C. maxima andreana* (Naudin).Filov. Grows well with sweetcorn and thornapple but dislikes potatoes[18, 20].

## 2.2.3 Zea mays

Sweet Corn, Corn

2 tlin 11 cyuc 5 kca3 2 tcan 3 dwat m hkuc  
htut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprik  
hpa7tmwatli hjonli

drutta *Zea mays* is an ANNUAL growing to 2 m (6ft 7in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 3 and is frost tender. It is in flower from July to October, 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. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid and neutral soils. It cannot grow in the shade. It prefers moist soil.

kcakta Edible Parts: Oil Oil Pollen Seed StemEdible Uses: Coffee Oil OilSeed - raw or cooked. Corn is one of the most commonly grown foods in the world. The seed can be eaten raw or cooked before it is fully ripe[1, 2, 33, 34] and there are varieties especially developed for this purpose

(the sweet corns) that have very sweet seeds and are delicious[183, K]. The mature seed can be dried and used whole or ground into a flour. It has a very mild flavour and is used especially as a thickening agent in foods such as custards[183]. The starch is often extracted from the grain and used in making confectionery, noodles etc[183]. The dried seed of certain varieties can be heated in an oven when they burst to make 'Popcorn'[183]. The seed can also be sprouted and used in making uncooked breads and cereals[183]. A nutritional analysis is available[218]. The fresh succulent 'silks' (the flowering parts of the cob) can also be eaten[55, 183]. An edible oil is obtained from the seed, it is an all-purpose culinary oil that is frequently used as a food in salads and for cooking purposes[13, 46, 183, 238]. The pollen is used as an ingredient of soups[183]. Rich in protein, it is harvested by tapping the flowering heads over a flat surface such as a bowl. Harvesting the pollen will actually help to improve fertilisation of the seeds[K]. The roasted seed is a coffee substitute[183]. The pith of the stem is chewed like sugar cane and is sometimes made into a syrup[183].

tcanta Adhesive Fuel Oil Oil Packing PaperA glue is made from the starch in the seed[13]. This starch is also used in cosmetics and the manufacture of glucose[61]. A semi-drying oil is obtained from the seed[57]. It has many industrial uses, in the manufacture of linoleum, paints, varnishes, soaps etc[21, 61]. The corn spathes are used in the production of paper, straw hats and small articles such as little baskets[74, 171]. A fibre obtained from the stems and seed husks is used for making paper[189]. They are harvested in late summer after the seed has been harvested, they are cut into usable pieces and soaked in clear water for 24 hours. They are then cooked for 2 hours in soda ash and then beaten in a ball mill for 1½ hours in a ball mill. The fibres make a light greenish cream paper[189]. Be careful not to overcook the fibre otherwise it will produce a sticky pulp that is very hard to form into paper[189]. The dried cobs are used as a fuel[171]. The pith of the stems is used as a packing material[171].

dwatta Cancer Cholagogue Demulcent Diuretic Hypoglycaemic Hypotensive Lithotropic Stimulant Vasodilator WartsA decoction of the leaves and roots is used in the treatment of strangury, dysuria and gravel[218]. The corn silks are cholagogue, demulcent, diuretic, lithotropic, mildly stimulant and vasodilator[4, 9, 165, 176, 218]. They also act to reduce blood sugar levels and so are used in the treatment of diabetes mellitus[9, 218] as well as cystitis, gonorrhoea, gout etc[222]. The silks are harvested before pollination occurs and are best used when fresh because they tend to lose their diuretic effect when stored and also become purgative[9]. A decoction of the cob is used in the treatment of nose bleeds and menorrhagia[218]. The seed is diuretic and a mild stimulant[4]. It is a good emollient poultice for ulcers, swellings and rheumatic pains[4], and is widely used in the treatment of cancer, tumours and warts[218]. It contains the cell-proliferant and wound-healing substance allantoin, which is widely used in herbal medicine (especially from the herb comfrey, *Symphytum officinale*) to speed the healing process[222]. The plant is said to have anticancer properties and is experimentally hypoglycaemic and hypotensive[218].

nrakta Original habitat is obscure, probably S. America or Mexico. ksacta Not known in the wild.

propta Seed - sow April in individual pots in a greenhouse. Grow on quickly and plant out after the last expected frosts. A direct outdoor sowing, especially of some of the less sweet varieties, can be tried in May.

nwatta Requires a warm position a well drained soil and ample moisture in the growing season[16, 33]. Prefers a pH in the range 5.5 to 6.8[200]. Requires a rich soil if it is to do well[201]. Corn is widely cultivated for its edible seed, especially in tropical and warm temperate zones of the world[200], there are many named varieties[132]. Unfortunately, the plant is not frost tolerant and so needs to be started off under glass in Britain if a reasonable crop is to be grown. There are five main types:- Sweetcorn is of fairly recent development. It has very sweet, soft-skinned grains that can be eaten raw or cooked before they are fully ripe. Cultivars have been developed that can produce a worthwhile crop even in the more northerly latitudes of Britain if a suitable warm sunny sheltered site is chosen[238, K]. Popcorn is a primitive form with hard-skinned grains. When roasted, these grains 'explode' to form the popular snack 'popcorn'[238]. Waxy corn is used mainly in the Far East.

It has a tapioca-like starch[238]. Flint corn, which shrinks on drying, can have white, yellow, purple, red or blue-black grains[238]. It is not so sweet and also takes longer to mature so is a problematic crop in Britain. There are many other uses for this plant as detailed below. Dent corn has mostly white to yellow grains. This and Flint corn are widely grown for oils, cornflour, cereals and silage crops. Corn grows well with early potatoes, legumes, dill, cucurbits and sunflowers[18, 20, 201], it dislikes growing with tomatoes[20]. 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].

## 2.2.4 *Rubus arcticus*

Arctic Bramble, Arctic raspberry, Dwarf raspberry

2 tlin 7 cyuc 5 kcak 1 tcan 0 dwat 0.2 m hkuc  
htuc cyutli tcup hwicli hrasjutnyik hpa7tli frusflatprikwis  
hpa7tmwatli xre7t hjonli

drutta *Rubus arcticus* is a PERENNIAL growing to 0.2 m (0ft 8in) by 1 m (3ft 3in). See above for USDA hardiness. It is hardy to UK zone 1. It is 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 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 acid soils. It cannot grow in the shade. It prefers moist soil.

kcakta Edible Parts: Flowers Fruit Edible Uses: Tea Fruit - raw or cooked[2, 61, 105, 257]. Very sweet, juicy and palatable with a pineapple-like aroma[1, 101, 172, 183]. Delicious when eaten out of hand, they are also used in making cakes, jams etc[183]. Unfortunately, they are often not produced very prolifically in a garden situation in Britain, probably because they prefer colder winters. Flowers - raw. Sweet and delicious[172]. The fresh or dried leaves are used as a tea substitute[61, 105, 183].

tcanta DyeA purple to dull blue dye is obtained from the fruit[168].

nrakta Northern N. America, N. Europe and N. Asia. Formerly native to Britain in the Scottish highlands[17] ksacta Damp peats or gravels, especially on calcareous soils[43].

propta Seed - requires stratification and is best sown in early autumn in a cold frame. Stored seed requires one month stratification at about 3°C and is best sown as early as possible in the year. Prick out the seedlings when they are large enough to handle and grow on in a cold frame. Plant them out into their permanent positions in late spring of the following year. Division in early spring or just before leaf-fall in the autumn[200]. 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 Easily grown in a good well-drained loamy soil in a sunny position[1, 11]. A very variable species, it is sometimes divided into three species, viz.: *R. arcticus*, *R. acaulis* and *R. stellatus*[101]. Suitable for growing in containers. Most often in acidic soils rich in organic matter. *Rubus arcticus* subsp. *x stellarcticus* G.Lars. is an unresolved name

This name is unresolved, but some data suggest that it is synonymous with *Rubus x stellarcticus* (G.Lars.) H.E.Weber, but some data suggest that it is an infraspecific name of *Rubus arcticus* L..

## 2.2.5 *Cucurbita moschata*

Squash, Crookneck squash

2 tlin 11 cyuc 5 kcak 1 tcan 3 dwat m hkuc  
hmimhtut cyutli tcup hwicli hrasjutnyik hpa7tli flatprikwis  
hpa7tmwatli fyif hjonli

drutta *Cucurbita moschata* is a ANNUAL CLIMBER growing to 0.6 m (2ft) by 4 m (13ft 1in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 3 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 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 can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

**pcista** The sprouting seed produces a toxic substance in its embryo[65].

**kcakta** Edible Parts: Flowers Fruit Leaves Oil SeedEdible Uses: OilFruit - cooked[2, 27, 46, 105]. Some cultivars have a delicious flavour when baked, rather like a sweet potato[K]. The flesh can be dried and ground into a powder then used in making breads etc[183]. Some varieties can be stored for up to 9 months. Seed - raw or cooked[57, 86, 105]. Rich in oil with a pleasant nutty flavour[183] but very fiddly to use because the seed is small and covered with a fibrous coat[K]. An edible oil is obtained from the seed[183]. Leaves and young stems - cooked and used as a potherb or added to soups, stews etc[105, 135, 183]. Flowers - cooked[105, 135, 183].

**tcanta** OilAn edible oil is obtained from the seed[183].

**dwatta** Anthelmintic GalactogogueThe seed is vermifuge[147]. It is eaten fresh or roasted for the relief of abdominal cramps and distension due to intestinal worms[218]. About 800 peeled seeds is said to make a safe and effective treatment for tape worm[218]. They are ground into a fine flour, then made into an emulsion with water and eaten. It is then necessary to take a purge in order to expel the tapeworms or other parasites from the body[7]. The boiled root is galactogogue[218].

**nrakta** Origin is obscure. **ksacta** Not known in the wild.

**propta** Seed - sow early to mid spring in a greenhouse in a rich soil. Germination should take place within 2 weeks. Sow 2 or 3 seeds per pot and thin out to the best plant. Grow them on fast and plant out after the last expected frosts, giving them cloche or frame protection for at least their first few weeks if you are trying them outdoors.

**nwatta** Requires a rich, well-drained moisture retentive soil and a very warm, sunny and sheltered position[1, 37, 86]. Prefers a pH of 5.5 to 5.9, but tolerates up to 6.8[86]. Moderate rainfall favours growth, but the roots of most cultivars are sensitive to high soil-water levels[200]. The squash is a frost-tender annual plant that is widely cultivated, especially in warm temperate and tropical areas, for its edible fruit[27]. There are very many named varieties widely differing in size shape and taste[27, 183]. Some varieties are used in the summer and autumn whilst others are harvested in the autumn and can be stored for several months. Succeeds outdoors most years in Britain[27]. Plants are more suited to warmer climates than Britain[200] and are only rarely successful in good summers in this country, they do not do well in the north[86]. Most cultivars are day-length neutral[200]. This species only hybridizes with other members of the genus under controlled conditions[86, 135]. Grows well with sweetcorn, radishes and nasturtium but dislikes potatoes[18, 20]. Squashes and pumpkins can be differentiated from each other by their fruit stalk, it is angular and polygonal in pumpkins but thick, soft and round in squashes[132].

## 3 3 tlin

### 3.1 bwon

#### 3.1.1 Hippophae salicifolia

Willow-Leaved Sea Buckthorn  
tfo2n 3 tlin 7 cyuc 5 kcaak 5 tcan 3 dwat 15 m hkuc  
htut cyutli kyuctcuphja7n hwicli hyishrasjlutnyik hpa7tli flat-prikrlwis hpa7tmwatli nyanhjen hjonli

**drutta** Hippophae salicifolia 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 8 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. The plant can tolerate strong winds but not maritime exposure.

**kcakta** Edible Parts: FruitEdible Uses: Fruit - raw or cooked[2, 46]. A very nutritious food, and possibly the most nutritious fruit that can be grown in temperate climates. It is very rich in vitamins, especially vitamin C, plus minerals and bioflavonoids, and is also a source of essential fatty acids[214]. It comes ripe in late summer, though it can be eaten for about a month before this, and will hang on the tree until mid-winter, by which time the flavour has become much milder, though it has also become very soft and difficult to pick[K]. We and many of our visitors really like this fruit, however the flavour is somewhat like a sharp lemon and a lot of people find this too acid for them[K]. It also makes a good salad dressing[K]. The fruits of some species and cultivars (not specified) contain up to 9.2% oil[214]. The fruit is used for making preserves[105, 183]. It is being increasingly used in making fruit juices, especially when mixed with other fruits, because of its reputed health benefits[214]. The fruit becomes less acid after a frost or if cooked[74].

**tcanta** Fuel Pioneer Soil stabilization WoodThe plant is very fast growing, even in areas exposed to maritime winds, and it makes an excellent pioneer species for providing shelter and helping to establish woodland conditions. The plant is very light-demanding and so will eventually be shaded out by the woodland trees, thus it will never out-stay its welcome[K]. The trees have an extensive and vigorous root system and sucker freely once established. They are thus excellent for stabilising the soil, especially on slopes, and are often planted in the Himalayas to prevent land slips on the mountain slopes and create conditions for the re-establishment of woodlands[K]. The wood is very tough and hard - it can be used for many purposes including wheel hubs and other applications where toughness is essential[K]. It is also used for fuel[146].

**dwatta** Cancer Cardiac Eczema Poultice Vitamin CThe 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 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. **ksacta** Alluvial gravel, wet landslips and riversides to 3500 metres[51].

**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** Succeeds in most soils so long as they are not too dry[200]. Grows well by water[1, 11]. A fast-growing and very wind-resistant tree, it is an excellent pioneer species for re-establishing woodlands[K]. This species is not hardy

in the colder areas of the country, it tolerates temperatures down to about -10°C[200]. 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]. The deeply cleft bark favours the growth of epiphytes[146]. 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 seed is required.

### 3.1.2 Hippophae rhamnoides

Sea Buckthorn, Seaberry

tfo2n 3 tlin 7 cyuc 5 kcaak 5 tcan 5 dwat 6 m hkuc

htut cyutli hgatkuyctcuphja7n hwicli hyishrasjlutnyik hpa7tli flatpruklwis hpa7tmwatli nyanhjen hjonli

driktla 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.

kcaakta 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 Poultice 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 medications 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. ks-acta 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].

### 3.1.3 *Apios Americana*

Ground Nut  
 tf02n 3 tlin 7 cyuc 5 kcaak 3 tcan 1 dwat 1.2 m hkuc  
 hmimhtut cyuti tucp hwicli hrasjlut hpa7tli frusflatprikrlwis  
 hpa7tmwatli xre7t hjonli

drutta *Apios Americana* is a PERENNIAL growing to 1.2 m (4ft). See above for USDA hardiness. It is hardy to UK zone 3. It is in leaf from April to November, in flower from June to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. It can fix Nitrogen. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained 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 soil.

kcaakta Edible Parts: Root Seed Seedpod Edible Uses: Tuber - raw or cooked[1, 2, 27, 55, 62, 63]. A delicious flavour somewhat like roasted sweet potatoes, it always receives very high marks in taste trials with us[K]. The tuber can also be dried and ground into a powder then used as a thickening in soups etc or can be added to cereal flours when making bread[132, 257]. Tubers contain 17% crude protein, this is more than 3 times that found in potatoes[183]. The tubers can be harvested in their first year but they take 2 - 3 years to become a sizeable crop[160]. They can be harvested at any time of the year but are at their best in the autumn[160]. The tubers can also be harvested in the autumn and will store until at least the spring[K]. Yields of 2.3 kilos of tubers per plant have been achieved[222]. Seed-cooked[62]. Rather small and not produced very freely[K], they are used like peas and beans[183, 213]. A good source of protein, they can be ground into a powder and added to cereals when making bread etc[257]. Young seedpods[55, 62, 95, 177].

tcanta Companion Latex There is one report that the plant contains a latex which could be used in the production of rubber[269].

dwatta The tubers were used in folk remedies for that cancerous condition known as "Proud Flesh" in New England. Nuts were boiled and made into a plaster, "For to eat out the proud flesh they (the Indians) take a kind of earth nut boyled and stamped"[269].

nrakta N. America - Pennsylvania. Occasionally naturalized in S. Europe[50]. ksacta Usually found in low damp bottomland or riparian woods and thickets, it is also often found round ancient Indian campsites[43, 62, 269].

propta Seed - pre-soak for 3 hours in tepid water and sow February/March in a cold frame. The seed usually germinates in 1 - 3 months at 15°C[134]. When large enough to handle, prick the seedlings out into individual pots and grow them on in light shade in the greenhouse for their first winter, planting them out in late spring or early summer. Division can be carried out at almost any time of the year, though spring is probably the best time. Simply dig up the roots, harvest the tubers and replant them where you want the plants to grow. It is also possible to harvest the tuber in winter, store them in a cool fairly dry but frost-free place over the winter and then plant them out in the spring. The tubers lose moisture rapidly once they have been harvested,

so make sure that you store them in a damp medium such as leafmold.

nwatta Agroforestry Services: Nitrogen Edible Beans Management: Standard New Crop for Tubers Staple Crop: Protein Prefers a light rich soil and a sunny position[1, 27]. When grown in a warm dry situation in a well-drained sandy soil, the plants will be long lived with the tuberous roots increasing in size and number each year[245]. Another report says that the plant prefers light dappled shade[200]. It tolerates acid soils[160]. Dislikes windy situations[K]. Groundnut is reported to tolerate an annual precipitation in the range of 97 to 117cm, an average annual temperature range of 9.9 to 20.3°C and a pH in the range of 4.5 to 7.0[269]. It tolerates a range of climatic conditions and produces well in cool temperate zones as well as the subtropical conditions of South Florida[269]. Whilst most reports suggest that this species should be cold hardy in all parts of Britain, one report says that the plants may require protection in severe winters[134]. The groundnut has occasionally been cultivated for its edible root and has the potential to become a commercial crop[95, 183]. Cultivars have been selected in the past for higher yields and larger tubers, it is said that the yields from some of these cultivars can rival potato crops[95, 183]. Some of these cultivars are gradually becoming available in Britain[K]. The best yields are obtained when the plant is left in the ground for at least two growing seasons. Yields of 30 tonnes per hectare have been achieved from weed crops growing in a field of cranberries[269]. This species has been grown in the past in S. Europe[46, 50] and has been suggested as a nitrogen-fixing edible ornamental for permaculturalists[222]. The plant forms long thin roots which enlarge at intervals along their length to form the tubers, the effect is somewhat like a necklace[K]. Plants can be invasive once they are established[200] and have become a weed of cultivated cranberry crops in N. America[269]. A climbing plant, twining around the thin branches of other plants for support[K]. The flowers have a scent of violets[245]. 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]. 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. Herbaceous. A suckering vine sending up suckers some distance main plant [1-2]. The root pattern is tuberous with swollen potato-like roots [1-2].

### 3.1.4 *Apios americana*

Ground Nut  
 tf02n 3 tlin 7 cyuc 5 kcaak 3 tcan 1 dwat 1.2 m hkuc  
 hmimhtut cyuti tucp hwicli hrasjlut hpa7tli frusflatprikrlwis  
 hpa7tmwatli xre7t hjonli

drutta *Apios americana* is a PERENNIAL growing to 1.2 m (4ft). See above for USDA hardiness. It is hardy to UK zone 3. It is in leaf from April to November, in flower from June to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. It can fix Nitrogen. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained 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 soil.

kcaakta Edible Parts: Root Seed Seedpod Edible Uses: Tuber - raw or cooked[1, 2, 27, 55, 62, 63]. A delicious flavour somewhat like roasted sweet potatoes, it always receives very high marks in taste trials with us[K]. The tuber can also be dried and ground into a powder then used as a thickening in soups etc or can be added to cereal flours when making bread[132, 257]. Tubers contain 17% crude protein, this is more than 3 times that found in potatoes[183]. The tubers can be harvested in their first year but they take 2 - 3 years to become a sizeable crop[160]. They can be harvested at any time of the year but are at their best in the autumn[160]. The tubers can also be harvested in the autumn and will store until at least the spring[K]. Yields of 2.3 kilos of tubers per plant have been achieved[222]. Seed-cooked[62]. Rather small and not produced very freely[K], they are used like peas and beans[183, 213]. A good source

of protein, they can be ground into a powder and added to cereals when making bread etc[257]. Young seedpods[55, 62, 95, 177].

tcanta Companion LatexThere is one report that the plant contains a latex which could be used in the production of rubber[269].

dwatta The tubers were used in folk remedies for that cancerous condition known as "Proud Flesh" in New England. Nuts were boiled and made into a plaster, "For to eat out the proud flesh they (the Indians) take a kind of earth nut boyled and stamped"[269].

nrakta N. America - Pennsylvania. Occasionally naturalized in S. Europe[50]. ksacta Usually found in low damp bottomland or riparian woods and thickets, it is also often found round ancient Indian campsites[43, 62, 269].

propta Seed - pre-soak for 3 hours in tepid water and sow February/March in a cold frame. The seed usually germinates in 1 - 3 months at 15°C[134]. When large enough to handle, prick the seedlings out into individual pots and grow them on in light shade in the greenhouse for their first winter, planting them out in late spring or early summer. Division can be carried out at almost any time of the year, though spring is probably the best time. Simply dig up the roots, harvest the tubers and replant them where you want the plants to grow. It is also possible to harvest the tuber in winter, store them in a cool fairly dry but frost-free place over the winter and then plant them out in the spring. The tubers lose moisture rapidly once they have been harvested, so make sure that you store them in a damp medium such as leafmold.

nwatta Agroforestry Services: Nitrogen Edible Beans Management: Standard New Crop for Tubers Staple Crop: ProteinPrefers a light rich soil and a sunny position[1, 27]. When grown in a warm dry situation in a well-drained sandy soil, the plants will be long lived with the tuberous roots increasing in size and number each year[245]. Another report says that the plant prefers light dappled shade[200]. It tolerates acid soils[160]. Dislikes windy situations[K]. Groundnut is reported to tolerate an annual precipitation in the range of 97 to 117cm, an average annual temperature range of 9.9 to 20.3°C and a pH in the range of 4.5 to 7.0[269]. It tolerates a range of climatic conditions and produces well in cool temperate zones as well as the subtropical conditions of South Florida[269]. Whilst most reports suggest that this species should be cold hardy in all parts of Britain, one report says that the plants may require protection in severe winters[134]. The groundnut has occasionally been cultivated for its edible root and has the potential to become a commercial crop[95, 183]. Cultivars have been selected in the past for higher yields and larger tubers, it is said that the yields from some of these cultivars can rival potato crops[95, 183]. Some of these cultivars are gradually becoming available in Britain[K]. The best yields are obtained when the plant is left in the ground for at least two growing seasons. Yields of 30 tonnes per hectare have been achieved from weed crops growing in a field of cranberries[269]. This species has been grown in the past in S. Europe[46, 50] and has been suggested as a nitrogen-fixing edible ornamental for permaculturalists[222]. The plant forms long thin roots which enlarge at intervals along their length to form the tubers, the effect is somewhat like a necklace[K]. Plants can be invasive once they are established[200] and have become a weed of cultivated cranberry crops in N. America[269]. A climbing plant, twining around the thin branches of other plants for support[K]. The flowers have a scent of violets[245]. 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]. 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. Herbaceous. A suckering vine sending up suckers some distance main plant [1-2]. The root pattern is tuberous with swollen potato-like roots [1-2].

## 3.2 mran

### 3.2.1 *Tilia x europaea*

Linden, Common Lime

3 tlin 9 cyuc 5 kcak 3 tcan 3 dwat 35 m hkcuc  
hmmihtut cyutli tcup hwicli hyishrasjlutnyik hpa7tli flatprikli-  
wis hpa7tmwatli xre7t hjonli

drutta *Tilia x europaea* is a deciduous Tree growing to 35 m (114ft) by 15 m (49ft) 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 July. 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. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil. The plant can tolerate strong winds but not maritime exposure.

pcista If the flowers used for making tea are too old, they may produce symptoms of narcotic intoxication[4].

kcakta Edible Parts: Flowers Leaves Manna SapEdible Uses: Chocolate Sweetener TeaYoung leaves - raw[6, 177, 183]. Excellent in salads, they are mild and mucilaginous. A refreshing tea is made from the dried flowers[183]. A honey-like fragrance[183]. Some caution is advised, see notes above on toxicity. Flowers - used as a vegetable[183]. A very acceptable chocolate substitute can be made from a paste of the ground-up flowers and immature fruit. Trials on marketing the product failed because the paste is very apt to decompose[2, 115]. Sap - used as a drink or concentrated to make a syrup and used as a sweetener[4, 115, 183]. An edible manna is obtained from the tree[183]. No further details, does this report refer to the sap?

tcanta Charcoal Fibre Paper WoodA fibre from the inner bark is used to make mats, shoes, baskets, ropes etc[1, 13, 14, 46, 61, 100]. It is also suitable for cloth[115]. It is harvested from trunks that are 15 - 30cm in diameter[115]. The fibre can also be used for making paper[189]. The stems are harvested in spring or summer, the leaves are removed and the stems steamed until the fibres can be stripped. The outer bark is removed from the inner bark by peeling or scraping. The fibres are cooked for 2 hours with lye and then beaten in a ball mill. The paper is beige in colour[189]. Wood - soft, white, easily carved. It is very suitable for carving domestic items and small non-durable items[4, 13, 46, 61, 115]. A charcoal made from the wood is used for drawing[46, 61, 115]. 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 Cholagogue Diaphoretic Diuretic Emollient Expectorant Hypotensive Sedative Skin VasodilatorLime flowers are a popular domestic remedy for a number of ailments, especially in the treatment of colds and other ailments where sweating is desirable[9]. A tea made from the fresh or dried flowers is antispasmodic, diaphoretic, expectorant, hypotensive, laxative and sedative[4, 9, 13, 226, 238]. Lime flower tea is also used internally in the treatment of indigestion, hypertension, hardening of the arteries, hysteria, nervous vomiting or palpitation[4, 238]. The flowers are harvested commercially and often sold in health shops etc[226]. Lime flowers are said to develop narcotic properties as they age and so they should only be harvested when freshly opened[238]. A charcoal made from the wood is used in the treatment of gastric or dyspeptic disturbances and is also made into a powder then applied to burns or sore places[4].

nrakta A hybrid, probably *T. cordata*. x *T. platyphyllos*. ksacta Not known in a truly wild situation.

propta Seed - much of the seed produced in Britain is not viable, cut a few seedcases open to see if there is a seed inside[80]. If possible, obtain fresh seed that is ripe but has not as yet developed a hard seed coat and sow it immediately in a cold frame. It may germinate in the following spring though it could take 18 months[80]. Stored seed can be very slow to germinate. It has a hard seed coat, embryo dormancy and a hard coat on the pericarp. All these factors mean that the seed may take up to 8 years to germinate[80]. One way of shortening this time is to stratify the seed for 5 months at high temperatures (10°C at night, up to 30°C by day) and then 5 months cold stratification[80]. 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. Layering in spring just before the leaves unfurl. Takes 1 - 3 years[78]. Suckers, when formed, can be removed with as much root as possible during the dormant season and replanted immediately[200].

nwatta Prefers a good moist loamy alkaline to neutral soil but succeeds on slightly acid soils[11, 200]. Grows poorly on any very dry or very wet soil[200]. Succeeds on poorer soils than *T. platyphyllos*[11, 14]. Tolerates considerable exposure[125]. A very valuable bee plant[11]. The flowers are toxic to bees[188]. A food plant for the caterpillars of many butterfly and moth species[30]. This tree is frequently infested by aphids[17, 200], which cover the ground and the leaves with a sticky honeydew[188]. Although a hybrid species, it does produce fertile seed in Britain[17]. Lime trees tend to hybridise freely if other members of the genus are growing nearby[238]. If growing plants from seed it is important to ensure the seed came from a wild source or from an isolated clump of the single species[K]. Easily transplanted, even when quite large, trees up to 60 years old have been moved successfully[1, 74]. Can be coppiced, the tree produces suckers very freely[98, 200]. Grows best in a woodland situation, young plants tolerate a reasonable level of side shade[200]. Plants in this genus are notably resistant to honey fungus[200]. Note: *Tilia × vulgaris* B.Heyne is a synonym of *Tilia × europaea* L. 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. A sprouting standard sending up shoots from the base [1-2]. The root pattern is suckering with new plants from underground runners away from the plant [1-2].

### 3.2.2 *Tilia cordata*

Small Leaved Lime, Littleleaf linden  
3 tin 7 cyuc 5 kcaak 3 tcan 3 dwat 30 m hkcuc  
hmimhtut cyuti tcup hwicli hrasjlutnyik hpa7tli flatprikwlis  
hpa7tmwatli xre7t hjonli

drutta *Tilia cordata* is a deciduous Tree growing to 30 m (98ft) by 12 m (39ft) 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 June to July, and the seeds ripen in 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), 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. The plant can tolerate strong winds but not maritime exposure.

pcista If the flowers used for making tea are too old, they may produce symptoms of narcotic intoxication[4].

kcakta Edible Parts: Leaves SapEdible Uses: Chocolate TeaYoung leaves - raw[2]. They make an excellent salad or sandwich filling, they are mild tasting and somewhat mucilaginous[K]. The leaves can be available from spring until early autumn from the young growths at the base of the tree[K]. A very acceptable chocolate substitute can be made from a paste of the ground-up flowers and immature fruit. Trials on marketing the product failed because the paste is very apt to decompose[2, 115]. A popular herb tea is made from the flowers, it has a sweet, fragrant pleasant flavour[46]. Some caution is advised, see the notes above on toxicity. Sap - harvested in the spring, it is sweet and can be used as a drink or concentrated into a syrup[4].

tcanta Charcoal Fibre Paper WoodA fibre from the inner bark is used to make mats, shoes, baskets, ropes etc[1, 13,

14, 46, 61, 100]. It is also suitable for cloth[115]. It is harvested from trunks that are 15 - 30cm in diameter[115]. The fibre can also be used for making paper[189]. The stems are harvested in spring or summer, the leaves are removed and the stems steamed until the fibres can be stripped. The outer bark is removed from the inner bark by peeling or scraping. The fibres are cooked for 2 hours with lye and then beaten in a ball mill. The paper is beige in colour[189]. Wood - soft, white, easily carved. It is very suitable for carving domestic items and small non-durable items[4, 13, 46, 61, 115]. A charcoal made from the wood is used for drawing[46, 61, 115].

dwatta Antispasmodic Diaphoretic Expectorant Hypotensive Laxative Sedative SkinLime flowers are a popular domestic remedy for a number of ailments, especially the treatment of colds and other ailments where sweating is desirable[9]. A tea made from the fresh or dried flowers is antispasmodic, diaphoretic, expectorant, hypotensive, laxative and sedative[4, 9, 13, 226, 238]. Lime flower tea is also used internally in the treatment of indigestion, hypertension, hardening of the arteries, hysteria, nervous vomiting or palpitation[4, 238]. The flowers are harvested commercially and often sold in health shops etc[226]. Lime flowers are said to develop narcotic properties as they age and so they should only be harvested when freshly opened[238]. A charcoal made from the wood is used in the treatment of gastric or dyspeptic disturbances and is also made into a powder then applied to burns or sore places[4].

nrakta Europe, including Britain, from Norway south and east to Spain, Siberia, Crimea and Caucasus. ksacta Woods on most fertile soils, especially limestone, it is commonly found on wooded limestone cliffs[17].

propta Seed - much of the seed produced in Britain is not viable, cut a few seedcases open to see if there is a seed inside[80]. If possible, obtain fresh seed that is ripe but has not as yet developed a hard seed coat and sow it immediately in a cold frame. It may germinate in the following spring though it could take 18 months[80]. Stored seed can be very slow to germinate. It has a hard seed coat, embryo dormancy and a hard coat on the pericarp. All these factors mean that the seed may take up to 8 years to germinate[80]. One way of shortening this time is to stratify the seed for 5 months at high temperatures (10°C at night, up to 30°C by day) and then 5 months cold stratification[80]. 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. Layering in spring just before the leaves unfurl. Takes 1 - 3 years[78]. Suckers, when formed, can be removed with as much root as possible during the dormant season and replanted immediately[200].

nwatta Landscape Uses:Firewood, Pollard, Screen, Specimen, Street tree. Prefers a good moist loamy alkaline to neutral soil but it also succeeds on slightly acid soils[200]. Grows poorly on any very dry or very wet soil[200]. Tolerates considerable exposure[125, K]. Succeeds in sun or semi-shade[188]. Plants can be transplanted quite easily, even when large, trees up to 60 years old have been moved successfully[1, 74]. Trees are very amenable to coppicing or pollarding[186]. They produce numerous suckers from the base[98]. Suckers are produced but not freely according to another report[186]. This species produces far less suckers than *T. platyphyllos* or *T. x vulgaris*[238]. This species grows well in Britain, but it rarely produces viable seed in areas with cool summers[200]. Lime trees tend to hybridise freely if other members of the genus are growing nearby[238]. If growing plants from seed it is important to ensure the seed came from a wild source or from an isolated clump of the single species[K]. Grows best in a woodland situation, young plants tolerate a reasonable level of side shade[186]. Mature trees cast a dense shade[186]. A very valuable bee plant, producing an abundance of nectar[186]. A valuable species for wildlife, there are 31 species of insects associated with this tree[24]. The leaves are very attractive to leaf aphid and these aphid produce an abundance of sweet secretions which drip off the leaves to the ground below and also attract sooty mould fungus[186]. This makes the tree unsuitable for street planting. This species, however, is less likely to become infested with aphid than *T. platyphyllos* or *T. x vulgaris*[238]. There are some named varieties selected for their ornamental value[188]. Plants in this genus are notably resistant to

honey fungus[200]. Special effects:Not North American native, Fragrant flowers, Attractive flowers or blooms.

### 3.2.3 Ginkgo biloba

Maidenhair Tree, Ginkgo

3 tlin 8 cyuc 5 kcaak 2 tcan 5 dwat 30 m hkuc  
htut cyuti hgatkuyctup hwlici hrasjlutnyik hpa7tli flatprik-  
lwis 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].

kcaakta 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 Antiatshmatic 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, seda-

tive, 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: Coppice 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].

### 3.2.4 Malus domestica

Apple  
 3 tlin 8 cyuc 5 kcaak 4 tcan 2 dwat 9 m hkuc  
 hmimhtut cyutli tcup hwicli hrasjlutnyikfrip hpa7tli flatprikli-  
 wis hpa7tmwatli xre7t hjonli

drutta Malus domestica is a deciduous Tree growing to 9 m (29ft 6in). See above for USDA hardiness. It is hardy to UK zone 3 and is not frost tender. It is in flower from April to June. 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.

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.

kcaakta Edible Parts: Fruit Oil OilEdible Uses: Oil Oil PectinFruit - raw, cooked or dried for later use. Apples are one of the most common and widely grown fruits of the temperate zone. There are a great many named varieties with differing flavours ranging from sour to sweet and textures from dry and mealy to crisp and juicy. There is also a wide range in the seasons of ripening with the first fruits being ready in late July whilst other cultivars are not picked until late autumn and will store for 12 months or sometimes more. See individual records for more details. The fruit of some cultivars is rich in pectin and can be used in helping other fruits to set when making jam etc[61, 142]. Pectin is also said to protect the body against radiation[201]. An edible oil can be obtained from the seed[4]. It would only really be viable to use these seeds as an oil source if the fruit was being used for some purpose such as making cider and then the seeds could be extracted from the remaining pulp[4].

tcanta Lighting Oil Oil Pectin Teeth WoodThe fruit is a source of pectin[61, 142]. Pectin is used as a thickener in jams etc and as a culture medium in laboratories. The apple is also an excellent dentifrice, the mechanical action of eating a fruit serving to clean both the teeth and the gums[4, 269]. The oil from the seed has been used as an illuminant[269]. Wood - hard, compact, fine-grained. Used for turnery, tool handles, canes etc[46, 171, 226]. It makes an excellent fuel[226]. Espalier: tree or other plants that is trained to grow flat against a support (such as a trellis or wall).

dwatta Antibacterial Antidiarrhoeal Astringent Laxative Odontalgic StomachicThe fruit is astringent and laxative[4, 19]. The bark, and especially the root bark, is anthelmintic,

refrigerant and saporific[218, 240]. An infusion is used in the treatment of intermittent, remittent and bilious fevers[4, 240]. The leaves contain up to 2.4% of an antibacterial substance called 'phloretin'[240]. This inhibits the growth of a number of gram-positive and gram-negative bacteria in as low a concentration as 30 ppm[240]. A ripe raw apple is one of the easiest foods for the stomach to deal with, the whole process of digestion taking about 85 minutes[4]. The apple juice will reduce the acidity of the stomach, it becomes changed into alkaline carbonates and thus corrects sour fermentation[4]. The apple is also an excellent dentifrice, the mechanical action of eating a fruit serving to clean both the teeth and the gums[4].

nrakta A hybrid of garden origin, mainly involving *M. sylvestris* and *M. pumila*[200]. ksacta Not known in a truly wild situation.

propta Seed - this species is a hybrid and will not breed true from seed, though some interesting new fruiting cultivars can be produced.. It is 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, though if these are poorly drained there could be problems with diseases such as canker[200]. Prefers a sunny position but succeeds in partial shade though it fruits less well in such a situation[1, 200]. Tolerates a pH range from 6 to 7, preferring a range of 6.5 to 6.8[200]. The apple is one of the most commonly cultivated fruit crops in the temperate zone. The primary climatic requirements for the production of good quality fruit are warm summer temperatures, relative freedom from spring frosts, reasonable protection from the wind (especially cold north and east winds) and an evenly distributed rainfall of about 600 - 800mm per annum[200]. Good apple production has been achieved as far north as 65°, whilst about 1000 hours of winter temperatures below 7°C are necessary to initiate flower production[269]. However good quality apples can still be produced in other areas with careful management and choice of cultivars[200]. Even in tropical latitudes, the plant has succeeded at high elevations, producing fruit at elevations over 3000 metres in Ecuador for example[269]. Where space is at a premium, or at the limits of their climatic range, apples can be grown against a wall. Most cultivars will grow well against a sunny south or west facing wall, an east facing wall will suit many of the tougher cultivars and even a north facing wall can be used for early culinary cultivars[219]. A hybrid of mixed origins, including *M. dasycarpa*, *M. praecox*, *M. pumila*, *M. sieversii* and *M. sylvestris*, this species is very commonly cultivated in temperate areas for its edible fruit[11]. There are very many named varieties[46, 183, 200] and with careful choice of these varieties it is possible to provide freshly harvested fruit from July to December and stored fruit for the rest of the year. When chives (*Allium schoenoprasum*) or other alliums are grown under apple trees it can prevent or cure scab[18]. A spray of the infused leaves of Equisetum spp can also be used against scab[18, 201]. If climbing nasturtiums (*Tropaeolum majus*) are grown into the tree they can repel woolly aphis[18, 201]. Apples lose their flavour if they are stored with potatoes[18]. They will also impart a bitter flavour to carrots or potatoes if they are stored in the same area[201]. Growing apples near potatoes makes the potatoes more susceptible to blight[201]. Wrapping maple leaves (*Acer* spp) around apples in store helps to preserve the apples[18, 20]. Apples store better if they are grown in a sward that contains a high percentage of clover[201]. Apple trees grow better and produce better quality fruit when foxgloves (*Digitalis* spp) and wallflowers (*Erysimum cheiri*) are growing in the orchard[201]. Dandelions (*Taraxacum* spp) produce ethylene gas and this can cause earlier ripening of fruit if plants are growing in an orchard[18]. The fruit is a good wildlife food source, especially

for birds[200]. Hybridizes with other members of this genus[200]. Plants in this genus are notably susceptible to honey fungus[200].

### 3.2.5 *Rosa rugosa*

Ramanas Rose, *Rugosa rose*

3 tlin 9 cyuc 5 kcaak 3 tcan 2 dwat 2 m hkuc

hmimhtut cyutli kyuctcup hwicli hrasljutnyikfrip hpa7tli flatprikwls hpa7tmwatli fyfxre7t hjonli

drutta *Rosa rugosa* is a deciduous Shrub growing to 2 m (6ft) by 2 m (6ft) 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 from June to August, and the seeds ripen from August to October. 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, 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 dry or moist soil. The plant can tolerate maritime exposure.

pcista There is a layer of hairs around the seeds just beneath the flesh of the fruit. These hairs can cause irritation to the mouth and digestive tract if ingested.

kcakta Edible Parts: Flowers Fruit Seed StemEdible

Uses: TeaFruit - raw or cooked[1, 2, 62]. They are very sweet and pleasant to eat, though it takes quite a bit of patience to eat any quantity[K]. The fruit is a fairly large size for a rose with a relatively thick layer of flesh[K]. The fruit is about 25mm in diameter[200]. Rich in vitamin C[3, 14], containing up to 2.75% dry weight[74]. Some care has to be taken when eating this fruit, see the notes above on known hazards. Flowers - raw or cooked[183]. An aromatic flavour, they are also used in jellies and preserves[74, 183]. Remove the bitter white base of the petals before using them. Young shoots - cooked and used as a potherb[183]. Harvested as they come through the ground in spring and are still tender. The seed is a good source of vitamin E, it can be ground into a powder and mixed with flour or added to other foods as a supplement[102, 183]. Be sure to remove the seed hairs[102]. A pleasant tasting fruity-flavoured tea is made from the fruit, it is rich in vitamin C[21]. A tea is also made from the leaves[218].

tcanta Hedge HedgeThe plant makes a good low hedge[1, 29]. It is very tolerant of maritime exposure, but is very bare in winter[K].

dwatta Cancer Hepatic Vitamin CThe leaves are used in the treatment of fevers[218]. The flowers act on the spleen and liver, promoting blood circulation[147, 218]. They are used internally in the treatment of poor appetite and digestion, and menstrual complaints arising from constrained liver energy[238]. The root is used in the treatment of coughs[218]. 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 - N. China, Japan, Korea. Naturalized in several places in Britain[17]. ksacta Sandy sea shores[58].

propta Seed. Rose seed often takes two years to germinate. This is because it may need a warm spell of weather after a cold spell in order to mature the embryo and reduce the seedcoat[80]. One possible way to reduce this time is to scarify the seed and then place it for 2 - 3 weeks in damp peat at a temperature of 27 - 32°C (by which time the seed should have imbibed). It is then kept at 3°C for the next 4 months by which time it should be starting to germinate[80]. Alternatively, it is possible that seed harvested 'green' (when it is fully developed but before it has dried on the plant) and sown immediately will germinate in the late winter. This method has not as yet(1988) been fully tested[80]. Seed sown as soon as it is ripe in a cold frame sometimes germinates in spring though it may take 18 months. Stored seed can be sown as early in the year as possible and stratified for 6 weeks at 5°C[200]. It may take 2 years to germinate[200]. Prick out the seedlings into individual pots when they are large enough to handle. Plant out in the summer if the plants are more than 25cm tall, otherwise grow on in a cold frame for the winter and plant

out in late spring. Cuttings of half-ripened wood with a heel, July in a shaded frame. Overwinter the plants in the frame and plant out in late spring[78]. High percentage[78]. Cuttings of mature wood of the current seasons growth. Select pencil thick shoots in early autumn that are about 20 - 25cm long and plant them in a sheltered position outdoors or in a cold frame[78, 200]. The cuttings can take 12 months to establish but a high percentage of them normally succeed[78]. Division of suckers in the dormant season. Plant them out direct into their permanent positions. Layering. Takes 12 months[11].

nwatta Prefers a light well-drained soil but succeeds in most soils including dry ones[11, 14, 200]. Grows well in heavy clay soils[200]. Prefers a circumneutral soil and a sunny position[200]. Dislikes water-logged soils[200]. Tolerates maritime exposure[14, K]. Plants are said to withstand temperatures down to -50°C without damage[160]. The foliage is said to resist disease[11]. A very ornamental plant[1], it suckers freely but these are fairly easily controlled[K]. There are a number of named varieties[11]. 'Scabrosa' is said to be larger in all its parts, including the fruit[200], though it has not proved to be much larger with us[K]. The flowers have a clove-like perfume[245]. Grows well with alliums, parsley, mignonette and lupins[18, 20]. Dislikes boxwood[18]. Garlic planted nearby can help protect the plant from disease and insect predation[18, 20]. Hybridizes freely with other members of this genus[80]. Plants in this genus are notably susceptible to honey fungus[200]. 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 running thicket former forming a colony from shoots away from the crown spreading indefinitely [1-2]. The root pattern is suckering with new plants from underground runners away from the plant [1-2].

### 3.2.6 *Secale hybrids*

Perennial cereal rye

3 tlin 9 cyuc 5 kcaak 4 tcan 1 dwat 1.8 m hkuc

htut cyutli tcup hwicli hrasljutnyik hpa7tli flatprikwls hpa7tmwatli hjonli

drutta *Secale hybrids* is a PERENNIAL growing to 1.8 m (6ft) by 0.3 m (1ft in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 3. 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.

kcakta Edible Parts: Oil SeedEdible Uses: OilCarbon 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]. A minor or regional perennial crop in production with low or unreported yields [1-1]. Perennial hybrids are now under development. Wild perennial species found in Turkey, for example, *Secale montanum* Guss var. *anatolicum* Boiss and *Secale montanum* Guss var. *vavilovi* Grossh. have a larger stature, high frost resistance, strong tillering ability, and tolerance to poor soils and drought. Understanding wild plant species is becoming important in the development of new hybrid crops.

tcanta OilMany including Biomass; Green manure; Oil; Soil stabilization; and Thatching.

dwatta Possible. For example *Secale cereale* 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 Origin: recent hybrid origin. ksacta Hybrid propta Seed. Division.

nwatta Management: Standard Staple Crop: Balanced carb Under DevelopmentClimate: boreal to warm temper-

ate, Mediterranean. Humidity: semi-arid to humid. Carbon Farming Solutions - Cultivation: under development perennial hybrids. Management: standard (Describes the non-destructive management systems that are used in cultivation) [1-1].

### 3.2.7 *Hemerocallis fulva*

Common Day Lily, Orange daylily, Tawny Daylily, Double Daylily

3 tlin 10 cyuc 5 kcak 2 tcan 2 dwat 1 m hkuc  
hmmihmtut cyutli kyuctcup hwicli hrasjlutnyikfrip hpa7tli flatprikwis hpa7tmwatli dyatxre7t hjonli

drutta *Hemerocallis fulva* is a PERENNIAL growing to 1 m (3ft 3in) by 1 m (3ft 3in) 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 from June to August. The species is hermaphrodite (has both male and female organs). The plant is not self-fertile. 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 dry or moist soil.

pcista Large quantities of the leaves are said to be hallucinogenic[127, 137]. Blanching the leaves removes this hallucinatory component[205]. (This report does not make clear what it means by blanching, it could be excluding light from the growing shoots or immersing in boiling water[K].)

ksakta Edible Parts: Flowers Leaves Root Shoots Edible Uses: Leaves and young shoots - cooked[85, 116, 179, 183]. An asparagus or celery substitute. An excellent sweet tasting vegetable[179, K], though some caution is recommended[127, 137]. The leaves need to be eaten whilst still very young since they quickly become fibrous[K]. Flowers - raw or cooked[62, 100]. The petals are thick and crunchy, making very pleasant eating raw, with a nice sweetness at the base because of the nectar[K]. The flowers can also be dried and used as a thickener in soups etc[62, 183]. In this case, they are picked when somewhat withered and closed[85]. A rich source of iron[218]. Flower buds - raw or cooked[62, 100, 105, 116]. A pea-like flavour[85]. Can be dried and used as a relish[178]. The dried flower contains about 9.3% protein. 25% fat!?, 60% carbohydrate (rich in sugar), 0.9% ash. It is rich in vitamin A[179]. Tubers - raw or cooked[183]. A nutty flavour[62]. Young tubers are best, though the central portion of older tubers is also good[85].

tcanta WeavingThe tough dried foliage is plaited into cord and used for making footwear[205]. Plants form a spreading clump and are suitable for ground cover when spaced about 90cm apart each way[208]. The dead leaves should be left on the ground in the winter to ensure effective cover[208]. The cultivar 'Kwanso Flore Pleno' has been especially mentioned[208].

dwatta Anodyne Anthelmintic Antidote Antiemetic Antispasmodic Blood purifier Cancer Depurative Diuretic Febrifuge Laxative SedativeDiuretic, febrifuge, laxative (mild)[62, 178, 205]. The flowers are anodyne, antiemetic, antispasmodic, depurative, febrifuge and sedative[218]. In China they are used as an anodyne for women in childbirth[240]. An extract of the flowers is used as a blood purifier[240]. The rhizome has shown antimicrobial activity, it is also tuberculostatic and has an action against the parasitic worms that cause filariasis[279]. It is used in Korea to treat opipulation, jaundice, constipation and pneumonia[279]. The juice of the roots is an effective antidote in cases of arsenic poisoning[205]. The root also has a folk history of use in the treatment of cancer - extracts from the roots have shown antitumour activity[218]. A tea made from the boiled roots is used as a diuretic[205, 218].

nrakta Of uncertain origin. A garden escape in Britain. ksakta Common and widespread in the wild[205], probably as an escape from cultivation.

propta Seed - sow in the middle of spring in a greenhouse. Germination is usually fairly rapid and good. Prick out the seedlings into individual pots when they are large enough to handle. Grow the plants on for their first winter in a greenhouse and plant out in late spring[K]. Division in spring or after flowering in late summer or autumn[200]. Division is very quick and easy, succeeding at almost any time of the year[K]. 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:Border, Erosion control, Ground cover, Massing. Succeeds in most soils[1], including dry ones, though it prefers a rich moist soil[111] and a sunny position but tolerating partial shade[88, 111]. Plants flower less freely in a shady position though the flowers can last longer in such a position[205]. Grows well in heavy clay soils. Succeeds in short grass if the soil is moist[1]. Prefers a pH between 6 and 7[200]. This species is hardy to about -20°C[187]. Plants take a year or two to become established after being moved[200]. The roots have spindle-shaped swellings and spread freely, the plant can become invasive[205]. A very ornamental plant[1], it is cultivated in China and Japan for its edible flowers and leaves, there are many named varieties[200]. Individual flowers are short-lived, opening in the morning and withering in the evening. The plant, however, produces a succession of flowers over a period of about 6 weeks[205]. The sterile cultivar 'Kwanso' has double flowers, it has been especially mentioned for these flowers which are said to be crunchy with a nutty aftertaste[137]. 'Flore Pleno' is another form with double-flowers that have a delicious taste[K]. The sterile cultivar 'Europa' is very vigorous, with long stolons, and each piece of root is capable of growing into a new plant[205]. This cultivar, which is the form usually supplied from nurseries, succeeds in lawns and has even been known to grow through tarmac[205]. Hybridizes freely with other members of this genus[200]. Many forms of this plant are sterile triploids, probably of garden origin, and do not set seed[205]. The pollen, however, is fertile and can be used to fertilize other plants[205]. The plants are very susceptible to slug and snail damage, the young growth in spring is especially at risk[200]. Special Features: Naturalizing, Attracts butterflies, Suitable for cut flowers, Attractive flowers or blooms. The plant is heat tolerant in zones 12 through 2. (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 rhizomatous with underground stems sending roots and shoots along their length [1-2]. The root pattern is tuberous with swollen potato-like roots [1-2].

### 3.2.8 *Foeniculum vulgare*

Fennel, Sweet fennel

3 tlin 10 cyuc 5 kcak 4 tcan 3 dwat 1.5 m hkuc  
htut cyutli hgatkyuctcup hwicli hrasjlutnyik hpa7tli flatprikwis hpa7tmwatli fyfixre7t 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].

ksakta Edible Parts: Flowers Leaves Oil Root Seed Stem Edible Uses: Condiment Drink Oil TeaLeaves - raw or cooked[2, 4, 5, 9, 27]. A delicious aniseed flavour[183],

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

**tcanta Dye Essential Oil Repellent Strewing**The 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 Urinary**Fennel 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 estab-

lished[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, tomatoes 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, tachinid 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].

### 3.2.9 *Lepidium* spp.

**Perennial Lepidium**

3 tlin 10 cyuc 5 kcaak 0 tcan 3 dwat 1.2 m hkuc  
hmimhtut cyutli tcup hwicli hrasljutnyik hpa7ti flatprikwis  
hpa7tmwatli hjonli

**drutta** *Lepidium* spp. is a PERENNIAL growing to 1.2 m (4ft) by 2 m (6ft 7in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 3. 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.

**kcakta** Edible Parts: Leaves Root Edible Uses: Carbon Farming Solutions - Staple Crop: 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]. Fruit is usually spreading and squat (less than 3 times as long as broad),

**tcanta** See individual species.

**dwatta** Various medicinal qualities depending on the species.

**nrakta** Origin: N. Temperate. Widely distributed in the Americas, Africa, Asia, Europe, and Australia. ksacta Various depending on the species.

**propta** See individual species.

**nwatta** Management: Standard Staple Crop: Oil Under Development Climate: boreal to warm temperate. Humidity: semi-arid to humid. A genus of plants in the mustard/cabbage family, Brassicaceae. Annual to perennial, herbs or shrubs. Species include garden cress, maca, and dittander. *Lepidium* is from the Greek *lepis* (scale) referring to the shape of the seed pods. Carbon Farming Solutions - Cultivation: under development. Management: standard (Describes the non-destructive management systems that are used in cultivation) [1-1].



## 3.2.10 Malva moschata

Musk Mallow

3 tlin 10 cyuc 5 kca2 2 tcan 2 dwat m hkuc  
hmmihtut cyutli tcup hwicli hrasljutnyik hpa7tli flatprikwlis  
hpa7tmwlati fyifxre7t hjonli

drutta Malva moschata is a PERENNIAL growing to 0.8 m (2ft 7in) by 0.6 m (2ft) 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 July to August, and the seeds ripen from August 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 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. The plant can tolerate strong winds but not maritime exposure.

pcista When grown on nitrogen rich soils (and particularly when these are used inorganically), the plant tends to concentrate high levels of nitrates in its leaves[76]. The leaves are perfectly wholesome at all other times.

kcakta Edible Parts: Flowers Leaves SeedEdible Uses: Leaves - raw or cooked[K]. A mild pleasant flavour[K]. The leaves are mucilaginous and fairly bland, we use them in bulk in summer salads[K]. They make a very good perennial substitute for lettuce in a salad, producing fresh leaves from spring until the middle of summer, or until the autumn from spring germinating plants[K]. Flowers - raw[K]. A very decorative addition to the salad bowl, they are a very mild flavour[K]. Seed - raw. Best used before it is fully mature, the seed has a pleasant nutty taste but it is rather small and fiddly to harvest[K].

tcanta Dye FibreCream, yellow and green dyes can be obtained from the plant and the seed heads[168]. A fibre obtained from the stems is used for cordage, textiles and paper making[115].

dwatta Antiphlogistic Astringent Demulcent Diuretic Emollient Expectorant Laxative Poultice Salve UrinaryAll parts of the plant are antiphlogistic, astringent, demulcent, diuretic, emollient, expectorant, laxative, salve[4, 7, 9, 21, 46, 222, 238]. The leaves and flowers can be eaten as part of the diet, or a tea can be made from the leaves, flowers or roots[222]. The leaves and flowers are the main part used, their demulcent properties making them valuable as a poultice for bruise, inflammations, insect bites etc, or taken internally in the treatment of respiratory system diseases or inflammation of the digestive or urinary systems[4, 238]. They have similar properties, but are considered to be inferior, to the common mallow (*M. sylvestris*) and the marsh mallow (*Althaea officinalis*) and are seldom used internally[4]. The plant is an excellent laxative for young children[7].

nrakta Most of Europe, including Britain, south to N. Africa. ksacta Grassy places, pastures, hedgebanks etc, especially on rich soils, avoiding acid soils.

propta Seed - best sown in early spring in a cold frame. The seed germinates quickly and easily. Prick out the seedlings into individual pots when they are large enough to handle and plant them out in their permanent positions in the early summer[K]. If you have sufficient seed then it can be sown outdoors in situ in the middle to late spring. Basal cuttings in late spring. Harvest the shoots with plenty of underground stem when they are about 8 - 10cm above the ground. Pot them up into individual pots and keep them in light shade in a cold frame or greenhouse until they are rooting well. Plant them out in the summer. Cuttings of side shoots, July/August in a cold frame[111].

nwatta Landscape Uses:Border A very easily grown plant, succeeding in ordinary garden soil[1], though it prefers a reasonably well-drained and moderately fertile soil in a sunny position[200]. Hardy to about -25°C[187]. A very ornamental plant[1]. It is very variable in form, especially with regard to the degree of laciniation of the leaves[17]. The crushed leaves have a musk-like smell[245]. Plants are generally quite short-lived though they can self-sow freely when in a suitable position and usually more than maintain themselves[233, K]. If the plant is pruned back to the main branches as it comes into flower, then it will produce a fresh flush of leaves in late summer for salad use[K]. A good plant for the summer meadow[24]. Plants seem to be immune to the predations of rabbits[233]. Prone to infestation by rust fungus[200]. Special Features: Attractive foliage, Edible,

Fragrant foliage, Not North American native, Naturalizing. 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. The plant growth habit is a clumper with limited spread [1-2].

## 3.2.11 Althaea officinalis

Marsh Mallow, Common marshmallow

3 tlin 7 cyuc 5 kca2 3 tcan 5 dwat 1.2 m hkuc  
htut cyutli kyuctcup hwicli hrasljutnyik hpa7tli flatprikwlisom hpa7tmwlati fyifxre7t hjonli

drutta Althaea officinalis is a PERENNIAL growing to 1.2 m (4ft) by 0.8 m (2ft 7in). See above for USDA hardness. It is hardy to UK zone 3 and is not frost tender. It is in flower from July to September, and the seeds ripen from August to October. 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. 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.

pcista No documented adverse effects but anecdotal reports allergic reaction and lower blood sugar.

kcakta Edible Parts: Leaves Oil RootEdible Uses: Egg Oil TeaLeaves - raw or cooked[2, 4, 100]. They are used as a potherb or to thicken soups[62, 183]. When used as a small proportion with other leaves, the taste and texture is acceptable, but if a lot of the leaves are cooked together their mucilaginous texture makes them unpalatable[K]. The leaves can be eaten raw but are rather fibrous and somewhat hairy, though the taste is mild and pleasant[K]. We have found them to be quite acceptable in salads when chopped up finely[K]. Root - raw or cooked[61]. When boiled and then fried with onions it is said to make a palatable dish that is often used in times of shortage[4]. The root is used as a vegetable[62, 141, 183], it is also dried then ground into a powder, made into a paste and roasted to make the sweet 'marshmallow'[4, 5, 7, 17, 61]. The root contains about 37% starch, 11% mucilage, 11% pectin[254]. The water left over from cooking any part of the plant can be used as an egg-white substitute in making meringues etc[62]. The water from the root is the most effective[183], it is concentrated by boiling until it has a similar consistency to egg white. A tea is made from the flowers[183]. A tea can also be made from the root[183].

tcanta Adhesive Fibre Oil TeethThe dried root is used as a toothbrush or is chewed by teething children[6, 7]. It has a mechanical affect on the gums whilst also helping to ease the pain. The root is also used as a cosmetic, helping to soften the skin[7]. A fibre from the stem and roots is used in paper-making[46, 61, 74, 115]. The dried and powdered root has been used to bind the active ingredients when making pills for medicinal use[268]. A glue can be made from the root[74]. The root is boiled in water until a thick syrup is left in the pan, this syrup is used as a glue. An oil from the seed is used in making paints and varnishes[74].

dwatta Antidiarrhoeal Antitussive Demulcent Diuretic Emollient Laxative Odontalgic UrinaryMarsh mallow is a very useful household medicinal herb. Its soothing demulcent properties make it very effective in treating inflammations and irritations of the mucous membranes such as the alimentary canal, the urinary and the respiratory organs[4, 254]. The root counters excess stomach acid, peptic ulceration and gastritis[254]. It is also applied externally to bruises, sprains, aching muscles, insect bites, skin inflammations, splinters etc[4, 238]. The whole plant, but especially the root, is antitussive, demulcent, diuretic, highly emollient, slightly laxative and odontalgic[4, 17, 21, 46, 165]. An infusion of the leaves is used to treat cystitis and frequent urination[254]. The leaves are harvested in August when the

just coming into flower and can be dried for later use[4]. The root can be used in an ointment for treating boils and abscesses[254]. The root is best harvested in the autumn, preferably from 2 year old plants, and is dried for later use[238]. The German Commission E Monographs, a therapeutic guide to herbal medicine, approve *Althaea officinalis* Marsh Mallow for irritation of mouth and throat and associated dry cough/bronchitis (Root and leaf), mild stomach lining inflammation (root) (see [302] for critics of commission E).

nrakta Central and southern Europe, including Britain, to N. Africa and W. Asia. ksacta The upper margins of salt and brackish marshes, sides of ditches and grassy banks near the sea[7, 17].

propta Seed - sow spring or autumn in a cold frame. The seed is best sown as soon as it is ripe in late summer, the germination is often erratic[238]. Stratification can improve germination rates and time. Prick out the seedlings into individual pots when they are large enough to handle and plant them out in the summer[K]. Division in spring or autumn. Fairly easy, it is best to pot up the divisions in a lightly shaded position in a cold frame or greenhouse until they are growing away well and then plant them out into their permanent positions. Root cuttings in December.

nwatta Succeeds in almost any soil and situation[1, 4, 200], though it prefers a rich moist soil in a sunny position[4, 200]. It also tolerates fairly dry soil conditions[1]. Plants are hardy to about -25°C[187]. Marsh mallow is often cultivated in the herb garden, as a culinary and medicinal herb as well as for ornament[61]. Its roots were at one time the source of the sweet 'marsh mallow', but this sweet is now made without using the plant[4]. 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 tap root similar to a carrot going directly down [1-2].

### 3.2.12 *Secale strictum kuprijanovii*

3 tlin 7 cyuc 5 kcaak 0 tcan 0 dwat 1.2 m hkuc  
htut cyutli hqactw hwicli hrasjlutnyik hpa7tli flatprikhlwis  
hpa7tli hrasjt 7t 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: Seed Edible 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 - Caucasus. 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].

### 3.2.13 *Urtica dioica*

Stinging Nettle, California nettle

3 tlin 10 cyuc 5 kcaak 4 tcan 5 dwat 1.2 m hkuc  
hmimhtut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprikhlwis  
hpa7tli hrasjt 7t hjonli

drutta *Urtica dioica* is a PERENNIAL growing to 1.2 m (4ft) by 1 m (3ft 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 leaf from March to November, in flower from May to October, and the seeds ripen from June 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 is noted for attracting wildlife. Suitable for: light (sandy), 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. The plant can tolerate strong winds but not maritime exposure.

pcista The leaves of the plants have stinging hairs, causing irritation to the skin[21, 200]. This action is neutralized by heat or by thorough drying, so the cooked leaves are perfectly safe and nutritious[200]. However, only young leaves should be used because older leaves develop gritty particles called cystoliths which act as an irritant to the kidneys[172]. Possible interference with allopathic drugs for diabetes mellitus, hypertension. Central nervous system depression drugs (e.g. morphine, alcohol) may also interact with nettle. Avoid during pregnancy [301].

kcakta Edible Parts: Leaves Oil Edible Uses: Colouring Curdling agent Drink Oil Young leaves - cooked as a potherb and added to soups etc[1, 2, 9, 12, 13, 36, 183]. They can also be dried for winter use[12]. Nettles are a very valuable addition to the diet[244], they are a very nutritious food that is easily digested and is high in minerals (especially iron) and vitamins (especially A and C)[4, 201, 238]. Only use young leaves (see the notes above on toxicity) and wear stout gloves when harvesting them to prevent being stung. Cooking the leaves, or thoroughly drying them, neutralizes the sting, rendering the leaf safe to eat[4, 244]. The young shoots, harvested in the spring when 15 - 20cm long complete with the underground stem are very nice[85]. Old leaves can be laxative[5]. The plants are harvested commercially for extraction of the chlorophyll, which is used as a green colouring agent (E140) in foods and medicines[238]. A tea is made from the dried leaves, it is warming on a winters day[21, 183]. A bland flavour, it can be added as a tonic to China tea[238]. The juice of the leaves, or a decoction of the herb, can be used as a rennet substitute in curdling plant milks[183]. Nettle beer is brewed from the young shoots[200].

teanta Biomass Compost Dye Fibre Hair Liquid feed Oil Repellent Waterproofing A strong flax-like fibre is obtained from the stems[200]. Used for making string and cloth[1, 4, 6, 13, 36], it also makes a good quality paper[115]. It is harvested as the plant begins to die down in early autumn and is retted before the fibres are extracted[4, 99]. The fibre is produced in less abundance than from flax (*Linum usitatissimum*) and is also more difficult to extract[4]. The plant matter left over after the fibres have been extracted are a good source of biomass and have been used in the manufacture of sugar, starch, protein and ethyl alcohol[4]. An oil obtained from the seeds is used as an illuminant[4]. An essential ingredient of 'QR' 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 leaves

are also an excellent addition to the compost heap[12, 18, 20] and they can be soaked for 7 - 21 days in water to make a very nutritious liquid feed for plants[54]. This liquid feed is both insect repellent and a good foliar feed[14, 18, 53]. The growing plant increases the essential oil content of other nearby plants, thus making them more resistant to insect pests[18, 20, 54]. Although many different species of insects feed on nettles, flies are repelled by the plant so a bunch of freshly cut stems has been used as a repellent in food cupboards[4]. The juice of the plant, or a decoction formed by boiling the herb in a strong solution of salt, will curdle milks and thus acts as a rennet substitute[4]. This same juice, if rubbed into small seams of leaky wooden tubs, will coagulate and make the tub watertight again[4]. A hair wash is made from the infused leaves and this is used as a tonic and antidandruff treatment[172, 201]. A beautiful and permanent green dye is obtained from a decoction of the leaves and stems[4, 115]. A yellow dye is obtained from the root when boiled with alum[4, 115]. 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 Antiasthmatic Antidandruff Antirheumatic Antiseborrheic Astringent Diuretic Eczema Galactogogue Haemostatic Hypoglycaemic Stings Tonic UrinaryNettles have a long history of use in the home as a herbal remedy and nutritious addition to the diet[K]. A tea made from the leaves has traditionally been used as a cleansing tonic and blood purifier so the plant is often used in the treatment of hay fever, arthritis, anaemia etc[254]. The whole plant is antiasthmatic, antidandruff, astringent, depurative, diuretic, galactogogue, haemostatic, hypoglycaemic and a stimulating tonic[4, 9, 21, 36, 165, 238]. An infusion of the plant is very valuable in stemming internal bleeding[4], it is also used to treat anaemia, excessive menstruation, haemorrhoids, arthritis, rheumatism and skin complaints, especially eczema[238]. Externally, the plant is used to treat skin complaints, arthritic pain, gout, sciatica, neuralgia, haemorrhoids, hair problems etc[238]. The fresh leaves of nettles have been rubbed or beaten onto the skin in the treatment of rheumatism etc[257]. This practice, called urtification, causes intense irritation to the skin as it is stung by the nettles. It is believed that this treatment works in two ways. Firstly, it acts as a counter-irritant, bringing more blood to the area to help remove the toxins that cause rheumatism. Secondly, the formic acid from the nettles is believed to have a beneficial effect upon the rheumatic joints. For medicinal purposes, the plant is best harvested in May or June as it is coming into flower and dried for later use[4, 238]. This species merits further study for possible uses against kidney and urinary system ailments[222]. The juice of the nettle can be used as an antidote to stings from the leaves and an infusion of the fresh leaves is healing and soothing as a lotion for burns[4]. The root has been shown to have a beneficial effect upon enlarged prostate glands[254]. A homeopathic remedy is made from the leaves[4]. It is used in the treatment of rheumatic gout, nettle rash and chickenpox, externally is applied to bruises[4]. The German Commission E Monographs, a therapeutic guide to herbal medicine, approve *Urtica dioica* (Stinging Nettle for rheumatic ailments (internal use of leaf), irrigation therapy, for inflammatory disease of the lower urinary tract and prevention of kidney 'gravel' formation, urination difficulty from benign prostatic hyperplasia (root) (see [302] for critics of commission E).

nrakta Temperate regions throughout the world, including Britain. The plant has become naturalized at higher elevations in the Tropics. ksacta Waste ground, hedgerows, woods etc, preferring a rich soil and avoiding acid soils[4, 19].

propta Seed - sow spring in a cold frame, only just covering the seed. Prick out the seedlings into individual pots when they are large enough to handle, and plant them out in the summer. Division succeeds at almost any time in the growing season. Very easy, plant them straight out into their permanent positions.

nwatta Industrial Crop: Fiber Management: Hay Regional Crop Staple Crop: ProteinPrefers a soil rich in phosphates and nitrogen. Plants must be grown in a deep rich soil if good quality fibre is required[4, 115]. Nettles are one of the most undervalued of economic plants. They have a wide range of uses, for food, medicines, fibres etc and are also a very important plant for wildlife. There are at least 30 species of insects that feed on it and the caterpillars of sev-

eral lepidoptera species are dependent upon it for food[30]. Especially when growing in rich soils, the plant can spread vigorously and is very difficult to eradicate. It is said that cutting the plant down three times a year for three years will kill it[4]. It is a good companion plant to grow in the orchard and amongst soft fruit[53, 54]. So long as it is not allowed to totally over-run the plants, it seems to improve the health of soft fruit that grows nearby and also to protect the fruit from birds, but it makes harvesting very difficult. Dioecious. Male and female plants must be grown if seed is required. The plant is heat tolerant in zones 10 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 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].

### 3.2.14 *Secale strictum*

Mountain Rye

3 tlin 7 cyuc 5 kcaok 0 tcan 0 dwat 1.2 m hkuc hntut 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].

## 3.2.15 Rumex acetosa

Sorrel, Garden sorrel

3 tlin 7 cyuc 5 kcaak 4 tcan 3 dwat 0.6 m hkuc

hmimhtut cyutli tcup hwicli hrasjlutnyik hpa7tli frusflatprik-lwis hpa7tmwatli nyanhjen hjonli

drutta Rumex acetosa is a PERENNIAL growing to 0.6 m (2ft) 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 leaf all year, in flower from May to June, and the seeds ripen from June to August. 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 is noted for attracting wildlife. 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 acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

pcista Plants can contain quite high levels of oxalic acid, which is what gives the leaves of many members of this genus an acid-lemon flavour. Perfectly alright in small quantities, the leaves should not be eaten in large amounts since the oxalic acid can lock-up other nutrients in the food, especially calcium, thus causing mineral deficiencies. The oxalic acid content will be reduced if the plant is cooked. 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].

kcaкта Edible Parts: Flowers - raw or cooked[2, 4, 5, 7, 13, 27]. They make a thirst-quenching on their own, or can be added to salads, used as a potherb or pureed and used in soups[183]. A delicious lemon-like flavour, liked by most people who try them, they can be rather overpowering in quantity and are more generally used as a flavouring in mixed salads[K]. The leaves can also be dried for later use[12]. The leaves can be available all through the winter, especially in mild weather or if a little protection is given to the plants[K]. The leaves should be used sparingly in the diet[9, 21], see the notes on toxicity above. Flowers - cooked as a vegetable or used as a garnish[183]. Root - cooked. It is dried, ground into a powder and made into noodles[105]. Seed - raw or cooked[172]. Ground into a powder and mixed with other flours to make bread[183]. The seed is easy to harvest, but is rather small and fiddly to use[K]. The juice of the leaves can be used as a curdling agent for milks[4, 183].

tcanta Cleanser Dye PolishDark green to brown and dark grey dyes can be obtained from the roots, they do not need a mordant[168]. A grey-blue dye is obtained from the leaves and stems[106]. An infusion of the stems is used as a polish for bamboo and wicker furniture and also for silver[53, 238]. The juice of the plant removes stains from linen[14] and also ink stains (but not ball-point ink) from white material[53, 238]. It is sometimes sold as 'essential salt of lemon'[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 Anthelmintic Antischorbutic Astringent Depurative Diuretic Febrifuge Homeopathy Laxative Refrigerant StomachicThe fresh or dried leaves are astringent, diuretic, laxative and refrigerant[4, 7, 14, 21, 238]. They are used to make a cooling drink in the treatment of fevers and are especially useful in the treatment of scurvy[4]. The leaf juice, mixed with fumitory, has been used as a cure for itchy skin and ringworm[4]. An infusion of the root is astringent, diuretic and haemostatic[4, 7, 14, 21, 218]. It has been used in the treatment of jaundice, gravel and kidney stones[4]. Both the roots and the seeds have been used to stem haemorrhages[4]. A paste of the root is applied to set dislocated bones[272]. The plant is depurative and stomachic[7, 14, 21, 218]. A homeopathic remedy is made from the plant[9]. It is used in the treatment of spasms and skin ailments[9].

nrakta Most of Europe, including Britain, temperate Asia, N. America, Greenland. ksacta Meadows, by streams and in open places in woodland[7, 17]. Often found as a weed of acid soils[1].

propta Seed - sow spring in situ. Leaves can be harvested within 8 weeks from sowing. Division in spring. Division is very simple at almost any time of the year, though the plants establish more rapidly in the spring. Use a sharp spade or knife to divide the rootstock, ensuring that there

is at least one growth bud on each section of root. 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 Industrial Crop: Biomass Management: Hay Management: Standard Minor Global Crop Staple Crop: Balanced carbA very easily grown and tolerant plant, it succeeds in most soils[37], preferring a moist moderately fertile well-drained soil in a sunny position[200]. Shade tolerant[12]. Established plants are tolerant of considerable neglect, surviving even in dense weed growth[K]. Sorrel has been used since ancient times as a food and medicinal plant[244]. It is still occasionally cultivated for its edible leaves, there are some named varieties[183]. The plant stops producing leaves when it flowers in the summer, regrowing after the seed has set. Plants also usually die down in the winter. Cutting down the flowering stem will encourage the growth of fresh young leaves[4]. 'Blonde de Lyon' has large, only slightly acid leaves and is much less likely to flower than the type[200]. This means that the leaves of this cultivar are often available all through the summer and are often also produced throughout the winter, especially if the winter is mild[200, K]. A food plant for the caterpillars of many species of butterfly, it is a good plant to grow in the spring meadow[24]. Dioecious. Male and female plants must be grown if seed is required. 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 a clumper with limited spread [1-2]. The root pattern is fibrous dividing into a large number of fine roots [1-2].

## 3.2.16 Camassia quamash

Quamash, Small camas, Utah small camas, Walpole's small camas

3 tlin 7 cyuc 5 kcaak 3 tcan 1 dwat 0.3 m hkuc

hmimhtut cyutli tcup hwicli hrasjlutnyikfril hpa7tli flatprik-lwis hpa7tmwatli xre7t hjonli

drutta Camassia quamash is a BULB growing to 0.3 m (1ft) by 0.2 m (0ft 8in). 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 July to August. 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), 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.

kcaкта Edible Parts: RootEdible Uses: Bulb - raw or cooked[62, 95]. The bulb, which can be up to 5cm in diameter[270], has a mild, starchy flavour when eaten raw, but a gummy texture that reduces the enjoyment of it somewhat[K]. When cooked, however, it develops a delicious sweet flavour somewhat like sweet chestnuts[92], and is a highly nutritious food[2]. Excellent when slow baked, it can also be dried and made into a powder which can be used as a thickener in stews or mixed with cereal flours when making bread, cakes etc[K]. The bulbs can be boiled down to make a molasses, this was used on festival occasions by various Indian tribes[2, 183]. The bulbs can be harvested at any time of the year[85], but are probably best in early summer when the seeds are ripe[94]. One report says that the bulbs contain inulin (a starch that cannot be digested by humans) but that this breaks down when the bulb is cooked slowly to form the sugar fructose which is sweet and easily digested[256]. Quamash bulbs were a staple food of the N. American Indians[42, 92]. The tribes would move to the Quamash fields

in the early autumn and, whilst some people harvested the bulbs, others would dig a pit, line it with boulders then fill it with wood and set fire to it. The fire would heat the boulders and the harvested bulbs would then be placed in the pit and the whole thing covered with earth and the bulbs left to cook slowly for 2 days. The pit would then be opened and the Indians would feast on the bulbs until they could no longer fit any more in their stomachs. Whatever was left would be dried and stored for winter use.

tcanta Notable Products: Nectar, pollen, edible bulb. Attracts Wildlife - flowers attract beneficial insects. Grown as an ornamental plant.

dwatta Birthing aid OxytoxicA decoction of the roots has been used to induce labour[257]. An infusion of the leaves has been used to treat vaginal bleeding after birth and to help expel the placenta[257].

nrakta Western N. America - Washington to California, east to Montana and Utah. ksacta Coastal mountain forests and wet meadows inland[60, 62]. Marshy meadows in coniferous forest, to 2300 metres[90].

propta Seed - best sown as soon as it is ripe in a cold frame[134]. The seed can also be sown in a cold frame in spring[134]. It usually germinates in 1 - 6 months at 15°C, but it can be erratic[138]. Sow the seed thinly so that it does not need to be thinned and allow the seedlings to grow on undisturbed for their first year. Give an occasional liquid feed to ensure that the plants do not become nutrient deficient. When the plants are dormant in late summer, pot up the small bulbs putting 2 - 3 bulbs in each pot. Grow them on for another one or two years in a cold frame before planting them out when dormant in late summer. Offsets in late summer. The bulb has to be scored in order to produce offsets.

nwatta Succeeds in almost any soil[42]. Grows well in heavy clay soils. Prefers a rather heavy loam[1] that has plenty of moisture in spring but does not remain wet over the winter[138, 200]. Dislikes dry soils[200]. Prefers full sun but tolerates partial shade[138, 200]. The dormant bulbs are very hardy and will withstand soil temperatures down to at least -10°C[214]. Quamash is a very pretty flowering bulb that has quite a large potential as an edible ornamental plant[K]. It grows very well in the flower border but can also be naturalised in damp grass[134]. We are intending to grow it in a grassed-down orchard in our Cornish trial ground. The bulbs flower in late spring and early summer and have completely died down by early July so they do not interfere with harvesting the apple crop. The grass in the orchard will be cut in early spring before the quamash comes into growth, but will not be cut again until July. The bulbs will be harvested at any time from July to December and, since it is impossible to find all the bulbs, it is hoped that those remaining will be able to increase and supply bulbs for future years[K]. A polymorphic and very ornamental plant[1], there are some named varieties[200]. The subspecies C. quamash maxima has larger bulbs than the type, up to 65mm in diameter[270]. A good bee plant[108]. This species can be confused with certain poisonous bulbs in the genus Zigadenus[85]. Plant the bulbs 7 - 10cm deep in early autumn and then leave undisturbed[1]. 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 runner spreading indefinitely by rhizomes or stolons [1-2]. Ephemeral emerging in spring and dying back by summer every year [1-2]. The root pattern is a bulb.

## 4 4 tin

### 4.1 bwon

#### 4.1.1 Hippophae rhamnoides turkestanica

Sea Buckthorn

tfot2n 4 tin 7 cyuc 5 kcaak 5 tcan 5 dwat 6 m hkuc htut cyutll hgaikyuctcuphja7n hwicli hyishrasljutnyik hpa7tll flatpriklwis hpa7tmwatll 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.

kaakta Edible Parts: FruitEdible 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 Poultice 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

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.

## 4.1.2 *Amphicarpaea bracteata*

Hog Peanut, American hogpeanut  
tfo2n 4 tlin 9 cyuc 5 kcaak 3 tcan 1 dwat 1.5 m hkuc  
pcimhmim cyutli tcup hwicli hrasljutnyik hpa7tli flatpriklwis  
hpa7tmwatli xre7t hjonli

drutta *Amphicarpaea bracteata* is a PERENNIAL CLIMBER growing to 1.5 m (5ft). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in leaf from May to October, in flower from August to September, and the seeds ripe from September to October. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in full shade (deep woodland) or semi-shade (light woodland). It prefers moist soil.

ckakta Edible Parts: Root Seed Edible Uses: Seed - raw or cooked[2, 161]. Two types of seed are produced - flowers produced near the ground produce a pod that buries itself just below soil level. These pods contain a single seed are up to 15mm in diameter which can be used as a peanut substitute. They can be harvested throughout the winter and can

be eaten raw or cooked[2, 63, 95, 161]. They are sweet and delicious raw with a taste that is more like shelled garden beans than peanuts[183]. Yields are rather low, and it can be a fiddle finding the seeds, but they do make a very pleasant and nutritious snack[K]. Other flowers higher up the plant produce seed pods that do not bury themselves. The seeds in these pods are much smaller and are usually cooked before being eaten[95, 183]. They can be used in all the same ways as lentils and are a good source of protein[K]. The overall crop of these seeds is rather low and they are also fiddly to harvest[K]. Root - cooked[177, 257]. The root is peeled, boiled and then eaten[257]. Fleshy and nutritious according to one report[200], whilst another says that the root is too small to be of much importance in the diet[257]. Our plants have only produced small and stringy roots[K].

tcanta Nitrogen Fixer.

dwatta An infusion of the root has been used in the treatment of diarrhoea[257]. Externally, the root has been applied to bites from rattlesnakes[257]. A poultice of the pulverized leaves has been applied with any salve to swellings[257].

nrakta Eastern N. America - New Brunswick to Florida, west to Manitoba and Louisiana. ksacta Cool damp woodlands[43, 200].

propta Seed - pre-soak for 12 hours in warm water and then sow in spring in a semi-shaded position in a greenhouse. Germination usually takes place within a few weeks. 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. Division. We have been unable to divide this plant because it only makes a small taproot. However, many of the seeds are produced under the ground and these can be harvested like tubers and potted up to make more plants.

nwatta Agroforestry Services: Nitrogen Agroforestry Services: Understorey legume Historic Crop Management: Fodder Management: Standard Staple Crop: Protein Requires a moist humus-rich soil in a shady position[200]. The young shoots in spring can be damaged by late frosts[K]. The hog peanut has occasionally been cultivated for its edible seed which has been used as a peanut substitute[183]. Yields at present, however, are rather low[K]. Two types of blossom are produced by the plant - those produced from the leaf axils mostly abort but a few seeds are produced[95]. Solitary, inconspicuous cleistogamous flowers are produced on thread-like stems near the root and, after flowering, the developing seedpods bury themselves into the soil in a manner similar to peanuts[95, 274]. 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]. 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 self-seeding plant [1-2]. Growth habit is herbaceous. Growth habit is a single or multiple shooting vine from a crown [1-2]. The root pattern is fibrous dividing into a large number of fine roots [1-2].

## 4.1.3 *Apios fortunei*

Hodo, Hodoimo  
tfo2n 4 tlin 9 cyuc 5 kcaak 3 tcan 1 dwat m hkuc  
hmimhtut cyutli tcup hwicli hrasljut hpa7tli frusflatpriklwis  
hpa7tmwatli xre7t hjonli

drutta *Apios fortunei* is a PERENNIAL. See above for USDA hardiness. It is hardy to UK zone 5. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. It can fix Nitrogen. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained 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 soil.

ckakta Edible Parts: Root Edible Uses: Tuber - raw or cooked[105, 177]. It has a delicious flavour somewhat like sweet potatoes when roasted[179]. The tuber can also be dried and ground into a powder. The tuber contains about 4.2% protein, 0.2% fat, 18.3% starch, 6% other carbohydrate, 1.3% ash[179].

dwatta TonicThe root is tonic[218]. nrakta E. Asia - China, Japan. ksacta Woods and thickets, 600 - 1000 metres in W. China[109].

propta Seed - pre-soak for 3 hours in tepid water and sow February/March in a cold frame. The seed usually germinates in 1 - 3 months at 15°C[134]. When large enough to handle, prick the seedlings out into individual pots and grow them on in light shade in the greenhouse for their first winter, planting them out in late spring or early summer. Division can be carried out at almost any time of the year, though spring is probably the best time. Simply dig up the roots, harvest the tubers and replant them where you want the plants to grow. It is also possible to harvest the tuber in winter, store them in a cool fairly dry but frost-free place over the winter and then plant them out in the spring. The tubers lose moisture rapidly once they have been harvested, so make sure that you store them in a damp medium such as leafmold.

nwatta We have very little information on this species and do not know if it will be hardy in Britain, though judging by its native range it should succeed outdoors in many parts of this country. The following notes are based on the general needs of the genus. Prefers a light rich soil and a sunny position[1, 27]. Another report says that it prefers light dappled shade[200]. Tolerates acid soils[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[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. Growth habit is a single or multiple shooting vine from a crown [1-2]. Herbaceous. The root pattern is tuberous with swollen potato-like roots [1-2].

#### 4.1.4 Psoralea esculenta

Breadroot, Large Indian breadroot  
tfo2n 4 tlin 8 cyuc 5 kcak 3 tcan 1 dwat 0.3 m hkuc  
htut cyutli kyucup hwicli hrasljutnyik hpa7tli flatprikhwis  
hpa7tmwatli xre7t hjonli

drutta Psoralea esculenta is a PERENNIAL growing to 0.3 m (1ft). See above for USDA hardiness. It is hardy to UK zone 4. It is in flower from May to July. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. It can fix Nitrogen. 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.

pcista This species contains furanocoumarins, these substances can cause photosensitivity in some people[65].

kcakta Edible Parts: Oil RootEdible Uses: OilRoot - raw or cooked[2, 4, 46, 57, 161]. It can also be dried for later use[183]. The dried root can be ground into a powder and used with cereals in making cakes, porridges etc[183]. Starchy and glutinous, the raw root is said to have a sweetish turnip-like taste[183]. The plant is best harvested as the tops die down at the end of the growing season[85]. This food is a staple and also considered to be a luxury item by many native North American Indian tribes[2, 61]. The root contains about 70% starch, 9% protein and 5% sugars[95].

tcanta Oil Soil stabilizationThe plant is a good soil stabilizer in its natural environment[200].

dwatta Pectoral Poultice StomachicAn infusion of the dried roots has been used in the treatment of gastro-enteritis, sore throats and chest problems[257]. The roots have been chewed by children as a treatment for bowel complaints[257]. A poultice of the chewed roots has been applied to sprains and fractures[257].

nrakta N. America - Manitoba to North Dakota and Wisconsin, south to Missouri and Texas. ksacta Rocky woods and prairies, on calcareous soils[43].

propta Pre-soak the seed for 24 hours in warm water and then sow in early to mid spring in a greenhouse. Either sow the seed in individual pots or pot up the young seedlings as soon as possible in order to avoid root disturbance. Grow them on in the pots until planting out in their final positions. It is usually impossible to transplant this species without fatal damage to the root[200]. Division in spring. With great

care since the plant presents root disturbance. It is virtually impossible to divide this species successfully[200].

nwatta Succeeds in an ordinary garden soil[1]. Requires a well-drained soil in a sunny position[200]. Plants are very intolerant of root disturbance, they are best planted out into their permanent positions whilst still small[200]. This plant has been recommended for improvement through breeding and selection for its edible root[183]. It was sent to Europe around the year 1800 as a potential food crop but was not well received[213]. 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]. 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 tuberous with swollen potato-like roots [1-2].

## 4.2 mran

### 4.2.1 Tilia platyphyllos

Large Leaved Lime, Largeleaf linden, Bigleaf Linden  
4 tlin 6 cyuc 5 kcak 4 tcan 3 dwat 30 m hkuc  
hmimhtut cyutli tcup hwicli hrasljutnyik hpa7tli flatprikhwis  
hpa7tmwatli xre7t hjonli

drutta Tilia platyphyllos is a deciduous Tree growing to 30 m (98ft) by 20 m (65ft) 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, and the seeds ripen in 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), 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.

pcista If the flowers used for making tea are too old, they may produce symptoms of narcotic intoxication[4].

kcakta Edible Parts: Leaves SapEdible Uses: Chocolate TeaYoung leaves - raw. A delicious addition to salads and sandwiches, the young leaves are mild and tender with a somewhat mucilaginous texture[K]. A very acceptable chocolate substitute can be made from a paste of the ground-up flowers and immature fruit. Trials on marketing the product failed because the paste is very apt to decompose[2, 115]. A popular herb tea is made from the flowers, it has a sweet, fragrant pleasant flavour. Some caution is advised, see notes above on toxicity. Sap - harvested in the spring, it is sweet and can be used as a drink or concentrated into a syrup[4].

tcanta Charcoal Fibre Paper WoodA fibre from the inner bark is used to make mats, shoes, baskets, ropes etc[1, 13, 14, 46, 61, 100]. It is also suitable for cloth[115]. It is harvested from trunks that are 15 - 30cm in diameter[115]. The fibre can also be used for making paper[189]. The stems are harvested in spring or summer, the leaves are removed and the stems steamed until the fibres can be stripped. The outer bark is removed from the inner bark by peeling or scraping. The fibres are cooked for 2 hours with lye and then beaten in a ball mill. The paper is beige in colour[189]. Wood - soft, white, easily carved. It is very suitable for carving domestic items and small non-durable items[4, 13, 46, 61, 115]. A charcoal made from the wood is used for drawing and has medicinal properties[7, 46, 61, 115].

dwatta Antispasmodic Diaphoretic Diuretic Expectorant Hypotensive Laxative SedativeLime flowers are a popular domestic remedy for a number of ailments, especially in the treatment of colds and other ailments where sweating is desirable[9]. A tea made from the fresh or dried flowers is antispasmodic, diaphoretic, expectorant, hypotensive, laxative and sedative[4, 9, 13, 226, 238]. Lime flower tea is also used internally in the treatment of indigestion, hypertension, hardening of the arteries, hysteria, nervous vomiting or palpitation[4, 238]. The flowers are harvested commercially and often sold in health shops etc[226]. Lime flowers are said to develop narcotic properties as they age and so they should only be harvested when freshly opened[238]. A charcoal made from the wood is used in the treatment of gastric

despetic disturbances and is also made into a powder then applied to burns or sore places[4]. It is also quite an effective vasodilator[7].

nrakta Europe, from Britain and Belgium south and east to Spain, Crimea, Caucasus and W. Asia. ksacta Woods on good calcareous or base rich soils[17].

propta Seed - much of the seed produced in Britain is not viable, cut a few seedcases open to see if there is a seed inside[80]. If possible, obtain fresh seed that is ripe but has not as yet developed a hard seed coat and sow it immediately in a cold frame. It may germinate in the following spring though it could take 18 months[80]. Stored seed can be very slow to germinate. It has a hard seed coat, embryo dormancy and a hard coat on the pericarp. All these factors mean that the seed may take up to 8 years to germinate[80]. One way of shortening this time is to stratify the seed for 5 months at high temperatures (10°C at night, up to 30°C by day) and then 5 months cold stratification[80]. 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. Layering in spring just before the leaves unfurl. Takes 1 - 3 years[78]. Suckers, when formed, can be removed with as much root as possible during the dormant season and replanted immediately[200].

nwatta Landscape Uses:Espalier, Pollard, Screen, Specimen. Prefers a good moist loamy alkaline to neutral soil but succeeds on slightly acid soils[11, 200]. Grows poorly on any very dry or very wet soils[200]. Succeeds in sun or semi-shade[188]. Plants can be transplanted quite easily, even when quite large, trees up to 60 years old have been moved successfully[1, 74]. Lime trees are very long-lived[7] and are amenable to coppicing or pollarding. This species does not produce many suckers[98, 200]. Grows well in Britain, it is the only species that reliably produces viable seed in areas with cool summers[200]. Lime trees tend to hybridise freely if other members of the genus are growing nearby[238]. If growing plants from seed it is important to ensure the seed came from a wild source or from an isolated clump of the single species[K]. Grows best in a woodland situation, young plants tolerate a reasonable level of side shade[200]. Mature trees cast a dense shade[186]. A very valuable bee plant, producing an abundance of nectar[7, 11, 125]. A valuable tree for wildlife, there are 31 species of insects associated with this tree[24]. A food plant for the caterpillars of many butterfly and moth species[30]. Trees are usually attacked by aphids which cover the ground and the leaves with a sticky honeydew[188]. There are some named varieties selected for their ornamental value[188]. Plants in this genus are notably resistant to honey fungus[200]. Special Features:Not North American native, Fragrant flowers, Attractive flowers or blooms.

## 4.2.2 Corylus hybrids

Hybrid and Neohybrids, Hazel, Filbert

4 tlin 9 cyuc 5 kcaak 5 tcan 2 dwat 25 m hkuc  
hmimhtut cyutli tcup hwicli hrasljutnyik hpa7tli frusflatprikli-wisslip hpa7tmwatli hjonli

drutta Corylus hybrids is a deciduous Shrub growing to 25 m (82ft) by 20 m (65ft) at a medium rate. See above for USDA hardness. It is hardy to UK zone 4. 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 can grow in semi-shade (light woodland) or no shade. It prefers moist soil. The plant can tolerate strong winds but not maritime exposure.

kcakta 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). Hazelnuts are among the best perennial protein and oil staple crops for temperate and boreal climates. Hybrids and neohybrid hazels are of increasing importance [1-1].

tcanta Carbon Farming Solutions - Other Systems: woody agriculture. See individual species.

dwatta See individual species.

nrakta Hybrid ksacta Native to the temperate Northern Hemisphere. See individual species.

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]. Division of suckers in early spring. Very easy, they can be planted out straight into their permanent positions.

nwatta Climate: boreal to warm temperate, Mediterranean. Humidity: semi-arid to humid. Carbon Farming Solutions - Cultivation: new crop. Management: standard, coppice (Describes the non-destructive management systems that are used in cultivation) [1-1].

## 4.2.3 Quercus ilex

Holly Oak, Evergreen Oak

4 tlin 10 cyuc 5 kcaak 3 tcan 2 dwat 25 m hkuc  
hmimhtut cyutli tcup hwicli hrasljutnyikfrip hpa7tli flatprikli-wisslipshom hpa7tmwatli hjonli

drutta Quercus ilex is an evergreen Tree growing to 25 m (82ft) by 20 m (65ft) at a slow rate. See above for USDA hardness. It is hardy to UK zone 7. 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. 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 and saline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil. The plant can tolerate maritime exposure.

kcakta Edible Parts: Oil Seed Edible Uses: Coffee Oil Seed - raw or cooked[1, 2, 46, 61]. It can be sweet or bitter[K]. The seed is up to 3cm long[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 contains 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. An edible oil is obtained from the seed[183]. One reader noted the Q. suber population of the Mamora forest in Morocco contains only sweet acorns and can be eaten raw, it has a similar taste to raw chestnuts. The skin removes quite easily Quercus ilex also exists with tannin-free acorns in the Moroccan forests, the locals say around 20 percent are sweet.

tcanta Fodder Fuel Hedge Oil Repellent Shelterbelt Tannin WoodLandscape Uses: Specimen, Street tree. A 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]. Very tolerant of maritime exposure and of trimming, it can be grown as a shelterbelt tree or hedge in maritime areas[11, 29, 49, 75]. Wood - strong, hard, durable. Used for furniture[46, 61, 89]. It makes a good charcoal[89] and a good fuel, burning well even if green[146]. The bark is a source of tannin[146]. Heat Zone: 9-2.

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].



nrakta Europe - Mediterranean. Occasionally naturalized in Britain in S. England[17]. ksacta Arid places, maquis, woods and hills on limestone[89].

propta Seed - it quickly loses viability if it is allowed to dry out. It can be stored moist and cold 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.

nrwatta Fodder: Mast Industrial Crop: Tannin Management: Standard Other Systems: Dethesa Regional Crop Staple Crop: Balanced carbPrefers a good deep fertile loam which can be on the stiff side[11]. Thrives on shallow chalky soils[188]. Succeeds in all soils except those that are cold and poorly drained[98]. Grows well in sandy soils[188]. Young plants tolerate reasonable levels of side shade[200]. Very resistant to maritime exposure[11, 49, 75]. A very ornamental tree[1] but it is quite slow-growing[75]. Transplants badly unless moved regularly and this should be done as growth commences in late May or in September[11]. Fruits very freely in Britain[K]. The seed ripens in its first year[200]. The sub-species *Q. ilex* ballota is cultivated for its sweet-tasting edible seed in Portugal and Spain[K]. Hybridizes freely with other members of the genus[200]. This species is notably resistant to honey fungus[88, 200]. Special Features: Not North American native, Inconspicuous flowers or blooms. The plant is heat tolerant in zones 9 through 2. (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].

## 4.2.4 Diospyros virginiana

American Persimmon, Common persimmon, Persimmon

4 tlin 8 cyuc 5 kcaak 3 tcan 1 dwat 20 m hkuc  
hmmihmtut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprikwlis  
hpa7tmwatli nyanhjen hjonli

drutta *Diospyros virginiana* is a deciduous Tree growing to 20 m (65ft 7in) 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, 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 Insects, 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 can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

kcakta Edible Parts: Fruit OilEdible Uses: Coffee Oil Sweetener TeaFruit - raw, cooked or dried and used in breads, cakes, pies, puddings etc[46, 183]. About the size of a plum, the fruit has an exquisitely rich flavour when it is fully ripe (and almost at the point of going bad) but it is very harsh and astringent before then[2, 3, 171, K]. The fruit may not ripen properly in a cool summer, though if it is frosted it normally develops a very good flavour[K]. The fruit can also be harvested in the autumn, preferably after a frost, and bled. (This is a process where the fruit is kept in a cool place and only eaten when it is very soft and almost at the point of going rotten). Much of the fruit on trees in a relatively sunny position at Kew after a relatively warm summer in 1996 was still not fully ripe, though it was very nearly so and ripened well off the tree[K]. The fruit can also be dried and used in

bread, cakes etc. The fruit is up to 4.5cm in diameter[200]. Molasses can be made from the fruit pulp[183]. An oil obtained from the seeds is said to taste like peanut oil[222]. A tea is made from the dried leaves[102]. It is high in vitamin C and has a pleasant flavour somewhat like saffras[21, 183]. The roasted seed is used as a coffee substitute[177, 183].

tcanta Oil Soil stabilization WoodCan be used as a rootstock for *D. kaki*[46]. Wood - strong, hard, heavy, fine-grained, elastic, resistant to wear. A valuable wood, it is used for making wooden ware, turnery etc[46, 82, 149, 171]. It is used especially for making handles for golf clubs[149].

dwatta Antiscorbatic Astringent Vitamin C WartsA decoction of the boiled fruit was used to treat bloody stools[213]. (This probably refers to the unripe fruit, which is very astringent[K]). The leaves are rich in vitamin C and are used as an antiscorbatic[213]. A decoction of the inner-bark is highly astringent[149, 222]. It has been used as a mouth rinse in the treatment of thrush and sore throats[213, 222]. Used externally as a wash for warts or cancers[222].

nrakta Eastern N. America - New England to Florida, west to Texas and Kansas. ksacta Dry woods, old fields and clearings[43], on light well-drained sandy soils[82]. Found on most soil types from sands to shales and mud bottomlands[149].

propta Seed - best sown in a cold frame as soon as it is ripe[113, 200]. Stored seed requires cold-stratification and should be sown as early in the year as possible[78]. It usually germinates in 1 - 6 months at 15°C[175]. Pot up the young seedlings as soon as they are large enough to handle into fairly deep pots and plant them out in early summer. Give the plants some protection from winter cold for their first winter or two outdoors. Cuttings of half-ripe wood, July/August in a frame[200]. Layering in spring[200].

nrwatta Requires a good deep loamy soil in sun or light shade[200]. If being grown for its fruit, the tree requires a warm, sunny, sheltered position[K]. It dislikes very acid or wet and poorly drained soils[200]. Plants are somewhat tender when young[11], though dormant mature trees are hardy to about -35°C[160]. 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]. Dioecious, but the female tree can produce seedless fruits in the absence of a pollinator[1]. It is likely that unfertilized fruits are more astringent than fertilized fruits since this is the case with *D. kaki*[K]. Trees can start producing fruit when only a few years old, a specimen seen at Kew Botanical gardens in autumn 1996 was only 1.5 metres tall and was bearing a very large crop of fruit[K]. This species is occasionally cultivated for its edible fruit, there are several named varieties[82, 183]. 'Dooley' grows well near the northern limits of persimmon culture[183]. 'Geneva Red' also grows well at the northern limits of persimmon culture. The fruit is medium to large[183]. 'Meader' grows well in cooler areas, it is self-fertile[183]. Plants have a long tap root and are difficult to transplant[149, 200], it is best to plant them out in their permanent position as soon as possible and to give protection overwinter for the first year or two[K]. The ssp. *D. virginiana* platycarpa has sweet succulent flesh, it grows wild from Missouri to Arkansas[82]. Special Features: Attracts birds, North American native, 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. A sprouting standard sending up shoots from the base [1-2]. The root pattern is a tap root similar to a carrot going directly down [1-2]. The root pattern is suckering with new plants from underground runners away from the plant [1-2].

## 4.2.5 Actinidia arguta

Tara Vine  
4 tlin 8 cyuc 5 kcaak 2 tcan 0 dwat 15 m hkuc  
hmmimhtut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprklwis  
hpa7tmwatli nyanhjen hjonli

drutta Actinidia arguta is a deciduous Climber growing to 15 m (49ft 3in). See above for USDA hardiness. It is hardy to UK zone 4 and is not frost tender. It is in leaf from May to November, in flower from June to July, 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 Bees, insects. The plant is not self-fertile. Suitable for: light (sandy), 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.

kcakta Edible Parts: Fruit SapEdible Uses: Fruit - raw, cooked or dried for later use[1, 3, 61, 105]. Sweeter than A. deliciosa, the kiwi fruit[183], the skin is smooth and can be eaten with the fruit[K]. The fruit contains up to 5 times the vitamin C content of blackcurrants[74]. Highly esteemed according to one report[151] whilst another says that they are insipid[11]. The fruits are greenish-yellow or purple-red when mature and are about 2 to 3cm long[198, 266]. They contain a number of small seeds, but these are easily eaten with the fruit[K]. The plant is rich in sap and this can be tapped and drunk in the spring[105, 177, 183].

nrakta E. Asia - China, Japan ksacta Climbing up trees in woodland, mountain forests, thickets, streamsidings and moist places at elevations of 700 - 3600 metres[11, 198, 266].

propta Seed - sow spring in a greenhouse[133]. It is probably best if the seed is given 3 months stratification[113], either sow it in a cold frame as soon as it is ripe in November or as soon as it is received. Fresh seed germinates in 2 - 3 months at 10°C, stored seed can take longer[133]. When they are large enough to handle, prick the seedlings out into individual pots and grow them on in light shade in the greenhouse for at least their first winter. When the plants are 30cm or more tall, plant them out into their permanent positions in late spring or early summer, after the last expected frosts[K]. Most seedlings are male[126]. The seedlings are subject to damping off, so they must be kept well ventilated[113]. Cuttings of softwood as soon as ready in spring in a frame[K]. Cuttings of half-ripe wood, July/August in a frame. Very high percentage[113]. Cuttings of ripe wood, October/November in a frame.

nwatta Prefers a sound loamy neutral soil[1, 200]. Tolerates acid and moderately alkaline soils[202]. Succeeds in semi-shade but full sun is best for fruit production[200]. Prefers a sheltered position[200]. A very hardy plant, tolerating temperatures down to -30°C or more, but the young spring growth is susceptible to frost damage[160]. Some cultivars are said to tolerate temperatures down to about -50°C when fully dormant[160]. This species is often cultivated for its edible fruit and it is increasingly being seen as having potential in Britain. There are some named varieties[183]. Plants are usually dioecious but the cultivar 'Is-sai' is self-fertile[200]. A polymorphic species[74]. Fruits are formed on second year wood and also on fruit spurs on older wood[126], any pruning is best carried out in the winter[219]. Plants only flower when grown in warm climates[202]. This species flowers well in gardens in the south and west of Britain[219], the small flowers being sweetly scented[245]. This is a climbing plant, supporting itself by twining around branches etc[200]. Male and female plants must usually be grown if seed is required. Plants in this genus are notably resistant to honey fungus[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 avail-

able. Woody. Growth habit is a single or multiple shooting vine from a crown [1-2]. The root pattern is a heart root, dividing from the crown into several primary roots going down and out [1-2].

## 4.2.6 Prunus domestica

Plum, European plum  
4 tlin 9 cyuc 5 kcaak 3 tcan 2 dwat 12 m hkuc  
hmmimhtut cyutli tcup hwicli hrasjlutnyikfrip hpa7tli flatprklwis hpa7tmwatli fyifxre7t hjonli

drutta Prunus domestica is a deciduous Tree growing to 12 m (39ft) by 10 m (32ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 5. It is in flower in April, and the seeds ripen from July to November. 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, 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.

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: Flowers Fruit Oil Oil SeedEdible Uses: Gum Oil Oil TeaFruit - raw or cooked[1, 2, 7, 46]. The fruit varies considerably from cultivar to cultivar, but it is generally somewhat mealy, soft and juicy with a delicious flavour ranging from very sweet to acid[K]. The more acid fruits are usually only used for cooking purposes[K]. The fruit varies widely in size according to cultivar but can be 8cm long and contains a single large seed[200]. Seed - raw or cooked. Do not eat the seed if it is too bitter - see the notes above on toxicity. An edible gum is obtained from points of damage on the trunk[64]. The seed contains about 20% of an edible semi-drying oil[4, 57]. It has an agreeable almond smell and flavour[4]. The flowers are eaten. They are used as a garnish for salads and ice cream or brewed into a tea[183].

tcanta Adhesive Dye Gum Oil Oil WoodA green dye can be obtained from the leaves[168]. A dark grey to green dye can be obtained from the fruit[168]. A yellow dye is obtained from the bark[115]. A gum obtained from points of damage along the stem can be used as an adhesive[64]. The ground up seeds are used cosmetically in the production of face-masks for dry skin[7]. A semi-drying oil is obtained from the seed[64]. No details of its uses. Wood - hard, compact. Used for musical instruments[115].

dwatta Febrifuge Laxative StomachicThe dried fruit, known as prunes, is a safe and effective laxative and is also stomachic[4, 7, 21, 238]. The bark is sometimes used as a febrifuge[7]. 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 Europe to W. Asia. Naturalized in Britain. A hybrid P. spinosa x P. cerasifera divaricata. ksacta Found in hedges in Britain[17].

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.

nawatta Requires a well-drained moisture retentive soil[1, 11] and a sheltered position[200]. Succeeds in light shade but fruits better in a sunny position[11, 200]. Thrives in a loamy soil, doing well on limestone[11]. Grows well in heavy clay soils. Prefers some chalk in the soil but it is apt to become chlorotic if too much is present[1]. Prefers a pH between 6 and 6.5[200]. The plum is widely cultivated for its edible fruit in temperate zones, there are many named varieties able to supply fresh fruits from late July to November or December[183]. Many cultivars are fully self-fertile, though some are partially self-sterile and others require cross-pollination[200]. Where space is at a premium, or at the limits of their climatic range, plums can be grown against a wall. Most cultivars will grow well against a sunny south or west facing wall, whilst an east facing wall will suit some of the tougher cultivars, a north facing wall is not really suitable[219]. This species is probably a hybrid of ancient origin between *P. spinosa* and *P. cerasifera*, coupled with chromosome doubling[17]. It does not cross-pollinate with the Japanese plum, *P. salicina*[200]. Prefers growing in a continental climate, mild winters tend to encourage earlier flowering with a greater risk of frost damage to the blossom. In Britain the best fruits are produced away from the western side of the country. 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]. The plant is heat tolerant in zones 8 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 the 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]. 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. The root pattern is suckering with new plants from runners away from the plant [2-1].

## 4.2.7 Rubus procerus

### Himalayan Giant Blackberry

4 tlin 8 cyuc 5 kcaak 1 tcan 0 dwat 10 m hkuc  
hmimhtut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprikhwis  
hpa7tmwtwli fyifxre7t hjonli

drutta Rubus procerus is a deciduous Shrub growing to 10 m (32ft 10in) 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 August, and the seeds ripen from August to September. 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 can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked in pies, cakes etc[3, 105, 183]. The fruit can also be dried for later use[183]. Very large for a blackberry[50, 183] with a very pleasant rich flavour when fully ripe[K].

tcanta DyeA purple to dull blue dye is obtained from the fruit[168].

nrakta C. Europe. ksacta Not known

propta Seed - requires stratification and is best sown in early autumn in a cold frame. Stored seed requires one month stratification at about 3°C and is best sown as early as possible in the year. Prick out the seedlings when they are large enough to handle and grow on in a cold frame. Plant them out into their permanent positions in late spring of the following year. Cuttings of half-ripe wood, July/August in a frame[200]. Tip layering in July. Plant out in autumn. Division in early spring or just before leaf-fall in the autumn[200].

nawatta Easily grown in a good well-drained loamy soil in sun or semi-shade[1, 11, 200]. A form of this species, known as 'Himalayan giant', is commonly cultivated in temperate zones for its edible fruit[50]. Although a blackberry, the stems are often perennial and can fruit for more than one year[50]. This name may be wrongly applied. According to the new RHS Dictionary of Gardening, the correct name for the 'Himalayan Giant' blackberry is *R. procerus*. P.J.Muell., the name *R. discolor* is misapplied. Plants in this genus are notably susceptible to honey fungus[200].

## 4.2.8 Crataegus pedicellata

### Scarlet Haw, Scarlet hawthorn

4 tlin 8 cyuc 5 kcaak 2 tcan 2 dwat 7 m hkuc  
hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfrp hpa7tli  
flatprikhwisslp hpa7tmwtwli 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 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 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

the roots of 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.

## 4.2.9 *Corylus avellana*

Common Hazel, Common filbert, European Filbert, Harry Lauder's Walking Stick, Corkscrew Hazel, Hazel  
4 tlin 8 cyuc 5 kcaak 5 tcan 2 dwat 6 m hkuc  
hmimhtut cyutli tcup hwicli hrasjlutnyik hpa 7tli frusflatprikli-wisslip hpa 7tmwatli dyat hjonli

drutta *Corylus avellana* is a deciduous Tree growing to 6 m (19ft) by 3 m (9ft) 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 from January to April, 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. It is noted for attracting wildlife. 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 acid and very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil. The plant can tolerate strong winds but not maritime exposure.

kcakta Edible Parts: Oil Oil Seed Edible Uses: Milk Oil Oil Seed - raw or roasted and used in breads, cakes, biscuits, sweets etc[2, 5, 9, 12, 13, 34, 183]. An excellent nut for raw eating[K]. They can also be liquized and used as a plant milk[183]. Rich in oil. 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]. A clear yellow edible oil is obtained from the seed[7, 9, 183]. It is used in salad dressings, baking etc.

tcanta Basketry Charcoal Cosmetic Hedge Hedge Miscellany Oil Oil Plant support Polish Tannin Wood The seed contains up to 65% of a non-drying oil, used in paints, cosmetics etc[13, 46, 57, 132]. The whole seed can be used to polish and oil wood[6]. It is very easy to apply and produces a nice finish[K]. The finely ground seeds are used as an ingredient of face masks in cosmetics[7]. Plants can be grown as a tall hedge[29]. They need to be left untrimmed or only lightly trimmed if seed is required[29]. The bark and leaves are a source of tannin[7]. Wood - soft, easy to split, not very durable, beautifully veined. Used for inlay work, small items of furniture, hurdles, wattles, basketry, pea sticks etc[7, 13, 23, 46, 61, 63, 66, 125]. The twigs are used as dowsing rods by water diviners[11]. The wood also yields a good quality charcoal, used by artists[63, 101].

dwatta Anthelmintic Astringent Diaphoretic Diaphoretic Febrifuge Miscellany Nutritive Stomachic Tonic The bark, leaves, catkins and fruits are sometimes used medicinally[7]. They are astringent, diaphoretic, febrifuge, nutritive and odontalgic[7]. The seed is stomachic and tonic[240]. The oil has a very gentle but constant and effective action in cases of

infection with threadworm or pinworm in babies and young children[7].

nrakta Europe, including Britain, from Norway to Spain and east to W. Asia. ksacta Woods and hedgerows, especially on the slopes of hills, often on calcareous soils[7, 17].

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]. Division of suckers in early spring. Very easy, they can be planted out straight into their permanent positions.

nwatta Global Crop Industrial Crop: Biomass Management Coppice Management: Standard Staple Crop: Protein-oil Landscape Uses: Container, Standard, Specimen. 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]. Succeeds in a pH range 4.5 to 8.5, but prefers a range of 5 to 7[200]. Plants are fairly wind tolerant[1, 11]. A very hardy plant, succeeding in all areas of Britain[200]. The flowers, however, are produced in late winter and early spring and can be damaged by heavy frosts at this time[200]. A parent, together with *C. maxima*, of many cultivated forms of filberts and cob nuts. There are many named varieties[11]. Plants are self-fertile but a more certain crop is obtained if more than one cultivar is grown[200]. The main difference between cob nuts and filberts is that the husk of a filbert is longer than the seed and often completely encloses it, whilst the husk on a cob nut is shorter than the seed[200]. Squirrels are a major pest of this plant, often decimating the crop of nuts[200]. Often grown as a coppiced shrub in woodlands, the stems have a variety of uses[23, 67, 186]. Members of this genus bear transplanting well and can be easily moved even when relatively large[11]. A food plant for the caterpillars of many lepidoptera species[30]. Special Features: Not North American native, Attractive 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. 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].

## 4.2.10 *Amelanchier x grandiflora*

Apple Serviceberry  
4 tlin 7 cyuc 5 kcaak 0 tcan 0 dwat 6 m hkuc  
hmimhtut cyutli tcup hwicli hrasjlutnyik frip hpa 7tli flatprik hpa 7tmwatli fyifxre 7t hjonli

drutta *Amelanchier x grandiflora* is a deciduous Shrub growing to 6 m (19ft) by 4 m (13ft) at a slow 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 June to July. 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 and can grow in heavy clay soil. Suitable pH: mildly acid and neutral soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

ksakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[200]. Sweet and succulent with a flavour of apples[K], they can also be dried for later use[183]. The fruit is rich in iron and copper[226]. It is up to 10mm in diameter[200].

nrakta A hybrid of garden origin, *A. arborea* x *A. laevis*. ksakta Not known in the wild.

propta Seed - it is best harvested 'green', when the seed is fully formed but before the seed coat has hardened, and then sown immediately in pots outdoors or in a cold frame. If stored seed is obtained early enough in the autumn, it can be given 4 weeks warm stratification before being left out in the winter and it should then germinate in the spring. Otherwise seed can be very slow to germinate, perhaps taking 18 months or more. When large enough to handle, prick the seedlings out into individual pots and grow them on in a sheltered outdoor position, planting them out once they are 20cm or more tall. If there is sufficient seed it is best to sow it thinly in an outdoor seedbed[78, 80]. Grow the seedlings on for two years in the seedbed before planting them out into their permanent positions during the winter. Layering in spring - takes 18 months[78]. Division of suckers in late winter. The suckers need to have been growing for 2 years before you dig them up, otherwise they will not have formed roots. They can be planted out straight into their permanent positions if required.

nwatta Landscape Uses: Firewood, Specimen, Woodland garden. Prefers a rich loamy soil in a sunny position or semi-shade[1, 200] but thrives in any soil that is not too dry or water-logged[11]. Grows well in heavy clay soils. Prefers an acid or neutral soil. Plants are hardy to about -25°C[184]. This species does not produce suckers[184]. All members of this genus have edible fruits and, whilst this is dry and uninteresting in some species, in many others it is sweet and juicy. Many of the species have potential for use in the garden as edible ornamentals. The main draw-back to this genus is that birds adore the fruit and will often completely strip a tree before it is fully ripe[K]. This species is occasionally cultivated for its edible fruits, there are some named varieties[200]. The fruit is freely produced in Britain[184]. Considerable confusion has existed between this species, *A. arborea*, *A. canadensis*, *A. lamarckii* and *A. laevis*, see [11 and 200] for the latest (1991) classification. Hybridizes freely with other members of this genus[200]. Grafting onto seedlings of *A. lamarckii* or *Sorbus aucuparia* is sometimes practised in order to avoid the potential problem of hybridizing[1]. Special Features: Not North American native, Attracts butterflies, Blooms are very showy.

## 4.2.11 *Pyrus communis sativa*

Pear  
4 tlin 8 cyuc 5 kcak 3 tcan 0 dwat 5 m hkuc  
hmimhtut cyutli hgattcup hwicli hrasjlutnyikfrip hpa7tli flatprikhwis 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]. ksakta 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].

## 4.2.12 *Amelanchier alnifolia*

Saskatoon, Saskatoon serviceberry, Serviceberry  
4 tlin 6 cyuc 5 kcak 3 tcan 2 dwat 4 m hkuc  
hmimhtut cyutli tcup hwicli hrasjlutnyikfrip hpa7tli flatprikhwis hpa7tmwatli fyifxre7t hjonli

drutta *Amelanchier alnifolia* is a deciduous Shrub growing to 4 m (13ft) by 3 m (9ft) 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 June to July. 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 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.

kcakta Edible Parts: FruitEdible Uses: TeaEdible fruit - raw or cooked[3, 11, 46, 62, 101]. The fruit ripens in mid summer (early July in southern Britain), it is soft and juicy with a few small seeds in the centre. A very nice sweet flavour that is enjoyed by almost everyone who tries it, there is a hint of apple in the taste[K]. About the size of a blackcurrant, the fruit is produced in small clusters and the best wild forms can be 15mm in diameter[200, 212]. The fruit can also be dried and used as raisins or made into pemmican[101, 183]. The fruit is rich in iron and copper[226]. The leaves are a tea substitute[161, 257].

tcanta Shelterbelt Soil stabilizationPlants have a spreading, suckering root system and are used in windbreaks for erosion control[200]. Young branches can be twisted to make a rope[257]. Wood - hard, straight grained, tough. Used for tool handles etc. The wood can be made even harder by heating it over a fire and it is easily moulded whilst still hot[99]. The young stems are used to make rims, handles and as a stiffening in basket making[257]. Landscape Uses: Erosion control, Massing, Woodland garden. Hedging and Screens, Architectural City and Courtyard Gardens Cottage and Informal Garden, Wildlife Gardens (RHS).

dwatta Appetizer Birthing aid Contraceptive Diaphoretic Febrifuge Laxative Ophthalmic StomachicSaska-

been was quite widely employed as a medicinal herb by the North American Indians, who used it to treat a wide range of minor complaints[257]. It is little used in modern herbalism. An infusion of the inner bark is used as a treatment for snow-blindness[172]. A decoction of the fruit juice is mildly laxative. It has been used in the treatment of upset stomachs, to restore the appetite in children, it is also applied externally as ear and eye drops[257]. A decoction of the roots has been used in the treatment of colds[257]. It has also been used as a treatment for too frequent menstruation[257]. A decoction of the stems, combined with the stems of snowberry (*Symphoricarpos* spp) is diaphoretic. It has been used to induce sweating in the treatment of fevers, flu etc and also in the treatment of chest pains and lung infections[257]. A decoction of the plant, together with bitter cherry (*Prunus emarginata*) has been used as a contraceptive[257]. Other recipes involving this plant have also been used as contraceptives including a decoction of the ashes of the plant combined with the ashes of pine branches or buds[257]. A strong decoction of the bark was taken immediately after childbirth to hasten the dropping of the placenta. It was said to help clean out and help heal the woman's insides and also to stop her menstrual periods after the birth, thus acting as a form of birth control[257].

nrakta Western and Central N. America - Saskatchewan and south to Colorado and Idaho. ksacta Thickets, woodland edges and banks of streams[43] in moist well-drained soils[99, 200]. Small bushy forms grow on fairly dry hillsides[212].

propta Seed - it is best harvested 'green', when the seed is fully formed but before the seed coat has hardened, and then sown immediately in pots outdoors or in a cold frame. If stored seed is obtained early enough in the autumn, it can be given 4 weeks warm stratification before being left out in the winter and it should then germinate in the spring. Otherwise seed can be very slow to germinate, perhaps taking 18 months or more. When large enough to handle, prick the seedlings out into individual pots and grow them on in a sheltered outdoor position, planting them out once they are 20cm or more tall. If there is sufficient seed it is best to sow it thinly in an outdoor seedbed[78, 80]. Grow the seedlings on for two years in the seedbed before planting them out into their permanent positions during the winter. Layering in spring - takes 18 months[78]. Division of suckers in late winter. The suckers need to have been growing for 2 years before you dig them up, otherwise they will not have formed roots. They can be planted out straight into their permanent positions if required.

nwatta Prefers a rich loamy soil in a sunny position or semi-shade[1, 200] but thrives in any soil that is not too dry or water-logged[11]. Plants are fairly lime tolerant[200], they also grow well in heavy clay soils. Hardy to about -20°C according to one report[184], whilst another suggests that this species is hardy to about -50°C[11]. All members of this genus have edible fruits and, whilst this is dry and uninteresting in some species, in many others it is sweet and juicy. Many of the species have potential for use in the garden as edible ornamentals. This species is particularly interesting because it is quite compact and produces an excellent quality quite large fruit[K]. The main draw-back to this genus is that birds adore the fruit and will often completely strip a tree before it is fully ripe[K]. A very variable species, ranging from a thicket-forming shrub to a small tree in the wild[229]. It is occasionally cultivated for its edible fruit, there are several named varieties[183]. A stoloniferous species, spreading by suckers to form a thicket[11]. Hybridizes freely with other members of this genus[200]. Grafting onto seedlings of *A. lamarckii* or *Sorbus aucuparia* is sometimes practised in order to avoid the potential problem of hybridizing[1]. Special Features:North American native, Blooms are very showy. The plant is heat tolerant in zones 8 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 will also be useful and given here if available. The plant growth habit is multistemmed with multiple stems from the crown [1-2]. The root pattern is stoloniferous rooting from creeping stems above the ground [1-2].

## 4.2.13 *Rubus phoenicolasius*

Japanese Wineberry, Wine raspberry

4 tlin 8 cyuc 5 kcac 1 tcan 0 dwat 3 m hkuc  
hmimhtut cyutli tcup hwicli hrasljutnyik hpa7tli flatprikliw  
hpa7tmwatli xre7t hjonli

drutta *Rubus phoenicolasius* is a deciduous Shrub growing to 3 m (9ft) by 1 m (3ft 3in) 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, and the seeds ripen from August to September. 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.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[1, 2, 3, 34]. Sweet and juicy[11], A raspberry-type fruit, it is smaller than a raspberry, contains rather a lot of seeds and is not quite such a flavourful fruit, but it makes very nice eating all the same[K]. After flowering, the fruit is enclosed in its calyx until just before it is ripe, this prevents maggots etc getting into the fruit[K]. The fruit is about 20mm in diameter[200].

tcanta DyeA purple to dull blue dye is obtained from the fruit[168].

nrakta E. Asia - N. China, Japan, Korea. Occasionally naturalized in Britain[17]. ksacta Waste places and clearings in lowland and mountains all over Japan[58]. Roadsides and montane valleys at low to medium elevations in China[266].

propta Seed - requires stratification, is best sown in early autumn in a cold frame. Sow stored seed as early as possible in the year in a cold frame and stratify for a month at 3°C if sowing later than February. Prick out the seedlings when they are large enough to handle and grow on in a cold frame. Plant them out into their permanent positions in late spring of the following year. Tip layering in July. Plant out in autumn. Division in early spring.

nwatta Easily grown in a good well-drained loamy soil in sun or semi-shade[1, 11, 200], preferring light shade[202]. Plants are not too happy when grown in windy situations[K]. Hardy to about -18°C[202]. Some damage may be caused at this temperature but plants usually recover well[202]. A very ornamental plant, its red stems adding colour to the winter garden[1], it is sometimes cultivated for its edible fruit[1, 61]. There is at least one named variety, 'Bella di Tokyo' has small tasty red fruits[183]. This species is a raspberry with biennial stems, it produces a number of new stems each year from the perennial rootstock, these stems fruit in their second year and then die[200]. Plants in this genus are notably susceptible to honey fungus[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. The root pattern is suckering with new plants from underground runners away from the plant [2-1].

## 4.2.14 *Phragmites australis*

Common Reed, American common reed, Hybrid common reed, European common reed, Subtropical common re  
4 tlin 10 cyuc 5 kcac 4 tcan 2 dwat 3.6 m hkuc  
hmimhtut cyutli tcuphja7nhs6s hwicli hrasljutnyik hpa7tli  
flatprikliwsliphsom hpa7tmwatli xre7t hjonli

drutta *Phragmites australis* is a PERENNIAL growing to 3.6 m (11ft) by 3 m (9ft) 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 August 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. Suitable pH: mildly acid, neutral and basic (mildly alkaline)

and can grow in very alkaline and saline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can grow in water. The plant can tolerate maritime exposure.

**ksakta Edible Parts:** Leaves Root Seed Shoots Stem  
**Edible Uses:** Condiment Drink Sweetener Root - raw or cooked like potatoes[2, 13, 74, 102, 106, 183]. It contains up to 5% sugar. The flavour and texture are best when the root is young and still growing[144]. It can be dried, ground coarsely and used as a porridge[12, 46, 62]. In Russia they are harvested and processed into starch[269]. Young shoots - raw or cooked[61, 62, 102, 179]. They are best if used before the leaves form, when they are really delicious[144]. They can be used like bamboo shoots[183]. The partly unfolded leaves can be used as a potherb and the Japanese dry young leaves, grind them into a powder and mix them with cereal flour when making dumplings[183]. The stems are reported to contain 4.8 g protein, 0.8 g fat, 90.0 g total carbohydrate, 41.2 g fiber, and 4.4 g ash[269]. Seed - raw or cooked[257]. It can be ground into a powder and used as a flour[57, 62, 102, 106]. The seed is rather small and difficult to remove from the husk but it is said to be very nutritious[183]. A sugar is extracted from the stalks or wounded stems[2, 5, 62, 95]. A sweet licurice-like taste[95], it can be eaten raw or cooked[62]. The stems can be boiled in water and then the water boiled off in order to obtain the sugar[178]. A sugary gum that exudes from the stems can be rolled into balls and eaten as sweets[183]. A powder extracted from the dried stems can be moistened and roasted like marshmallow[62, 95, 102, 183].

**tcanta Alcohol Basketry Biomass Broom Cork Dye Fencing Fertilizer Fibre Fodder Fuel Furniture Green manure Insulation Miscellany Paper Pencil Soil stabilization String Teeth Thatching Weaving**The common reed can provide a large quantity of biomass and this is used in a wide variety of ways as listed below. Annual yields of 40 - 63 tonnes per hectare have been reported[269]. The plant is also converted into alcohol (for use as a fuel), is burnt as a fuel and is made into fertilizer[238]. The plant is rich in pentosans and may be used for the production of furfural - the nodes and sheaths yield 6.6% whilst the underground parts over 13% of furfural[269]. The pentosan content increases throughout the growing period and is maximum in the mature reed[269]. The reed can be used also for the preparation of absolute alcohol, feed yeast and lactic acid[269]. The stems are useful in the production of homogeneous boards[269]. They can also be processed into a fine fibrous material suitable as a filler in upholstery[269]. The stems have many uses. They are used for thatching roofs[1, 46, 74, 106]. It can last for 100 years[169]. The stems and leaves are also used for building dwellings, lattices, fences, arrows by Indians, and for weaving mats, carrying nets, basket making, insulation, fuel, as a cork substitute etc[13, 74, 99, 102, 115, 257, 269]. The stem contains over 50 percent cellulose and is useful in the manufacture of pulps for rayon and paper[269]. The fibre from the leaves and stems is used for making paper[189]. The fibre is 0.8 - 3.0 mm long and 5.0 - 30.5µm in diameter. The stems and leaves are harvested in the summer, cut into usable pieces and soaked for 24 hours in clear water. They are then cooked for 2 hours with lye and beaten in a blender. The fibre makes a khaki paper[189]. A fibre obtained from the plant is used for making string[95, 106]. The flowering stalks yield a fibre suitable for rope making[269]. The leaves are used in basket making and for weaving mats etc[169, 238]. A light green dye is obtained from the flowers[6, 115]. Freshly cut shoots are a good green manure[74] (Does this man as a soil mulch?[K]). The inflorescences are used as brooms[74]. The plant can be used as a cork substitute[74]. No further details. The plant is mixed with mud to make a plaster for walls[145]. Pens for writing on parchment were cut and fashioned from the thin stems of this reed[269], whilst the stems were also used as a linear measuring device[269]. The plant has a very vigorous and running rootstock, it is useful for binding the soil along the sides of streams etc[115]. It is planted for flood control since it stabilizes the banks and gradually builds up soil depth, thus raising the level of the bank.

**dwatta Antiasthmatic Antidiarrhoeal Antidote Antiemetic Antipyretic Antitussive Cholera Depurative Diuretic Febrifuge Febrifuge Lithotropic Miscellany Odontalgic Refrigerant Sedative Sialogogue Skin Stomachic Styptic Urinary**The leaves are used in the treatment of bronchitis and cholera, the ash of the leaves is applied to foul

sores[218]. A decoction of the flowers is used in the treatment of cholera and food poisoning[218]. The ashes are styptic[218]. The stem is antidote, antiemetic, antipyretic and refrigerant[218]. The root is antiasthmatic, antiemetic, antipyretic, antitussive, depurative, diuretic, febrifuge, lithotropic, sedative, sialogogue and stomachic[147, 176, 218, 238]. It is taken internally in the treatment of diarrhoea, fevers, vomiting, coughs with thick dark phlegm, lung abscesses, urinary tract infections and food poisoning (especially from sea foods)[238, 257]. Externally, it is mixed with gypsum and used to treat halitosis and toothache[238]. The root is harvested in the autumn and juiced or dried for use in decoctions[238].

**nrakta Cosmopolitan**, in most regions of the world, including Britain, but absent from the Amazon Basin. **ksakta** Shallow water and wet soil, avoiding extremely poor soils and very acid habitats[17].

**propta Seed - surface sow** in spring in a light position. Keep the soil moist by emmersing the pot in 3cm of water. Germination usually takes place quite quickly. Prick out the seedlings into individual pots when they are large enough to handle and plant them out in the summer. Division in spring. Very simple, any part of the root that has a growth bud will grow into a new plant. Larger divisions can be planted out direct into their permanent positions. We have found that it is better to pot up the smaller divisions and grow them on in light shade in a cold frame until they are well established before planting them out in late spring or early summer.

**nwatta Fodder: Bank Industrial Crop: Biomass Minor Global Crop**A very easily grown plant that thrives in deep moisture retentive soils such as marshes and swamps, whilst it also grows well along the sides of streams, lakes and ponds, in shallow water, ditches and wet wastelands[162, 200, 269]. Plants are tolerant of moderately saline water[169, 269]. The plant is reported to tolerate an annual precipitation in the range of 31 to 241cm, an annual temperature in the range of 6.6 to 26.6°C and a pH of 4.8 to 8.2[269]. Plants are hardy to about -20°C[200]. This species is very fast growing with a very vigorous and invasive running rootstock that can be 10 metres or more long, it can form very large stands in wetlands[200, 238, 260]. Difficult to eradicate once established, it is unsuitable for planting into small spaces[200, 238, 269]. The flowering heads are often used in dried flower arrangements[238]. There are some named forms, selected for their ornamental value[238].

## 4.2.15 *Dioscorea batatas*

Chinese Yam

4 tlin 11 cyuc 5 kcaak 3 tcan 5 dwat 3 m hkuc  
hmimhtut cyutli tcup hwclli hrasjutnyik hpa7tli flatprikliwis  
hpa7tmwatli nyanhjen hjonli

**drutta** *Dioscorea batatas* is a PERENNIAL growing to 3 m (9ft) by 1.5 m (5ft). See above for USDA hardiness. It is hardy to UK zone 5. It is in flower 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). 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 can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

**pcista** Edible species of *Dioscorea* have opposite leaves whilst poisonous species have alternate leaves[174].

**ksakta Edible Parts:** Fruit Root  
**Edible Uses:** Tuber - cooked[1, 46, 61, 105]. A floury texture[27] with a very pleasant flavour that is rather like a potato[K]. The tubers can be boiled, baked, fried, mashed, grated and added to soups[183]. They store well and for a long time[27, 37] and can also be left in the ground and harvested as required in the winter[K]. This is a top quality root crop, very suitable for use as a staple food[K]. An arrowroot can be extracted from the root[46], though this is not as good at binding other foods as the starch from *D. japonica*[183]. The root contains about 20% starch. 75% water, 0.1% vitamin B1, 10 - 15 mg% vitamin C[174]. Fruit. A starchy flavour, it is said to be very good for the health[206]. We wonder if this report is referring to the tubercles[K]. We've heard the aerial tubers can be eaten and are very tasty. Carbon Farming - Staple Crop: basic starch.

dwatta Anthelmintic Antidote Contraceptive Digestive Miscellaneous Vitamin C The Chinese yam, called Shan Yao in Chinese herbalism, is a sweet soothing herb that stimulates the stomach and spleen and has a tonic effect on the lungs and kidneys[238]. The tuber contains allantoin, a cell-proliferant that speeds the healing process[238]. The root is an ingredient of "The herb of eight ingredients", traditionally prescribed in Chinese herbalism to treat hyperthyroidism, nephritis and diabetes[254]. The tuber is anthelmintic, digestive and gently tonic[116, 147, 218, 254]. It is used internally in the treatment of tiredness, weight loss, poor appetite, poor digestion, chronic diarrhoea, asthma, dry coughs, frequent or uncontrollable urination, diabetes and emotional instability[238]. It is applied externally to ulcers, boils and abscesses[218, 238]. The tubers are harvested in the autumn and can be used raw or baked[238]. The leaf juice is used to treat snakebites and scorpion stings[218]. The roots of most, if not all, members of this genus, contains diosgenin[222, 240]. This is widely used in modern medicine in order to manufacture progesterone and other steroid drugs. These are used as contraceptives and in the treatment of various disorders of the genitinary organs as well as in a host of other diseases such as asthma and arthritis[222].

nrakta Temperate E. Asia, though the exact range is not known. ksacta Found in an apparently wild situation in valleys and on the slopes of hills in China[147]. Prefers sunny slopes in the wild[254].

propta Seed - sow March to April in a sunny position in a warm greenhouse and only just cover. It germinates in 1 - 3 weeks at 20°C[175]. Prick out the seedlings as soon as they are large enough to handle and grow on in a greenhouse for their first year. Plant out in late spring as the plant comes into new growth. Basal stem cuttings in the summer[37]. Division in the dormant season, never when in growth[1]. The plant will often produce a number of shoots, the top 5 - 10 cm of the root below each shoot can be potted up to form a new plant whilst the lower part of the root can be eaten[K]. Tubercles (baby tubers) are formed in the leaf axils. These are harvested in late summer and early autumn when about the size of a pea and coming away easily from the plant. They should be potted up immediately in individual pots in an unheated greenhouse or cold frame, covering them with about 10mm of soil. Protect them from mice etc and keep the soil moist but not wet. They should come into growth in the spring, plant them out in early summer when in active growth[K].

nwatta Management: Standard Minor Global Crop Staple Crop: Basic Starch An easily grown plant, succeeding in a fertile well-drained soil in a sunny position or light shade[27, 37, 200], though it is best in full sun[160]. Plants are hardy to at least -18°C[160]. This species of yam is much cultivated in China for its edible root which can be up to 1 metre long[1]. It has a great potential to be a commercial crop in Britain, though a satisfactory method of harvesting the root needs to be found[K]. Plants take 3 - 4 years to reach full maturity[160], though one year roots of well grown plants can weigh more than 500g. There are many cultivated forms with different root shapes in China and Japan[174]. The yam is a climbing plant that supports itself by twining around the branches of other plants[219]. It can be grown successfully into small bushes or, perhaps simpler when being grown as a root crop, it can be grown up a frame in a similar manner to growing runner beans[K]. Plants produce tubercles (small tubers that are formed in the leaf axils of the stems), and can be propagated by this means[K]. The small white flowers have a pleasant scent of cinnamon[219]. There is some confusion over the correct name for this species. One report says that *D. batatas* is an invalid name that is often erroneously applied to two distinct species *D. opposita* and *D. japonica*[218]. The Flora of China accepts *D. batatas* as a synonym for *D. polystachya*[266]. Dioecious. Male and female plants must be grown if seed is required. Carbon Farming - Cultivation: regional crop. Management: standard. The plant is heat tolerant in zones 10 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. Growth habit is a single or multiple shooting vine from a crown [1-2]. Herbaceous. The root pattern is a tap root similar to a carrot going directly down [1-2].

## 4.2.16 *Amelanchier confusa*

4 tlin 8 cyuc 5 kcaok 0 tcan 0 dwat 3 m hkuc hmimhtut cyutli tcup hwicli hrasjlutnyikfrjp hpa7tli flatprik hpa7tmwatli fyfxre7t hjonli

drutta *Amelanchier confusa* is a deciduous Shrub growing to 3 m (9ft) by 3 m (9ft). 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 June to July. 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 and can grow in heavy clay soil. Suitable pH: mildly acid and neutral soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

kcaok Edible Parts: Fruit Edible Uses: We have no records for this species, but the fruit is almost certainly edible both raw and cooked[K]. It is 7 - 9mm in diameter[200]. The fruit is rich in iron and copper[226].

nrakta Europe - S. Sweden. ksacta This species is only known from plants naturalised in Sweden, its origin is uncertain[11, 200].

propta Seed - it is best harvested 'green', when the seed is fully formed but before the seed coat has hardened, and then sown immediately in pots outdoors or in a cold frame. If stored seed is obtained early enough in the autumn, it can be given 4 weeks warm stratification before being left out in the winter and it should then germinate in the spring. Otherwise seed can be very slow to germinate, perhaps taking 18 months or more. When large enough to handle, prick the seedlings out into individual pots and grow them on in a sheltered outdoor position, planting them out once they are 20cm or more tall. If there is sufficient seed it is best to sow it thinly in an outdoor seedbed[78, 80]. Grow the seedlings on for two years in the seedbed before planting them out into their permanent positions during the winter. Layering in spring - takes 18 months[78]. Division of suckers in late winter. The suckers need to have been growing for 2 years before you dig them up, otherwise they will not have formed roots. They can be planted out straight into their permanent positions if required.

nwatta Prefers a rich loamy soil in a sunny position or semi-shade[1, 200] but thrives in any soil that is not too dry or water-logged[11]. Grows well in heavy clay soils. Prefers an acid or neutral soil. All members of this genus have edible fruits and, whilst this is dry and uninteresting in some species, in many others it is sweet and juicy. Many of the species have potential for use in the garden as edible ornamentals. The main draw-back to this genus is that birds adore the fruit and will often completely strip a tree before it is fully ripe[K]. A suckering plant, the suckers are formed very close to the original stem so the plant forms a gradually expanding clump[K]. Plants growing at Hilliers Arboretum in Hampshire were 4 metres tall in early April 1999, they were suckering quite freely in a tight clump and flowering very freely[K]. This species is closely related to *A. laevis*[11]. Hybridizes freely with other members of this genus[200]. Grafting onto seedlings of *A. lamarckii* or *Sorbus aucuparia* is sometimes practised in order to avoid the potential problem of hybridizing[1].

## 4.2.17 *Chenopodium* spp.

Perennial quinoa

4 tlin 10 cyuc 5 kcaok 2 tcan 3 dwat 2 m hkuc htut cyutli hgatkuyctup hwicli hyhrasjlutnyik hpa7tli frus-flatprikwiwsliphsum 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.

pcista 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].

kcakta 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 of 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 Hypothenal 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].

## 4.2.18 *Rubus idaeus*

Raspberry, American red raspberry, Grayleaf red raspberry 4 tlin 8 cyuc 3 tcan 3 dwat 2 m hkuc hmimhtut cyutlii tcup hwicli hrasjltunyk hpa7tli flatprikwis hpa7tmwatli fyifxre7t hjonli

drutta *Rubus idaeus* is a deciduous Shrub growing to 2 m (6ft) by 1.5 m (5ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 3 and is not frost tender. It is in leaf from April to November, 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 Bees, flies. 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.

kcakta Edible Parts: Fruit Root Shoots StemEdible Uses: Coffee TeaFruit - raw or cooked[2, 5, 7, 61]. Delicious when eaten out of hand, the fruit is also used in pies, preserves etc[183]. Root - cooked. The root, which should be neither too young nor too old, requires a lot of boiling[7]. Young shoots - peeled and eaten raw or cooked like asparagus[172]. They are harvested as they emerge through the ground in the spring and whilst they are still tender. A herb tea is made from the dried leaves[21, 46, 183]. Another report says that a type of tea made from raspberry and blackberry leaves is an excellent coffee substitute[7].

tcanta Cosmetic Dye PaperLandscape Uses:Erosion control, Foundation, Ground cover, Massing, Rock garden, Seashore, ts in this genus are notably susceptible to honey fungus[200]. Special Features: Not North American native, attracts butterflies, Inconspicuous flowers or blooms. A purple to dull blue dye is obtained from the fruit[168]. A fibre obtained from the stems is used in making paper[189]. The stems are harvested in the summer after the fruit has been eaten, the leaves are removed and the stems are steamed until the fibres can be stripped. The fibres are cooked for 2 hours with lye and then hand beaten with mallets or ball milled for 3 hours. The paper is light brown in colour[189]. A decongestant face-mask made from the fruit is used cosmetically to soothe reddened skin[7].

dwatta Antiinflammatory Astringent Birthing aid Cardiac Decongestant OxytocicAntiemetic[13, 165]. The leaves and roots are anti-inflammatory, astringent, decongestant, ophthalmic, oxytocic and stimulant[4, 13, 165, 222, 254]. A tea made from them is used in the treatment of diarrhoea, as a tonic for the uterus to strengthen pregnant women, and as an aid in childbirth[4, 222, 257]. The tea has also been shown as effective in relieving painful menstrual cramps[222]. The active ingredients both stimulate and relax the uterus[222]. They can be used during the last three months of pregnancy and during childbirth, but should not be used earlier[238]. Externally, the leaves and roots are used as a gargle to treat tonsillitis and mouth inflammations, as a poultice and wash to treat sores, conjunctivitis, minor wounds, burns and varicose ulcers[238, 257]. The leaves are harvested in the summer and dried for later use[9]. The fruit is antiscorbutic and diuretic[7]. Fresh raspberry juice, mixed with a little honey, makes an excellent refrigerant beverage to be taken in the heat of a fever[21]. Made into a syrup, it is said to have a beneficial effect on the heart[21].

nrakta Europe, Britain, from Iceland south and east to Spain and temperate Asia. ksacta Moist neglected land, hedgerows and woodland edges[7, 11, 244].

propta Seed - requires stratification and is best sown in early autumn in a cold frame. Stored seed requires one month stratification at about 3°C and is best sown as early as possible in the year. Prick out the seedlings when they are large enough to handle and grow on in a cold frame. Plant them out into their permanent positions in late spring of the following year. Cuttings of half-ripe wood, July/August in a frame[200]. Tip layering in July. Plant out in autumn. Division in early spring or just before leaf-fall in the autumn[200].

nwatta Prefers a good deep well-drained loamy soil on the acid side[1, 34]. Dislikes very heavy soils[1, 200], light soils[4] and alkaline soils[200]. Prefers an open position but tolerates some shade[1]. Plants crop less well when grown in the shade of trees though they do well in the open on a north-facing slope[200]. Requires a position sheltered from strong winds[200]. Prefers a pH between 6 and 6.5[200]. Raspberries are frequently cultivated in temperate regions of the world, both in the garden and commercially, for their edible fruit. There are many named varieties able to supply fresh fruit from mid-summer to the autumn[1, 200]. High costs of picking the fruit means that little is actually sold fresh, most of the commercially cultivated crops either being used for preserves or grown for the 'Pick Your Own' trade. All the cultivars are self-fertile[200]. This species has biennial stems, it produces a number of new stems each year from the perennial rootstock, these stems fruit in their second year and then die[200]. It is best not to grow raspberries near blackberries or potatoes[18]. PlanFor 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 suckering with new plants from underground runners away from the plant [1-2]. Heat zone: 9-1.

## 4.2.19 Rubus laciniatus

Oregon Cut-Leaf Blackberry, Cutleaf blackberry  
4 tlin 8 cyuc 5 kcaak 1 tcan 0 dwat 2.5 m hkuc  
hmimhtut cyutli tcup hwicli hrasljutnyik hpa7tli flatprikliw  
hpa7tmwatli xre7t hjonli

drutta Rubus laciniatus is a deciduous Shrub growing to 2.5 m (8ft 2in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 5. It is in flower from July to August, and the seeds ripen from August to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects, Apomictic (reproduce by seeds formed without sexual fusion). 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.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[3, 34, 101, 257]. Large sweet and juicy with a fine flavour[11, 183]. The fruit is about 20mm in diameter[200].

tcanta DyeA purple to dull blue dye is obtained from the fruit[168].

nrakta The origin of this plant is uncertain. ksacta Not known in a truly wild situation.

propta Seed - requires stratification and is best sown in early autumn in a cold frame. Stored seed requires one month stratification at about 3°C and is best sown as early as possible in the year. Prick out the seedlings when they are large enough to handle and grow on in a cold frame. Plant them out into their permanent positions in late spring of the following year. Cuttings of half-ripe wood, July/August in a frame[200]. Tip layering in July. Plant out in autumn. Division in early spring or just before leaf-fall in the autumn[200].

nwatta Easily grown in a good well-drained loamy soil in sun or semi-shade[1, 11, 200]. This species is a blackberry with biennial stems, it produces a number of new stems each year from the perennial rootstock, these stems fruit in their second year and then die[200]. The plant produces apomictic flowers, these produce fruit and viable seed without fertilization, each seedling is a genetic copy of the parent[200]. Sometimes cultivated for its edible fruit, it is a very vigorous

and productive plant[3]. There is at least one named variety. 'Oregon Cutleaf Thornless' is high yielding with good flavoured fruits and no prickles on the stems, thus making it easier to harvest[17]. Plants in this genus are notably susceptible to honey fungus[200].

## 4.2.20 Amelanchier stolonifera

Quebec Berry, Running serviceberry  
4 tlin 8 cyuc 5 kcaak 0 tcan 1 dwat 1.5 m hkuc  
hmimhtut cyutli kyuctup hwicli hrasljutnyikfrip hpa7tli frus-  
flatprik hpa7tmwatli fyifxre7t hjonli

drutta Amelanchier stolonifera is a deciduous Shrub growing to 1.5 m (5ft). See above for USDA hardiness. It is hardy to UK zone 4 and is not frost tender. It is in flower in May, and the seeds ripen in July. 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 and can grow in heavy clay 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.

kcakta Edible Parts: FruitEdible Uses: Edible fruit - raw or cooked[3, 101, 105]. Sweet and juicy with a good flavour that has a hint of apple[1, 11, 183, K]. The plant usually yields very well in Britain and the well-flavoured fruit means that it has excellent potential as a commercial crop[K] The fruit is rich in iron and copper[226].

dwatta TonicThe root bark has been used as a tonic[257].

nrakta Eastern N. America ksacta Dry acid rocky or sandy open habitats[43].

propta Seed - it is best harvested 'green', when the seed is fully formed but before the seed coat has hardened, and then sown immediately in pots outdoors or in a cold frame. If stored seed is obtained early enough in the autumn, it can be given 4 weeks warm stratification before being left out in the winter and it should then germinate in the spring. Otherwise seed can be very slow to germinate, perhaps taking 18 months or more. When large enough to handle, prick the seedlings out into individual pots and grow them on in a sheltered outdoor position, planting them out once they are 20cm or more tall. If there is sufficient seed it is best to sow it thinly in an outdoor seedbed[78, 80]. Grow the seedlings on for two years in the seedbed before planting them out into their permanent positions during the winter. Layering in spring - takes 18 months[78]. Division of suckers in late winter. The suckers need to have been growing for 2 years before you dig them up, otherwise they will not have formed roots. They can be planted out straight into their permanent positions if required.

nwatta Dislikes calcareous soils[11]. Prefers a rich loamy soil in a sunny position or semi-shade[1, 200] but thrives in any soil that is not too water-logged[11]. Grows well in heavy clay soils. Tolerates dry soils[200]. All members of this genus have edible fruits and, whilst this is dry and uninteresting in some species, in many others it is sweet and juicy. Many of the species have potential for use in the garden as edible ornamentals. The main draw-back to this genus is that birds adore the fruit and will often completely strip a tree before it is fully ripe[K]. Produces suckers quite freely, the plant forms thickets. When propagated by these suckers, the new plants can begin producing a crop of fruit in their second year[K]. The sub-species A. stolonifera micropetalata was seen growing in dappled shade at Hilliers Arboretum in early April 1999. It was about 2 metres tall, suckering freely with some suckers more than 50cm from the parent plant, and flowering freely[K]. Hybridizes with A. arborea, A. bartramiana, A. laevis and A. sanguinea. Grafting onto seedlings of A. lamarkii or Sorbus aucuparia is sometimes practised in order to avoid the potential problem of hybridizing[1]. 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 running thicket former forming a colony from shoots away from the crown spreading indefinitely [1-2]. The root pattern is stoloniferous rooting from creeping stems above the ground [1-2].

## 4.2.21 *Ribes nigrum*

Blackcurrant, European black currant

4 tlin 8 cyuc 5 kcak 2 tcan 3 dwat 1.8 m hkuc  
hmmihtut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprikhwis  
hpa7tmwatli fyfxfre7t hjonli

*drutta* *Ribes nigrum* is a deciduous Shrub growing to 1.8 m (6ft). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in leaf from March to November, in flower from April to May, and the seeds ripen from July to August. 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 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.

kcakta Edible Parts: Fruit Leaves Edible Uses: Tea Fruit - raw or cooked. An excellent aromatic flavour[K]. The fully ripe fruit is very acceptable raw, though it is more often cooked and used to make pies, jams etc[1, 2, 5, 9, 34]. Very rich in vitamin C[244]. The fruit is about 10mm in diameter[200], though selected cultivars have larger fruits[K]. The leaves are used in soups[183]. The dried leaves are a tea substitute[74, 177, 183]. They are sometimes added to blended herb teas[238].

tcanta Cosmetic Dye Miscellany Preservative The 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 leaves[100]. A blue or violet dye is obtained from the fruit[100]. The leaves are used for vegetable preservation[74]. No more details.

dwatta Antidiarrhoeal Antirheumatic Diaphoretic Diuretic Febrifuge Miscellany Vitamin C Blackcurrant fruits are a good source of minerals and vitamins, especially vitamin C. They have diuretic and diaphoretic actions, help to increase bodily resistance to infections and are a valuable remedy for treating colds and flu[4, 254]. The juice, especially when fresh or vacuum-sealed, helps to stem diarrhoea and calms indigestion[4, 254]. The leaves are cleansing, diaphoretic and diuretic[4, 9]. By encouraging the elimination of fluids they help to reduce blood volume and thereby lower blood pressure[254]. An infusion is used in the treatment of dropsy, rheumatic pain and whooping cough, and can also be used externally on slow-healing cuts and abscesses[9]. It can be used as a gargle for sore throats and mouth ulcers[254]. The leaves are harvested during the growing season and can be used fresh or dried[238]. It is believed that an infusion of the leaves increases the secretion of cortisol by the adrenal glands, and thus stimulates the activity of the sympathetic nervous system[254]. This action may prove useful in the treatment of stress-related conditions[254]. An infusion of the young roots is useful in the treatment of eruptive fevers[4]. A decoction of the bark has been found of use in the treatment of calculus, dropsy and haemorrhoidal tumours[4]. The seed is a source of gamma-linolenic acid, an unsaturated fatty acid which assists the production of hormone-like substances[238]. This process is commonly blocked in the body, causing disorders that affect the uterine muscles, nervous system and metabolism[238]. We have no records of the oil from this species being used medicinally, though it is used in cosmetic preparations[238, K].

nrakta Europe, including Britain, from Scandinavia south and east to France, Bulgaria, N. and C. Asia. ksacta Hedges and woodlands, often by streams[9, 17].

propta Seed - best sown as soon as it is ripe in the autumn in a cold frame. Stored seed requires 3 months cold stratification at between 0 and 5°C and should be sown as early in the year as possible[113, 164]. Under normal storage conditions the seed can remain viable for 17 years or more. Prick out the seedlings into individual pots when they are large enough to handle and grow them on in a cold frame for their first winter, planting them out in late spring of the

following year. Cuttings of half-ripe wood, 10 - 15cm with a heel, July/August in a frame[78, 113]. Cuttings of mature wood of the current year's growth, preferably with a heel of the previous year's growth, November to February in a cold frame or sheltered bed outdoors[78, 200].

nwatta Easily grown in a moisture retentive but well-drained loamy soil of at least moderate quality[11, 200]. Best grown on a deep sandy loam[1]. Dislikes very heavy clay, chalky soils and thin dry soils, but it can succeed on most soil types if plenty of organic matter is incorporated[1]. Plants require plenty of nitrogen if they are to do well[200]. Prefers a pH in the range 6.7 to 7 and is intolerant of acid soils[200]. Plants are quite tolerant of shade though do not fruit so well in such a position[11]. Plants fruit less freely when grown in windy sites[200]. The plant is hardy to about -20°C, though flowers are damaged at -1°C[200]. Blackcurrants are widely cultivated in temperate areas for their edible fruit, there are many named varieties[183, 200]. Most fruit is produced on one year old wood. Pruning usually consists of removing about a third of all the stems from just above ground level in the autumn. The oldest stems with least new growth are removed since these will be the poorest fruiterers. The plant is able to make new growth from the base of the removed stems and, if the plants are well fed, this growth is very vigorous and will fruit heavily the following year. The flowers can self-fertilize but many cultivars fruit better with insect pollination[200]. Plants can harbour a stage of 'white pine blister rust', so they should not be grown in the vicinity of pine trees[155]. 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]. 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. The root pattern is suckering with new plants from underground runners away from the plant [2-1].

## 4.2.22 *Daucus carota sativus*

Carrot

4 tlin 10 cyuc 5 kcak 4 tcan 3 dwat 1.2 m hkuc  
htut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprikhwis  
hpa7tmwatli fyfxfre7t hjonli

*drutta* *Daucus carota sativus* is a BIENNIAL growing to 1.2 m (4ft) by 0.3 m (1ft 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, and the seeds ripen from August to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Flies, beetles. 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 moist soil. The plant can tolerate strong winds but not maritime exposure.

pcista Carrots sometimes cause allergic reactions in some people[46]. Skin contact with the sap is said to cause photo-sensitivity and/or dermatitis in some people[218].

kcakta Edible Parts: Leaves Root Edible Uses: Coffee Colouring Condiment Root - raw or cooked[2, 7, 27]. The roots of well-grown plants are crisp, sweet and juicy, they are very nice raw and are also cooked as a vegetable or added to soups, stews etc[K]. The grated root is a tasty addition to the salad bowl[K]. The juice can be extracted from the root and used as a health-promoting drink[46]. The root is very rich in carotene, which is transformed by the body into vitamin A when it is eaten[7]. The root is sometimes ground into a powder and used in making cakes, bread etc[7, K]. The roasted root is a coffee substitute[21, 46]. Carotin, extracted from the roots, is used as an orange-yellow food dye[171]. Leaves - raw or cooked. A very strong flavour, they can be added in small quantities to mixed salads[K]. The leaves contain an oil that is rich in vitamin E, they are sometimes used as a flavouring in soups[7]. An essential oil from the seed is used as a food flavouring.

tcanta Alcohol Dye Essential The roots are fermented in order to produce alcohol[7]. An orange dye is obtained from the root[171]. An essential oil from the seed has a distinctive fragrance and is used in perfumery[7, 46].

dwatta Anthelmintic Carminative Deobstruent Diuretic Galactogogue Ophthalmic Stimulant Cultivated carrot roots are a rich source of beta-carotene, which is converted to vitamin A by the liver[254]. When used as a regular item in the diet the roots improve eyesight and skin health, and also have anti-cancer effects[238]. A wonderful cleansing medicine, it supports the liver and stimulates urine flow and the removal of waste by the kidneys[254]. The root is diuretic and ophthalmic[7]. The juice of organic carrots is a delicious drink and a valuable detoxifier[254]. The raw root, grated or mashed, is a safe treatment for threadworms, especially in children[254]. The seed is carminative, galactogogue, lithotropic and stimulant[7, 240]. They are useful in the treatment of kidney diseases, dropsy and to settle the digestive system[240, 254]. They stimulate menstruation and have been used in folk medicine as a treatment for hangovers[254].

nrakta A cultivated form of *D. carota*. ksacta Not known in the wild.

propta Seed - sow in situ in succession from early spring to early summer. Do not transplant the seedlings, since this will usually cause damage to the roots and a good crop will not be obtained. Carrot seed needs a well-made seed bed with a fine tilth if good germination is to be achieved. The earliest sowings can be made of an early maturing variety in a cold frame or greenhouse in January or February, this will provide edible roots in late spring. The first outdoor sowings are made as the soil warms up in the spring. Successional sowings can be made until early summer if required. A September sowing in mild areas can provide an early spring supply of young roots, though the plants will often require some protection.

nwatta Prefers a good light warm well-drained soil and plenty of moisture[16, 27, 37, 200]. Prefers a sandy or calcareous loam[132]. Plants are extremely sensitive to soil conditions, good roots can only be produced in a soil that permits easy penetration of the root[200]. Carrots are reported to tolerate an annual precipitation in the range of 31 to 410cm, an annual temperature range of 3.6 to 28.5°C and a pH of 4.2 to 8.7[269]. They prefer a pH in the range 6.5 to 7.5[200]. Carrots are widely cultivated in most areas of the world for their edible root, which can be available all year round from successional sowings[46]. There are many named varieties, with roots varying in size and shape from short and round to long and tapering[183, 200]. World-wide, the yields of roots averages about 24 tonnes per hectare, the world low production yield was 3,125 kg/ha in Zaire, whilst the world high production yield was 62,889 kg/ha in Belgium-Luxembourg[269]. Plants grow best at a mean temperature of 16 - 18°C. At temperatures above 28°C top growth is reduced and the roots become very strongly flavoured. At temperatures below 16°C the roots become long and tapered and are pale in colour[200]. The leaves are moderately susceptible to frost but the roots are much hardier and can safely be left in the ground in the winter in most areas[200], so long as pests such as slugs or root fly are not a problem[K]. If dug up for storage, the roots can be kept for up to six months at 0 - 1°C and high relative humidity[200]. Carrots are very susceptible to a number of pests and diseases. The young seedlings are adored by slugs and so will generally need some protection. Carrot root fly is also a major problem. This creature lays its eggs near the young carrots. When they hatch, the larvae burrow into the soil and then eat their way into the root. In bad seasons almost all the crop can be heavily damaged. It is possible to reduce this damage by timing seed sowing to try and avoid the worst times of infestation, a June sowing of a fast-maturing cultivar will often be successful. There are also various companion plants that can help to reduce infestation. In general, these are strong-smelling plants such as garlic, onions and various aromatic plants such as wormwood. The idea is that these plants will mask the smell of the carrots and therefore the fly, which mainly uses scent to find the plants, will not be able to detect the smell of the carrots. This method is most likely to fail when the fly comes close enough to the plants to see them and then no longer relies on scent. The most successful organic solution to date has been to erect barriers of clear polythene about 1 metre tall all around the bed of carrots. Since the fly generally flies below this height, it has proved to be quite effective.

time, although any fly that does get in will then tend to stay inside the barrier and lay all of its eggs there. About 95% of carrot flowers are pollinated by insects, with the remaining 5% self-pollinating[269]. Carrots grow well with lettuce and chives[18] but dislike dill[20]. They also grow badly with potatoes, kohlrabi, fennel and cabbages[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 fleshy. Thick or swollen - fibrous or tap root [2-1].

## 4.2.23 Ribes uva

Gooseberry, European gooseberry  
4 tlin 8 cyuc 5 kcaak 2 tcan 1 dwat 1.2 m hkuc  
hmimhtut cyutli tcup hwclli hrasjlutnyik hpa7tli flatprikwis  
hpa7tmwatli fyfixre7t hjonli

drutta *Ribes uva-crispa* is a deciduous Shrub growing to 1.2 m (4ft) by 1 m (3ft 3in) 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 March to May, 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. 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.

pcista The fresh leaves contain the toxin hydrogen cyanide, though details of quantities are not given[240]. This substance is found in several foods, including almonds. 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.

kcaakta Edible Parts: Fruit Leaves Edible Uses: Fruit - raw or cooked[1, 2, 5, 7, 61]. The fruit is often picked when under-ripe and very firm, it has a very tart flavour at this time and is mainly used in making pies, jams etc. However, if the fruit is allowed to remain on the plant until it is fully ripe and soft it becomes quite sweet and is delicious for eating out of hand[K]. The fruit of the wild species is often less than 1cm in diameter, but named cultivars have considerably larger fruits up to 3cm in diameter[K]. Leaves- raw. The young and tender leaves can be eaten in salads[4]. Some caution is advised, see the notes above on toxicity.

tcanta Cosmetic Miscellany The fruit pulp is used cosmetically in face-masks for its cleansing effect on greasy skins[7].

dwatta Astringent Dysentery Laxative Miscellany The fruit is laxative[7]. Stewed unripe gooseberries are used as a spring tonic to cleanse the system[4]. The leaves have been used in the treatment of gravel[4]. An infusion taken before the monthly periods is said to be a useful tonic for growing girls[4]. The leaves contain tannin and have been used as an astringent to treat dysentery and wounds[7].

nrakta Europe, including Britain, from Scandinavia south and east to N. Africa, Italy and the Caucasus. ksacta Woods and hedges, often by streams[17].

propta Seed - best sown as soon as it is ripe in the autumn in a cold frame. Stored seed requires 3 months cold stratification at between 0 and 5°C and should be sown as early in the year as possible[113, 164]. Under normal storage conditions the seed can remain viable for 17 years or more. Prick out the seedlings into individual pots when they are large enough to handle and grow them on in a cold frame for their first winter, planting them out in late spring of the following year. Cuttings of half-ripe wood, 10 - 15cm with a heel, July/August in a frame[78, 113]. Cuttings of mature wood of the current year's growth, preferably with a heel of the previous year's growth, November to February in a cold frame or sheltered bed outdoors[78, 200].

nwatta Easily grown in a moisture retentive but well-drained loamy soil of at least moderate quality[11, 200]. Growth is often poor in light soils, whilst heavy soils encourage soft growth and excess vigour[200]. Prefers a pH in the range 6 to 6.5[200], though it can grow well in more acid or alkaline soils[K]. It is important to add plenty of humus or chalky soil[K]. Plants are quite tolerant of shade though do not fruit so well in such a position[11]. They can be grown

against east or north facing walls[37]. The fruit of plants on north facing walls will ripen later, thus extending the fruiting season, though yields will be lower[K]. Plants dislike very hot weather[37]. Dormant plants are hardy to about -20°C[200], but the flowers and young fruits are susceptible to frost damage. Plants are very susceptible to potassium deficiency[1], especially when grown on alkaline soils[K]. Gooseberries are commonly cultivated in temperate regions for their edible fruit, there are many named varieties[183, 200]. Birds love the fruit and so some protection is often required, especially if the fruit is being grown to full ripeness[K]. Plants grow best in cool moist climates such as N. Europe[200]. Plants fruit best on one and two year old wood so any pruning should be to encourage vigorous new shoots[200]. Plants can harbour a stage of white pine blister rust, so should not be grown in the vicinity of pine trees[155]. Plants in this genus are notably susceptible to honey fungus[200]. The plant is heat tolerant in zones 9 through 2. (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 suckering with new plants from underground runners away from the plant [1-2].

#### 4.2.24 Malva alcea

Vervain mallow, Hollyhock Mallow

4 tlin 8 cyuc 5 kcaak 2 tcan 1 dwat 1.2 m hkuc

hmimhtut cyutli tcup hwicli hrasljutnyik hpa7tli flatprikwlis hpa7tmwatli xre7t hjonli

drutta Malva alcea is a PERENNIAL growing to 1.2 m (4ft) by 0.8 m (2ft 7in) 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 July to October, and the seeds ripen from August 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 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.

pcista Although we have seen no reports of toxicity for this species, when grown on nitrogen rich soils (and particularly when these are cultivated inorganically), the leaves of some species tend to concentrate high levels of nitrates in their leaves[76]. The leaves are perfectly wholesome at all other times.

kcakta Edible Parts: Flowers Leaves Oil Oil Seed Edible Uses: Oil Oil Leaves - raw or cooked[74]. A mild pleasant flavour[K]. The leaves are mucilaginous and fairly bland, this is a very good perennial substitute for lettuce in a salad, producing fresh leaves from spring until the middle of summer, or until the autumn from self-sown plants[K]. Flowers - raw[K]. A very decorative addition to the salad bowl, they have a mild flavour and a texture similar to the leaves[K]. Seed - raw[74]. Best used before it is fully mature, the seed has a pleasant nutty taste but it is rather small and fiddly to harvest[K].

tcanta Dye Fibre Oil Oil A fibre obtained from the stem is used for making cordage[74]. Cream, yellow and green dyes can be obtained from the plant and the seed heads[168]. The seed yields 15% oil[74]. The uses of this oil have not been given though it is almost certainly edible[K].

dwatta Demulcent Mouthwash The leaves are demulcent. They are also used as a mouthwash for inflammatory and catarrhal conditions[74].

nrakta Europe. An occasional casual in Britain. ksacta Gardens, vineyards and waste places[74].

propta Seed - best sown in early spring in a cold frame. The seed germinates quickly and easily. Prick out the seedlings into individual pots when they are large enough to handle and plant them out in their permanent positions

in the early summer[K]. If you have sufficient seed then it can be sown outdoors in situ in the middle to late spring. Basal cuttings in late spring. Harvest the shoots with plenty of underground stem when they are about 8 - 10cm above the ground. Pot them up into individual pots and keep them in light shade in a cold frame or greenhouse until they are rooting well. Plant them out in the summer.

nwatta Landscape Uses:Border, Container, Massing. A very easily grown plant, succeeding in ordinary garden soil[1], though it prefers a reasonably well-drained and moderately fertile soil in a sunny position[200]. A very ornamental and polymorphic plant[1, 50]. It tends to be quite short-lived in cultivation but usually self-sows when well-sited[233, K]. It is closely related to *M. excisa*[74]. If the plant is cut back to the ground as it comes into flower, then it will produce a fresh flush of leaves for salads[K]. Plants seem to be immune to the predations of rabbits[233] and are seldom bothered by slugs[K]. Plants are prone to infestation by rust fungus[200]. Special Features: Not North American native, Naturalizing, Extended bloom season in Zones 9A and above. 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 clumper with limited spread [1-2].

#### 4.2.25 Allium cepa proliferum

Tree Onion, Walking Onion

4 tlin 8 cyuc 5 kcaak 3 tcan 3 dwat 1.2 m hkuc

htut cyutli tcup hwicli hrasljut hpa7tli flatprikwlis hpa7tmwatli xre7t hjonli

drutta Allium cepa proliferum is a BULB growing to 1.2 m (4ft). 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 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 moist soil.

pcista There have been cases of poisoning caused by the consumption, in large quantities and by some mammals, of this plant. Dogs seem to be particularly susceptible[76].

kcakta Edible Parts: Leaves Root Edible Uses: The plant forms small bulbs at the top of the flowering stem, these can be eaten raw or cooked[16, 33]. They have a strong onion flavour and are often used as pickled onions or added to salads[K]. As long as the bulbils are dried properly at harvest time, they store well[4]. Bulb - raw or cooked. The bulb can be up to 4cm in diameter and has a strong onion flavour[K]. Chopped into slices, it makes a good addition to salads and can also be used as a vegetable or as a flavouring in cooked foods[K]. Leaves - raw or cooked. A strong onion flavour, it makes a nice flavouring in salads though it should not be harvested in quantity because this would reduce the yield of bulbils[K]. The leaves are produced from late autumn, though we have found that harvesting them at this time will often encourage diseases such as mildew[K].

tcanta Cosmetic Dye Hair Polish Repellent Rust The juice of the plant is used as a moth repellent and can also be rubbed onto the skin to repel insects[7]. The plant juice can be used as a rust preventative on metals and as a polish for copper and glass[7]. A yellow-brown dye is obtained from the skins of the bulbils[141, 168]. Onion juice rubbed into the skin is said to promote the growth of hair and to be a remedy for baldness[7]. It is also used as a cosmetic to get rid of freckles[7]. The growing plant is said to repel insects and moles[201]. A spray made by pouring enough boiling water to cover 1kg of chopped unpeeled onions is said to increase the resistance of other plants to diseases and parasites[201].

drutta Anthelmintic Antispasmodic Antistomatitis Antispasmodic Carminative Diuretic Expectorant Febrifuge Hypoglycaemic Hypotensive Lithontripic Skin Stomachic Tonic  
Although rarely used specifically as a medicinal herb, the onion has a wide range of beneficial actions on the body and when eaten (especially raw) on a regular basis will promote the general health of the body. The bulb is anthelmintic, anti-inflammatory, antiseptic, antispasmodic, carminative, diuretic, expectorant, febrifuge, hypoglycaemic, hypotensive, lithontripic, stomachic and tonic[4, 7, 21]. When used regularly in the diet it offsets tendencies towards angina, arteriosclerosis and heart attack[254]. It is also useful in preventing oral infection and tooth decay[254]. Baked onions can be used as a poultice to remove pus from sores[254]. Fresh onion juice is a very useful first aid treatment for bee and wasp stings, bites, grazes or fungal skin complaints[7, 201]. When warmed the juice can be dropped into the ear to treat earache[254]. It also aids the formation of scar tissue on wounds, thus speeding up the healing process, and has been used as a cosmetic to remove freckles[7].

nrakta Original habitat is obscure. ksacta Not known in the wild.

propta Harvest bulbils in late summer and replant immediately or store them in a cool dry frost-free place and plant them out in late winter or early spring. Division of the bulbs after the leaves die down in late summer.

nwatta Prefers a sunny position in a light well-drained soil[1] but succeeds in most soils that are in good condition[16]. Tolerates a pH in the range 4.5 to 8.3. The bulbs should be planted fairly deeply[1]. Some modern works have moved this plant from *A. cepa*, seeing it as being of hybrid origin with *A. fistulosum* and therefore renaming in *A. x proliferum*. The tree onion is a genuinely perennial form of *A. cepa* that is sometimes grown in the herb garden for its edible bulbils. Plants rarely if ever produce seed, instead the flowering head is comprised of a number of small onions or bulbils[16, 33]. Plants are propagated by means of these bulbils or by dividing the main bulb that grows underground[K]. By no means a heavily productive plant, though the bulbils are very well flavoured and the plant is fairly easily grown[K]. Its main problem is that slugs seem to be attracted to it and can eat to death even well-established plants[K]. 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]. Said to be immune to onion root fly[16]. Members of this genus are rarely if ever troubled by browsing deer[233]. The plant is heat tolerant in zones 12 through 2. (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-grown 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.

#### 4.2.26 *Hemerocallis middendorffii* *esculenta*

4 tlin 8 cyuc 5 kcaak 0 tcan 1 dwat m hkuc  
hmimhtut cyutli kyuctcup hwicli hrasjlutnyikfrip hpa7tli flat-prikhwis hpa7tmwattli xre7t hjonli

drutta *Hemerocallis middendorffii* *esculenta* is a PERENNIAL growing to 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 June to July. 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 semi-shade (light woodland) or no shade. It prefers dry or moist soil.

pcista Large quantities of the leaves are said to be hallucinogenic. Blanching the leaves removes this hallucina-

tory component[205]. (This report does not make clear what it means by blanching, it could be excluding light from the growing shoots or immersing in boiling water[K].)

kcakta Edible Parts: Flowers Leaves Edible Uses: Leaves and young shoots - cooked[105, 116, 177, 183]. They must be consumed when very young or else they become fibrous[K]. Flowers and flower buds - raw or cooked[105, 127, 177, 183]. The flowers are crisp and succulent with a delicious sweet flavour and no aftertaste[K]. The flowers can be dried and used as a thickener in soups etc. The flower buds contain about 43mg vitamin C per 100g, 983 IU vitamin A and 3.1% protein[205].

tcanta Weaving The tough dried foliage is plaited into cord and used for making footwear[205]. Plants form a spreading clump and are suitable for ground cover when spaced about 45cm apart each way[208]. The dead leaves should be left on the ground in the winter to ensure effective cover[208]. (This report was for a plant labelled *H. middendorffiana*, which I have assumed is a mis-spelling of this species[K])

dwatta Antidote Diuretic Vitamin C The juice of the roots is an effective antidote in cases of arsenic poisoning[205]. A tea made from the boiled roots is used as a diuretic[205].

nrakta E. Asia - China, Japan ksacta Meadows in high mountains, N. and C. Japan[58, 205]. Forests, forest margins, grassy slopes, stony places and roadsides at elevations of 500 - 2500 metres in China[266].

propta Seed - sow in the middle of spring in a greenhouse. Germination is usually fairly rapid and good. Prick out the seedlings into individual pots when they are large enough to handle. Grow the plants on for their first winter in a greenhouse and plant out in late spring[K]. Division in spring or after flowering in late summer or autumn[200]. Division is very quick and easy, succeeding at almost any time of the year[K]. 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[1], including dry ones, preferring a rich moist soil and a sunny position[111] but tolerating partial shade[88]. Plants flower less freely in a shady position though the flowers can last longer in such a position[205]. Grows well in heavy clay soils. Succeeds in short grass if the soil is moist[1]. Prefers a pH between 6 and 7[200]. Hybridizes freely with other members of this genus[200]. Individual flowers only live for one day[205]. Plants take a year or two to become established after being moved but then form large clumps[200, 187]. The roots are fibrous without any obvious swellings[205]. Plants seem to be immune to the predations of rabbits[233]. The plants are very susceptible to slug and snail damage, the young growth in spring is especially at risk[200].

#### 4.2.27 *Hemerocallis middendorffii*

Amur dayilily, Middendorf, Daylily  
4 tlin 8 cyuc 5 kcaak 2 tcan 1 dwat m hkuc  
hmimhtut cyutli kyuctcup hwicli hrasjlutnyikfrip hpa7tli flat-prikhwis hpa7tmwattli xre7t hjonli

drutta *Hemerocallis middendorffii* is a PERENNIAL growing to 0.9 m (3ft) by 0.5 m (1ft 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). 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 dry or moist soil.

pcista Large quantities of the leaves are said to be hallucinogenic. Blanching the leaves removes this hallucinatory component[205]. (This report does not make clear what it means by blanching, it could be excluding light from the growing shoots or immersing in boiling water[K].)

kcakta Edible Parts: Flowers Leaves Shoots Edible Uses: Leaves and young shoots - cooked[105, 116, 177, 183]. They must be consumed when very young or else they become fibrous[K]. Flowers and flower buds - raw or cooked[105, 177, 183]. The flowers can be dried and used as a thickener in soups etc. The flower buds contain about 43mg vitamin C per 100g, 983 IU vitamin A and 3.1% protein[205].

canta Weaving The tough dried foliage is plaited into cord and used for making footwear[205]. Plants form a spreading clump and are suitable for ground cover when spaced about 45cm apart each way[208]. The dead leaves should be left on the ground in the winter to ensure effective cover[208]. (This report was for a plant labelled *H. midendorffiana*, which I have assumed is a mis-spelling of this species[K]). Attractive flowers.

dwata Antidote Diuretic Vitamin C The juice of the roots is an effective antidote in cases of arsenic poisoning[205]. A tea made from the boiled roots is used as a diuretic[205].

nrakta E. Asia - China, Japan, Korea. ksacta Meadows in high mountains of N. Japan[58]. Forests, forest margins, meadows and wet grasslands from near sea level to 2000 metres in China[266].

propta Seed - sow in the middle of spring in a greenhouse. Germination is usually fairly rapid and good. Prick out the seedlings into individual pots when they are large enough to handle. Grow the plants on for their first winter in a greenhouse and plant out in late spring[K]. Division in spring or after flowering in late summer or autumn[200]. Division is very quick and easy, succeeding at almost any time of the year[K]. 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.

nwata Landscape Uses:Border, Container, Ground cover, Massing, Seashore. Succeeds in most soils[1], including dry ones, preferring a rich moist soil and a sunny position[111] but tolerating partial shade[88]. Plants flower less freely in a shady position though the flowers can last longer in such a position[205]. Grows well in heavy clay soils. Succeeds in short grass if the soil is moist[1]. Prefers a pH between 6 and 7[200]. Hybridizes freely with other members of this genus[200]. Individual flowers are short-lived, but the plant produces a succession of blooms and also flowers again in late summer[205]. The plant has a fibrous root system that does not extend far[205]. Plants take a year or two to become established after being moved but then form large clumps[200, 187]. Plants seem to be immune to the predations of rabbits[233]. The plants are very susceptible to slug and snail damage, the young growth in spring is especially at risk[200]. Special Features: Attractive foliage, Not North American native, Naturalizing, Attracts butterflies, Suitable for cut flowers, Fragrant flowers.

## 4.2.28 *Viola odorata*

Sweet Violet, English Violet, Garden Violet, Sweet Violet, Florist's Violet

4 tlin 8 cyuc 5 kcaok 3 tcan 3 dwat 0.1 m hkuc  
hmimhtut cyutli tcup hwicli hrasljutnyik hpa7tli flatprikwlis  
hpa7tmwatli fyfjxre7t hjonli

drutta *Viola odorata* is an evergreen Perennial growing to 0.1 m (0ft 4in) by 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 leaf all year, in flower from February to April, and the seeds ripen from April to June. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees, Cleistogomy (self-pollinating without flowers ever opening). 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.

pcista May cause vomiting. Possible additive effect with laxatives [301].

kcakta Edible Parts: Flowers Leaves Edible Uses: Condiment Tea Young leaves and flower buds - raw or cooked[21, 85, 183]. Usually available all through the winter[K]. The leaves have a very mild flavour, though they soon become quite tough as they grow older. They make a very good salad, their mild flavour enabling them to be used in bulk whilst other stronger-tasting leaves can then be added to give more flavour[K]. When added to soup they thicken it in much the same way as okra[62, 85, 159]. Also used as a flavouring in puddings etc. A tea can be made from the leaves[85]. Flowers - raw. Used to decorate salads and desserts[5, 9, 85]. A sweet mild flavour with a delicate perfume, the flowers are an especially welcome decoration for the salad bowl since they are available in late winter[K]. The flowers are also used

fresh to flavour and colour confectionery[238]. A soothing tea can be made from the leaves and flowers[85, 183]. A leaf extract is used to flavour sweets, baked goods and ice cream[183].

cantata Essential Litmus An essential oil from the flowers and leaves is used in perfumery[57, 100]. 1000kg of leaves produces about 300 - 400g absolute[46]. The flowers are used to flavour breath fresheners[238]. A pigment extracted from the flowers is used as a litmus to test for acids and alkalines[4, 13, 100, 115]. Plants can be grown as a ground cover when spaced about 30cm apart each way[208]. They make an effective weed-excluding cover[K]. ornamental. 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 Antiinflammatory Antirheumatic Cancer Demulcent Diaphoretic Diuretic Emetic Emollient Expectorant Homeopathy Laxative Purgative Urinary Sweet violet has a long and proven history of folk use, especially in the treatment of cancer and whooping cough[4, 165, 218]. It also contains salicylic acid, which is used to make aspirin[244]. It is therefore effective in the treatment of headaches, migraine and insomnia[244]. The whole plant is anti-inflammatory, diaphoretic, diuretic, emollient, expectorant, and laxative[4, 7, 21, 46, 165]. It is taken internally in the treatment of bronchitis, respiratory catarrh, coughs, asthma, and cancer of the breast, lungs or digestive tract[238]. Externally, it is used to treat mouth and throat infections[238]. The plant can either be used fresh, or harvested when it comes into flower and then be dried for later use[4]. The flowers are demulcent and emollient[240]. They are used in the treatment of biliousness and lung troubles[240]. The petals are made into a syrup and used in the treatment of infantile disorders[240]. The roots is a much stronger expectorant than other parts of the plant but they also contain the alkaloid violine which at higher doses is strongly emetic and purgative[4, 244, 254]. They are gathered in the autumn and dried for later use[7]. The seeds are diuretic and purgative. They have been used in the treatment of urinary complaints are considered to be a good remedy for gravel[4]. A homeopathic remedy is made from the whole fresh plant[4]. It is considered useful in the treatment of spasmodic coughs and rheumatism of the wrist[4]. An essential oil from the flowers is used in aromatherapy in the treatment of bronchial complaints, exhaustion and skin complaints[238].

nrakta Europe, including Britain, from Norway south and east to N. Africa, W. Asia and Syria. ksacta Fields, hedgerows and woodlands, especially on calcareous soils[7, 17, 31].

propta Seed - best sown in the autumn in a cold frame. The seed requires a period of cold stratification and the germination of stored seed can be erratic. Prick out the seedlings into individual pots when they are large enough to handle and plant them out in the summer. Division in the autumn or just after flowering. Larger divisions can be planted out direct into their permanent positions, though 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.

nwata Landscape Uses:Alpine garden, Border, Container, Ground cover, Massing, Rock garden, Woodland garden. Succeeds in most soils but prefers a cool moist well-drained humus-rich soil in partial or dappled shade and protection from scorching winds[1, 14, 31, 200]. When grown in the open it prefers a moderately heavy rich soil[1]. Plants have done very well in a hot dry sunny position on our Cornish trial grounds[K]. Tolerates sandstone and limestone soils. Plants are hardy to about -20°C[187]. Sweet violets are very ornamental plants, there are many named varieties[187]. They produce their delicately scented flowers in late winter and early spring - these are designed for fertilisation by bees and since there are few bees around at this time of year these flowers seldom set seed[4]. However, the plants also produce a second type of flower later in the year. These never open, but seed is produced within them by self-fertilization[4]. The plants will often self-sow freely when well-sited[188]. They can also spread fairly rapidly at the roots when they are growing well[K]. Responds well to an annual replanting in rich loose leafy soils[187]. All members of this genus have more or less edible leaves and flower buds, though those species with yellow flowers can cause

diarrhoea if eaten in large quantities[62, 85, 159]. Special Features: Edible, Not North American native, Invasive, Naturalizing, Suitable for cut flowers, Extended bloom season in Zones 9A and above, Fragrant flowers. 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. The plant growth habit is a runner spreading indefinitely by rhizomes or stolons [1-2]. The root pattern is rhizomatous with underground stems sending roots and shoots along their length [1-2]. The root pattern is stoloniferous rooting from creeping stems above the ground [1-2].

## 4.2.29 *Fragaria x ananassa*

Strawberry

4 tlin 8 cyuc 5 kcaok 3 tcan 0 dwat 0.3 m hkuc  
hmmihmtut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprikrlwis  
hpa7tmwatli fyfjkre7t hjonli

drutta *Fragaria x ananassa* is a PERENNIAL growing to 0.3 m (1ft). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from May to July, and the seeds ripen from June to 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 can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

kcakta Edible Parts: Fruit Leaves Edible Uses: Fruit - raw. Fruits of the best cultivars are sweet and succulent with an exquisite flavour[K]. Strawberries are a very popular fruit and are widely available in the summer. The fruit of some cultivars is up to 3cm in diameter[200]. Young leaves - raw. tcanta 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.

nrakta A hybrid of garden origin, probably *F. virginiana* x *F. chiloensis*. ksacta Not known in the wild.

propta Seed - sow early spring in a greenhouse. The seed can take 4 weeks or more to germinate. The seedlings are very small and slow-growing at first, but then grow rapidly. Prick them out into individual pots when they are large enough to handle and plant them out during the summer. This is a hybrid species and seed will not breed true, though this is the only way to develop new varieties. Division of runners, preferably done in July/August in order to allow the plants to become established for the following years crop[200]. They can also be moved in the following spring if required though should not then be allowed to fruit in their first year. The runners can be planted out direct into their permanent positions.

nwatta Prefers a fertile, well-drained, moisture retentive soil in a sunny position[200]. Tolerates semi-shade though fruit production will be reduced when plants grow in such a position. Strawberries appreciate a mulch of pine or spruce leaves[18]. The strawberry is widely cultivated in temperate areas for its edible fruit, there are many named varieties[183] that can supply fruit from late spring (under clothes) to late autumn. Most strawberry varieties are day-length sensitive and only flower at certain times of the year. However, a number of cultivars have been selected that are not sensitive to day-length and can produce fruit for most of the summer. These cultivars are normally referred to as 'remontants'. The blossom can be damaged by late spring frosts[1]. Oat straw should not be used as a mulch since this can infect the strawberries with stem and bulb eelworm. Strawberry plants are very subject to virus diseases, these are usually spread by an aphid. Plants tend to degenerate after a few years and need to be replaced. Seed is a safe means of propagation though, since this species is of hybrid origin, the seed will not breed true. Strawberries are a good companion plant, growing well with bush beans, spinach, borage, lettuce and pyrethrum[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 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 stoloniferous rooting from creeping stems above the ground [1-2].

## 4.2.30 *Allium cepa ascalonicum*

Shallot

4 tlin 8 cyuc 5 kcaok 0 tcan 3 dwat 0.3 m hkuc  
htut cyutli tcup hwicli hrasjlut hpa7tli flatprikrlwisslip  
hpa7tmwatli xre7t hjonli

drutta *Allium cepa ascalonicum* is a BULB growing to 0.3 m (1ft). 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 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 and can grow in very alkaline soils. It cannot grow in the shade. It prefers moist soil.

pcista There have been cases of poisoning caused by the consumption, in large quantities and by some mammals, of this plant. Dogs seem to be particularly susceptible[76].

kcakta Edible Parts: Flowers Leaves Root Edible Uses: Bulb - raw or cooked. A mild onion flavour, the bulbs can be up to 6cm in diameter. They can be added to salads etc, cooked as a vegetable or used as a flavouring in soups etc[1, 2, 16, 37]. Leaves - raw or cooked. A pleasant onion flavour, though they should not be harvested in quantity since this would reduce production of the bulbs[K]. Flowers - raw. Used as a garnish on salads. The flowers are somewhat dry and are less pleasant than many other species[K].

tcanta Cosmetic Dye Hair Polish Repellent Rust The juice of the plant is used as a moth repellent and can also be rubbed onto the skin to repel insects[7]. The plant juice can be used as a rust preventative on metals and as a polish for copper and glass[7]. A yellow-brown dye is obtained from the skins of the bulbs[141, 168]. Onion juice rubbed into the skin is said to promote the growth of hair and to be a remedy for baldness[7]. It is also used as a cosmetic to get rid of freckles[7]. The growing plant is said to repel insects and moles[201]. A spray made by pouring enough boiling water to cover 1kg of chopped unpeeled onions is said to increase the resistance of other plants to diseases and parasites[201].

dwatta Alternative Anthelmintic Antiinflammatory Antiseptic Antispasmodic Astringent Carminative Diuretic Expectoant Febrifuge Hypoglycaemic Hypotensive Lithotropic Nutritive Skin Stings Stomachic Tonic Vulnerary Although rarely used specifically as a medicinal herb, the onion has a wide range of beneficial actions on the body and when eaten (especially raw) on a regular basis will promote the general health of the body. The bulb is anthelmintic, anti-inflammatory, antiseptic, antispasmodic, carminative, diuretic, expectoant, febrifuge, hypoglycaemic, hypotensive, lithotropic, stomachic and tonic[4, 7, 21]. When used regularly in the diet it offsets tendencies towards angina, arteriosclerosis and heart attack[254]. It is also useful in preventing oral infection and tooth decay[254]. Baked onions can be used as a poultice to remove pus from sores[254]. Fresh onion juice is a very useful first aid treatment for bee and wasp stings, bites, grazes or fungal skin complaints[7, 201]. When warmed the juice can be dropped into the ear to treat earache[254]. It also aids the formation of scar tissue on wounds, thus speeding up the healing process, and has been used as a cosmetic to remove freckles[7].

nrakta Original habitat is obscure. ksacta Not known in the wild.

propta Plant out bulbs in late winter or very early spring. Plant firmly to half the bulbs depth and protect from birds until the bulbs have rooted[200]. (Birds seem to have a fascination for pulling the bulbs out of the ground and then leaving them lying on the surface[K]). Traditionally, bulbs were planted on the shortest day and harvested on the longest. Smaller bulbs are less likely to bolt as a result of exposure to cold conditions[200].

nwatta Prefers a sunny position in a light well-drained soil but tolerates most soils.[1, 200]. Does not grow well on heavy clays[200]. Prefers a pH in the range 6 to 7[200]. Tolerates a pH in the range 4.5 to 8.3. We are using the name *A. cepa ascalonicum* for this plant in order to differentiate it from the potato onion, *A. cepa aggregatum*, though it should really be included in *A. cepa aggregatum*[K]. This is a genuinely perennial form of *A. cepa* that is widely grown in temperate and tropical areas for its edible bulbs[200]. These are milder but smaller than the onion. There are several named forms[200]. The plant is easier to grow than onions, matures faster and keeps better[200], though yields are lower. Plants



are very tolerant of high temperatures up to 30°C and bulbing only occurs at temperatures above 20°C[200]. Plants rarely produce viable seed in temperate areas, they are usually propagated by means of their bulbs, each one dividing up in the growing season to produce from 2 to more than 12 new bulbs[200]. Bulbs can become infected with virus, it is important to only plant clean stock[200]. Closely related to *A. oschaninii*. *O. fedschii*, a wild species found in C. Asia. 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].

### 4.2.31 *Allium ursinum*

Wild Garlic  
4 tlin 8 cyuc 5 kcaok 0 tcan 3 dwat 0.3 m hkuc  
pcimhmtut cyutli tcup hwicli hrasjut hpa7tli flatpriklwis  
hpa7tmwatli xre7t hjonli

*drutta* *Allium ursinum* is a BULB growing to 0.3 m (1ft) by 0.3 m (1ft in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in leaf from February to June, in flower from May to June, and the seeds ripen from May to July. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees, insects. Suitable for: light (sandy) and medium (loamy) soils. 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.

*pcista* There have been cases of poisoning caused by the consumption, in very large quantities and by some mammals, of this species. Dogs seem to be particularly susceptible[76].

*kcakta* Edible Parts: Flowers Leaves Root Edible Uses: Leaves - raw or cooked[2, 5, 9, 12, 24]. Usually available from late January[K]. One report says that they have an overpowering garlic odour that dissipates on cooking[183], though our experience is that they are considerably milder than garlic[K]. The leaves make a very nice addition to salads, and are especially welcome as a vital and fresh green leaf in the middle of winter[K]. Flowers - raw or cooked. These are somewhat stronger than the leaves, in small quantities they make a decorative and very tasty addition to salads[K]. The flowering heads can still be eaten as the seed pods are forming, though the flavour gets even stronger as the seeds ripen[K]. Bulb - raw or cooked[2]. A fairly strong garlic flavour, though it is quite small and fiddly to harvest[K]. The bulbs can be harvested at any time the plant is dormant from early summer to early winter. Harvested in early summer, they will store for at least 6 months[K]. The bulbs can be up to 4cm long and 1cm in diameter[00]. The small green bulbils are used as a caper substitute[183].

*tcanta* Companion Disinfectant Repellent The juice of the plant is used as a moth repellent. The whole plant is said to repel insects and moles[20]. The juice of the plant has been used as a general household disinfectant[7].

*dwatta* Anthelmintic Antiasthmatic Anticholesterolemic Antiseptic Antispasmodic Astringent Cholagogue Depurative Diaphoretic Disinfectant Diuretic Expectorant Febrifuge Hypotensive Rubefacient Stimulant Stomachic Tonic Vasodilator Ramsons has most of the health benefits of the cultivated garlic, *A. sativum*[7, 238], though it is weaker in action[254]. It is therefore a very beneficial addition to the diet, promoting the general health of the body when used regularly. It is particularly effective in reducing high blood pressure and blood cholesterol levels[9]. It is recognised as having a good effect on fermentative dyspepsia[244]. All parts of the plant can be used, but the bulb is most active. The plant is anthelmintic, antiasthmatic, anticholesterolemic, antiseptic, antispasmodic, astringent, cholagogue, depurative, diaphoretic, diuretic, expectorant, febrifuge, hypotensive, rubefacient, stimulant, stomachic, tonic and vasodilator[7, 21]. Ramsons ease stomach pain and are tonic to the digestion, so they can be used in the treatment of diarrhoea, colic, wind, indigestion and loss of appetite[254]. The whole herb can be used in an infusion against threadworms, either ingested or given as an enema[254]. The herb is also beneficial in the treatment of asthma, bronchitis and emphysema[254]. The juice is used as an aid to weight loss and can also be applied externally to rheumatic and arthritic joints where its

mildd irritant action and stimulation to the local circulation can be of benefit[254].

*nrakta* Much of Europe, including Britain, east to the Caucasus and W. Asia. ksacta Damp soils in woods, copses, valleys and similar moist shady localities[9].

*propta* Seed - best sown as soon as it is ripe either in situ or in a cold frame. It germinates quickly and can be grown on in the greenhouse for the first year, planting out the dormant bulbs in the late summer of the following year. Stored seed can be sown in spring in a greenhouse. Division in summer after the plants have died down. Very easy, the divisions can be planted out straight into their permanent positions.

*nwatta* Prefers woodland conditions in a moist well-drained soil[203]. Plants are often found in the wild growing in quite wet situations[K]. When growing in suitable conditions, wild garlic forms a dense carpet of growth in the spring and can be a very invasive plant[24, 203, K]. It dies down in early summer; however, allowing other plants to grow in the same space[K]. The bulbs should be planted fairly deeply[1]. The seeds are dispersed by ants[244]. 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].

### 4.2.32 *Crataegus missouriensis*

4 tlin 8 cyuc 5 kcaok 0 tcan 2 dwat m hkuc  
hmimhtut cyutli hgattcuphja7n hwicli hrasjutnyikfrip hpa7tli  
flatpriklwis hpa7tmwatli xre7t hjonli

*drutta* *Crataegus missouriensis* 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. 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.

*kcakta* Edible Parts: Fruit Edible 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, mallets and other small items[82].

*dwatta* Cardiotonic Hypotensive 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* 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

up the seedlings as soon as they are large enough to handle and grow them out 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].

## 4.2.33 Allium cepa

Onion, Garden onion

4 tlin 10 cyuc 5 kcak 3 tcan 3 dwat 0.6 m hkuc  
htut cyutli tcup hwicli hrasljut hpa7tli flatprikliwslip  
hpa7tmwlati xre7t hjonli

drutta Allium cepa is an evergreen Bulb growing to 0.6 m (2ft). See above for USDA hardness. 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, insects. Suitable for: light (sandy) and medium (loamy) 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 moist soil.

pcista There have been cases of poisoning caused by the consumption, in large quantities and by some mammals, of this plant. Dogs seem to be particularly susceptible[76]. Hand eczema may occur with frequent handling. May interfere with drug control of blood sugar [301].

kcakta Edible Parts: Flowers Leaves Root SeedEdible Uses: Bulb - raw or cooked. A very versatile food, the bulb can be 10cm or more in diameter and is widely used in most countries of the world. Eaten raw, it can be sliced up and used in salads, sandwich fillings etc, it can be baked or boiled as a vegetable in its own right and is also commonly used as a flavouring in soups, stews and many other cooked dishes. Some cultivars have been selected for their smaller and often hotter bulbs and these are used for making pickles. Leaves - raw or cooked[2, 37]. There are some cultivars, the spring onions, that have been selected for their leaves and are used in salads whilst still young and actively growing - the bulb is much smaller than in other cultivars and is usually eaten with the leaves. By successional sowing, they can be available at any time of the year. Flowers - raw. Used as a garnish on salads. The flowers are somewhat dry and are less pleasant than many other species[K]. The seeds are sprouted and eaten. They have a delicious onion flavour[K].

tcanta Cosmetic Dye Hair Polish Repellent RustThe juice of the plant is used as a moth repellent and can also be rubbed onto the skin to repel insects[7]. The plant juice can be used as a rust preventative on metals and as a polish for copper and glass[7]. A yellow-brown dye is obtained from the skins of the bulbs[141, 168]. Onion juice rubbed into the skin is said to promote the growth of hair and to be a remedy

for baldness[7, 254]. It is also used as a cosmetic to get rid of freckles[7]. The growing plant is said to repel insects and moles[201]. A spray made by pouring enough boiling water to cover 1kg of chopped unpeeled onions is said to increase the resistance of other plants to diseases and parasites[201].

dwatta Anthelmintic Antiinflammatory Antiseptic Antispasmodic Appetizer Carminative Diuretic Expectorant Febrifuge Homeopathy Hypoglycaemic Hypotensive Lithotropic Skin Stings Stomachic TonicAlthough rarely used specifically as a medicinal herb, the onion has a wide range of beneficial actions on the body and when eaten (especially raw) on a regular basis will promote the general health of the body. The bulb is anthelmintic, anti-inflammatory, antiseptic, antispasmodic, carminative, diuretic, expectorant, febrifuge, hypoglycaemic, hypotensive, lithotropic, stomachic and tonic[4, 7, 21]. When used regularly in the diet it offsets tendencies towards angina, arteriosclerosis and heart attack[254]. It is also useful in preventing oral infection and tooth decay[254]. Baked onions can be used as a poultice to remove pus from sores[254]. Fresh onion juice is a very useful first aid treatment for bee and wasp stings, bites, grazes or fungal skin complaints[7, 201]. When warmed the juice can be dropped into the ear to treat earache[254]. It also aids the formation of scar tissue on wounds, thus speeding up the healing process, and has been used as a cosmetic to remove freckles[7]. Bulbs of red cultivars are harvested when mature in the summer and used to make a homeopathic remedy[232]. This is used particularly in the treatment of people whose symptoms include running eyes and nose[232]. The German Commission E Monographs, a therapeutic guide to herbal medicine, approve Allium cepa Onion for appetite loss, arteriosclerosis, dyspeptic complaints, fevers and colds, cough/bronchitis, hypertension, tendency to infection, inflammation of mouth and pharynx, common cold (see [302] for critics of commission E).

nrakta W. Asia - Iran? The original habitat is obscure. ksacta Not known in the wild.

propta Seed. Early sowings can be made in February in a greenhouse to be planted out in late spring. The main sowing is made in March or April in an outdoor seedbed, this bed must be very well prepared. A sowing can also be made in an outdoor seedbed in August of winter hardy varieties (the Japanese onions are very popular for this). These overwinter and provide an early crop of onion bulbs in June of the following year. Onion sets can be planted in March or April. Sets are produced by sowing seed rather thickly in an outdoor seedbed in May or June. The soil should not be too rich and the seedlings will not grow very large in their first year. The plants will produce a small bulb about 1 - 2cm in diameter, this is harvested in late summer, stored in a cool frost-free place over winter and then planted out in April. A proportion of the bulbs will run quickly to seed but most should grow on to produce good sized bulbs.

nwatta Prefers a sunny sheltered position in a rich light well-drained soil[1, 16]. Prefers a pH of at least 6.5[200]. Plants tolerate a pH in the range of 4.5 to 8.3. Onions are best grown in a Mediterranean climate, the hot dry summers ensuring that the bulbs are ripened fully[200]. For best growth, however, cool weather is desirable at the early stages of growth[200]. Plants are frost-tolerant but prolonged temperatures below 10°C cause the bulb to flower[200]. Optimum growth takes place at temperatures between 20 and 25°C[200]. Bulb formation takes place in response to long-day conditions[200]. Plants are perennial but the cultivated forms often die after flowering in their second year though they can perennate by means of off-sets[1]. The onion was one of the first plants to be cultivated for food and medicine[244]. It is very widely cultivated in most parts of the world for its edible bulb and leaves, there are many named varieties capable of supplying bulbs all the year round[200]. This species was derived in cultivation from *A. oschaninii*[203]. Most forms are grown mainly for their edible bulbs but a number of varieties, the spring onions and everlasting onions, have been selected for their edible leaves. There are several sub-species:- Allium cepa 'Perutile' is the everlasting onion with a growth habit similar to chives, it is usually evergreen and can supply fresh leaves all winter. Allium cepa aggregatum includes the shallot and the potato onion. These are true perennials, the bulb growing at or just below the surface of the ground and increasing by division. Plants can be divided annually when they die down in the summer to provide bulbs for eating and propagation.

*Allium cepa* proliferum is the true onion, it produces bulbs instead of flowers in the inflorescence. These bulbs have a nice strong onion flavour and can be used raw, cooked or pickled. Onions grow well with most plants, especially roses, carrots, beet and chamomile, but they inhibit the growth of legumes[18, 20, 54, 201]. 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].

#### 4.2.34 *Corylus maxima*

Filbert, Giant filbert

4 tlin 8 cyuc 5 kcaak 5 tcan 0 dwat m hkuc  
hmmihmtu cyutli tcup hwicli hrasjlutnyik hpa7tli flatprikli-  
wis hpa7tmwatli xre7t hjonli

drutta *Corylus maxima* is a deciduous Shrub growing to 6 m (19ft) by 5 m (16ft). 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 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. The plant can tolerate strong winds but not maritime exposure.

kcakta Edible Parts: Oil Oil Seed Edible Uses: Milk Oil Oil Seed - raw or cooked[22, 34, 46, 105]. It is rich in oil. Large and well flavoured, it can be eaten raw, cooked in cakes, pies, breads etc or used to make a plant milk[183]. 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 Basketry Charcoal Hedge Oil Oil Wood The seed contains up to 65% of a non-drying oil, used in paints, cosmetics etc[13, 46, 57, 132]. The whole seed can be used to polish and oil wood[6]. Very easy and effective[K]. Plants can be grown as a tall hedge[29]. They need to be left untrimmed or only lightly trimmed if seed is required. Wood - soft, easy to split, not very durable, beautifully veined. Used for inlay work, small items of furniture, hurdles, wattles, basketry, pea sticks etc[7, 13, 23, 46, 61, 63, 66, 125]. The twigs are used as dowsing rods by water diviners[11]. The wood also yields a good quality charcoal, used by artists[63, 101].

nrakta S. Europe to W. Asia. ksacta Woods, hedges and ravines[100].

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 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]. Division of suckers in early spring. Very easy, they can be planted out straight into their permanent positions.

nwatta Management: Coppice Management: Standard Regional Crop Staple Crop: Protein-oil 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]. Plants are fairly wind tolerant[1, 11]. A very hardy plant but the male flowers can be damaged by heavy frosts at flowering time[200]. The filbert is often cultivated for its edible seeds[50], there are many named varieties[63]. It has often been hybridized with *C. avellana* in breeding programmes[11]. Plants are self-fertile but a more certain crop is obtained if more than one cultivar is grown[200]. The main difference between cob nuts and filberts is that the husk of a filbert is longer than the seed and often completely encloses it, whilst the husk on a cob nut is shorter than the seed[200]. Squirrels are a major pest of this plant, often decimating the

crop of nuts[200]. Members of this genus bear transplanting well and can be easily moved even when relatively large[11].

#### 4.2.35 *Allium schoenoprasum sibiricum*

Giant Chives

4 tlin 8 cyuc 5 kcaak 2 tcan 2 dwat 0.3 m hkuc  
hmmihmtu cyutli tcup hwicli hrasjlutnyik frip hpa7tli flatprikli-  
wis hpa7tmwatli xre7t hjonli

drutta *Allium schoenoprasum sibiricum* is a BULB growing to 0.3 m (1ft) by 0.3 m (1ft in). 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 Bees, 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.

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 Root Edible Uses: Leaves - raw, cooked or dried for later use. The leaves have a mild onion flavour and are an excellent addition to mixed salads, they can also be used as a flavouring in soups etc[90, 105]. This form has a stronger garlic flavour than common chives[183] The leaves are often available from late winter and can continue to produce leaves until early the following winter, especially if the plant is in a warm, sheltered position[K]. A good source of sulphur and iron[201]. The bulbs are rather small but can be used as spring onions[K]. They can be harvested with the leaves still attached and be used as spring onions[K]. They have a pleasant mild onion flavour. The flowers can be used as a garnish in salads etc[183]. The flowers of this species are rather dry and less desirable than the flowers of many other species[K].

tcanta Fungicide Repellent The juice of the plant is used as an insect repellent, it also has fungicidal properties and is effective against scab, mildew etc[14, 18, 20]. The growing plant is said to repel insects and moles[14, 20].

dwatta Appetizer Digestive Hypotensive Tonic The whole plant has a beneficial effect on the digestive system and the blood circulation. It improves the appetite, is digestive, hypotensive and tonic[201]. It has similar properties to garlic (*A. sativum*), but in a much milder form, and it is rarely used medicinally[238].

nrakta N. America to E. Asia - Siberia, Japan. ksacta Calcareous or basic rock, gravels and shores, Alaska and southwards[43].

propta Seed - sow spring in a cold frame. Germination is usually free and easy, pot up the seedlings as soon as they are large enough to handle easily and plant out in the following spring. Division can be carried out at almost any time of the year but is probably best done in spring. The clumps should be divided at least every 3 or 4 years in order to maintain vigour[200], the divisions can be planted out direct into their permanent positions.

nwatta An easily grown plant[203], it prefers a sunny position in a rich moist but well-drained soil[14, 37]. Succeeds in most soils[1, 37] and in light shade[203]. Grows well in heavy clay soils[203]. Tolerates a pH in the range 5.2 to 8.3. This is a more robust form of *A. schoenoprasum*, the chive. It is often grown in the garden for its edible leaves which are available from late winter to the beginning of the next winter[K]. The bulbs divide rapidly and large clumps are quickly formed. There are some named varieties[183]. Regular cutting of the leaves ensures a continuous supply of young leaves and prevents flowering[33]. Plants can be moved into a frame or other protected environment in the autumn and will then produce leaves throughout the winter[33]. Do not do this every year or it weakens the plants. The bulbs should be planted fairly deeply[1]. A good bee plant[24]. Grows well with most plants, especially roses, carrots, beet and chamomile, but it inhibits the growth of legumes[18, 20, 54]. Helps to reduce the incidence of scab when it is grown under apple trees[201]. This plant is a bad

on alfalfa, each species negatively affecting the other[201]. Members of this genus are rarely if ever troubled by browsing deer[233].

## 4.2.36 *Agastache foeniculum*

Anise Hyssop, Blue giant hyssop

4 tlin 9 cyuc 5 kcaak 3 tcan 1 dwat 0.9 m hkuc  
htut cyutli kyuctcup hwicli hrasjlut hpa7tli flatprikrlwis  
hpa7tmwatli fyifxre7t hjonli

drutta *Agastache foeniculum* is a PERENNIAL growing to 0.9 m (3ft) by 0.4 m (1ft 4in). See above for USDA hardiness. It is hardy to UK zone 8 and is not frost tender. It is in flower in July, and the seeds ripen in August. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. 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.

kcakta Edible Parts: Flowers Leaves Edible Uses: Drink Tea Leaves and flowers - raw or cooked. They are used as a flavouring in raw or cooked dishes[108, 177, 257]. Excellent raw, they have a sweet anised flavour and are one of our favourite flavourings in salads[K]. They make a delicious addition to the salad bowl[183] and can also be used to flavour cooked foods, especially acid fruits[K]. The only drawback to the leaves is that they tend to have a drying effect in the mouth and so cannot be eaten in quantity[K]. A pleasant tasting tea is made from the leaves[46, 61, 161, 183].

tcanta Attracts wildlife. Invertebrate Shelter, nectary. Aromatic.

dwatta Cardiac Diaphoretic Pectoral Poultice The leaves are cardiac and diaphoretic[222, 238, 257]. An infusion of the leaves is used in the treatment of colds, fevers, weak heart etc[222]. When left to go cold, the infusion is used to treat pains in the chest (such as when the lungs are sore from too much coughing)[207]. A poultice of leaves and stems can be used to treat burns[257].

nrakta Western N. America - Ontario to Washington, south to Colorado. ksacta Dry thickets, fields and waste ground[43] on prairies and plains[235].

propta Seed - sow spring in a greenhouse and only just cover the seed. The seed usually germinates in 1 - 3 months at 13°C[133]. Prick out the seedlings into individual pots when they are large enough to handle and grow them on in the greenhouse for their first year. Plant out in late spring or early summer[K]. Division in spring. Fairly simple, if large divisions are used it is possible to plant them straight out into their permanent positions. Basal cuttings of young shoots in spring[111]. Harvest the young shoots when they are about 10 - 15cm tall and pot them up in a lightly shaded position in a greenhouse. They should root within 3 weeks and can be planted out in the summer or following spring.

nwatta Prefers a sunny position and a dry well-drained soil[187, 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 is very susceptible to slug damage[K]. The flowering plants are very attractive to bees and butterflies[K]. There is at least one named variety. 'Texas American' has an anise-pennyroyal fragrance and is used in a similar way to the species[183]. The plant is heat tolerant in zones 12 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 flat with shallow roots forming a plate near the soil surface [1-2].

## 4.2.37 *Fragaria vesca* 'Semperflorens'

Alpine Strawberry

4 tlin 8 cyuc 5 kcaak 0 tcan 3 dwat 0.3 m hkuc  
hmimhtut cyutli tcup hwicli hrasjlutnykifrip hpa7tli flatprikrl-  
wisslip hpa7tmwatli xre7t hjonli

drutta *Fragaria vesca* 'Semperflorens' is a PERENNIAL growing to 0.3 m (1ft) by 0.3 m (1ft in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from May to November, and the seeds ripen from June to November. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees, flies, Lepidoptera (Moths and Butterflies). 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 moist soil.

kcakta Edible Parts: Fruit Leaves Edible Uses: Coffee Tea Fruit - raw, cooked or made into preserves[183]. Sweet and succulent with an exquisite taste, they are far superior to the cultivated strawberry[K]. The fruit is fairly small, up to 15mm in diameter, but it is produced abundantly from early summer until the frosts of autumn[K]. Young leaves - raw or cooked[52, 105]. Added to salads or used as a poultice[183]. The fresh or dried leaves are used as a tea substitute[7, 177, 183]. The root has been used as a coffee substitute in India[240].

tcanta Compost Teeth The flowers are an alternative 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 fruit is used as a tooth cleaner[4]. The fresh fruit removes stains from teeth if it is allowed to remain for about 5 minutes[4]. The fruit is also used cosmetically in skin-care creams[7]. It tones and whitens the skin, combats wrinkles, lightens freckles, soothes sunburn and whitens the teeth[244].

dwatta Astringent Diuretic Laxative Tonic The leaves and the fruit are astringent, diuretic, laxative and tonic[4, 9, 222]. The leaves are mainly used, though the fruits are an excellent food to take when feverish and are also effective in treating rheumatic gout[4]. A slice of strawberry is also excellent when applied externally to sunburnt skin[4]. A tea made from the leaves is a blood tonic[222]. It is used in the treatment of chilblains[53] and also as an external wash on sunburn[222]. The leaves are harvested in the summer and dried for later use[238]. The fruits contain salicylic acid and are beneficial in the treatment of liver and kidney complaints, as well as in the treatment of rheumatism and gout[244]. The roots are astringent and diuretic[4, 222]. A decoction is used internally in the treatment of diarrhoea and chronic dysentery[4, 244]. Externally it is used to treat chilblains and as a throat gargle[244]. The roots are harvested in the autumn and dried for later use[238].

nrakta Most of Europe, including Britain, to temperate Asia. ksacta Woodland and damp undergrowth[7].

propta Seed - sow early spring in a greenhouse. The seed can take 4 weeks or more to germinate. The seedlings are very small and slow-growing at first, but then grow rapidly. Prick them out into individual pots when they are large enough to handle and plant them out during the summer.

nwatta Prefers a fertile, well-drained, moisture retentive soil in a sunny position[27, 200]. Tolerates semi-shade though fruit production will be reduced when plants are growing in such a position. Prefers some shade according to some reports[3, 31]. Plants are often found on clay soils[31] and on soils overlying chalk[13]. Alpine strawberries appreciate a mulch of pine or spruce leaves[18]. The alpine strawberry is often cultivated in the garden for its edible fruit. This fruit is fairly small but exquisitely flavoured and is freely produced from June to November. There are some named varieties[183]. It is not very feasible to grow this plant on a commercial scale because it is very labour intensive to pick and it is also hard to get the fruit to market in good quality. However, it is sometimes grown by specialised growers for the luxury market. The main drawback of growing this plant is that it tends to lose vigour after about 2 - 3 years, partly

to virus diseases and partly because the plant flowers and fruits so freely that it exhausts itself.

## 4.2.38 Allium canadense mobilese

Canadian Garlic

4 tlin 8 cyuc 5 kcaok 0 tcan 2 dwat m hkuc  
hmimhtut cyutli tcuphja7n hwicli hrasjlut hpa7tli flatprikrlwis  
hpa7tmwatli xre7t hjonli

drutta Allium canadense mobilese is a BULB growing to 0.5 m (1ft 8in) by 0.2 m (0ft 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 Bees, insects. Suitable for: light (sandy) and medium (loamy) 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 or wet soil.

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 RootEdible Uses: Bulb - raw or cooked[46, 61, 62, 177]. It can be used as a vegetable, or as a flavouring in soups and stews, and can also be pickled[2]. The bulb is up to 30mm in diameter, it is crisp, mild and with a pleasant flavour[183]. Used as a leek substitute according to one report[22], it is a garlic substitute according to others[55, 159, K]. Leaves - raw or cooked[55, 62, 177]. A delicious mild flavour, they are available from early spring until the autumn[K]. They make a very acceptable salad and can also be used as a greens or as a flavouring in cooked foods[K]. Flowers - raw. A little bit stronger flavour than the leaves, especially as the seeds begin to form, they can be used as a flavouring and garnish on 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 Antiasthmatic Carminative Cathartic Diuretic Expectorant StimulantThe plant is antiasthmatic, carminative, cathartic, diuretic, expectorant and stimulant[257]. A tincture is used to prevent worms and colic in children, and also as a remedy for croup[257]. Although no other 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 Southeaster N. America - Texas to North Carolina. ksacta Low woods, thickets and meadows[43]. Woods and prairies in sandy or rocky soils, rarely on limestone or clay[274].

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 Prefers a sunny position in a light well-drained soil[1]. A moisture loving plant according to another report[42]. The bulbs should be planted fairly deeply[1]. Bulbs grow to a good size under cultivation[183]. Some forms of this species produce many bulbils and are considered to be a pernicious weed in some areas of America[159], there is some risk that they could spread aggressively in Britain. This subspecies, however, is a form that does not produce bulbils and is much better behaved[200]. 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].

## 4.2.39 Allium tuberosum

Garlic Chives, Chinese chives, Oriental Chives,

4 tlin 8 cyuc 5 kcaok 3 tcan 2 dwat 0.3 m hkuc  
htut cyutli hgatyucuptc hwicli hrasjlutnyik hpa7tli flatprikrl-  
wisslip 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.

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 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 being 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, and 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 5 tlin

### 5.1 bwon

#### 5.1.1 *Elaeagnus multiflora ovata*

Goumi

tfo2n 5 tlin 9 cyuc 5 kcaak 3 tcan 2 dwat m hkuc  
hmimhtut cyutli hgatkyuctup hwicli hyishrasjlutnyik hpa7tli  
flatprikliwis hpa7tmwlati xre7t hjonli

drutta *Elaeagnus multiflora ovata* is a deciduous Shrub growing to 3 m (9ft) by 2 m (6ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender. It is in flower from April to May, and the seeds ripen in July. 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 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. It can tolerate atmospheric pollution.

kcakta Edible Parts: Fruit Seed Edible Uses: Fruit - raw or cooked[1, 3, 11, 15, 46, 177]. Pleasantly acid when ripe, they are usually made into pies, preserves etc[183]. Quite fiddly and difficult to pick without breaking the young shoots[200], this sub-species carries the fruit on longer stalks than the species and might therefore be easier to pick[K]. 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 is about 10mm long and contains a single large seed[275, K] Seed - raw or cooked. It can be eaten with the fruit though the seed case is rather fibrous[K].

tcanta Hedge Hedge Rootstock Plants can be grown as a hedge in exposed positions, tolerating maritime exposure. A hedge in a very exposed position at Rosewarne in N. Cornwall was 3.5 metres tall in 1989[K]. Often used as a rootstock for evergreen species that are hard to grow from cuttings. It frequently sprouts from the base and can out-compete the scion[182].

dwatta Cancer 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 and Japan. ksacta Thickets and thin woods in hills and on lowland, at elevations of 600 - 1800 metres[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 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. Good percentage[78]. Cuttings of mature wood of the current year's growth, 10 - 12cm with a heel, November in a frame. Leaves for 12 months. Fair to good percentage[78]. Layering in September/October. Takes 12 months[78].

nwatta An easily grown plant[184], it succeeds in most soils that are well-drained[11, 200]. Prefers a soil that is only moderately fertile, succeeding in poor soils and in dry soils[11, 200]. Prefers a light sandy loam and a sunny position but succeeds in light shade[11, 200]. Very drought and wind resistant[1, 11, 200]. Tolerates atmospheric pollution[160]. Plants are hardy to about -20°C[184], but the roots are hardy to -30°C (although top growth will be killed at this temperature). Cultivated for its edible fruit in Japan, there are some named varieties[3, 11, 183]. Plants can crop in 4 years from cuttings[160]. They bear heavily in Britain[11]. The fruit is well hidden in the shrub and is quite difficult to harvest without damaging the plant[K]. This sub-species produces brown fruits on long stalks[200], would this be any easier to harvest?[K] This species is notably resistant to honey fungus[88, 200]. Birds love the fruits[160]. There is some confusion over the correct name for this species. In the on-line version of the Flora of Japan it is referred to as *Elaeagnus montana ovata*[275]. 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 small flowers are deliciously scented, their aroma pervading the garden on calm days[K].

#### 5.1.2 *Elaeagnus multiflora*

Goumi, Cherry silverberry

tfo2n 5 tlin 9 cyuc 5 kcaak 3 tcan 2 dwat m hkuc  
hmimhtut cyutli hgatkyuctup hwicli hyishrasjlutnyik hpa7tli  
flatprikliwis hpa7tmwlati xre7t hjonli

drutta *Elaeagnus multiflora* is a deciduous Shrub growing to 3 m (9ft) by 2 m (6ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender. It is in flower from April to May, and the seeds ripen in July. 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 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. It can tolerate atmospheric pollution.

kcakta Edible Parts: Fruit Seed Edible Uses: Fruit - raw or cooked[1, 3, 11, 15, 46, 177]. Pleasantly acid when ripe, they make a very good dessert fruit[K] though they are usually made into pies, preserves etc[183]. Quite fiddly and difficult to pick without breaking the young shoots[200]. 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 Companion Hedge Hedge Rootstock Plants can be grown as a hedge in exposed positions, tolerating maritime exposure. Reasonably fast growing and providing a good screen in the summer, though much more open in the winter. It is a good companion hedge to grow, the plants enriching the soil and improving the growth of neighbouring plants[K]. A hedge in a very exposed position at Rosewarne in N. Cornwall was 3.5 metres tall in 1989[K]. Often used as a rootstock for evergreen species that are hard to grow from cuttings. It frequently sprouts from the base and can out-compete the scion[182].

dwatta Antitussive Astringent Cancer 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

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 leaves are used in the treatment of coughs[218]. The fruit is prescribed in the treatment of watery diarrhoea[218]. The root is astringent, a decoction is used to treat itch and foul sores[218].

nrakta E. Asia - China and Japan. ksacta Thickets and thin woods in hills and on lowland, at elevations of 600 - 1800 metres[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 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. 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 An easily grown plant[184], it succeeds in most soils that are well-drained[11, 200]. Prefers a soil that is only moderately fertile, succeeding in poor soils and in dry soils[11, 200]. Prefers a light sandy loam and a sunny position but succeeds in light shade[11, 200]. Very drought and wind resistant[1, 11, 200]. Tolerates atmospheric pollution[160]. Plants are hardy to about -20°C[184], but the roots are hardy to -30°C (although top growth will be killed at this temperature). A very variable species[266], it is often cultivated for its edible fruit in Japan, there are some named varieties[3, 11, 183]. Plants can crop in 4 years from cuttings[160]. They bear heavily in Britain[11]. The synonym *E. longipes* is sometimes accepted as a distinct species, differing mainly in having very long peduncles about 2.5cm in length[214]. The fruit is well hidden in the shrub and is quite difficult to harvest without damaging the plant[K]. The ssp. *E. multiflora ovata*. (Maxim.) Servettaz. produces brown fruits on long stalks[200], would this be any easier to harvest?[K]. This species is notably resistant to honey fungus[88, 200]. Birds love the fruits[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[200]. An excellent companion plant, when grown in orchards it can increase yields from the fruit trees by up to 10%. The small flowers are deliciously scented with a lilac-like smell, their aroma pervading the garden on calm days[K]. 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]. 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].

### 5.1.3 Lathyrus tuberosus

Earthnut Pea, Tuberous sweetpea  
tfo2n 5 tlin 9 cyuc 5 keak 3 tcan 0 dwat 1.2 m hkuc  
hmimhtut cyuti tcup hwicli hrasjlutnyik hpa7tli flatpriklwis  
hpa7tmwatli xre7t hjonli

drutta *Lathyrus tuberosus* is a PERENNIAL growing to 1.2 m (4ft). See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender. It is in flower from June to July, and the seeds ripen in August. 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. 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.

pcista Although no records of toxicity have been found for this plant, the seed of some species in this genus con-

tain a toxic amino acid that can cause a severe disease of the nervous system known as 'lathyrism' if they are eaten in large amounts (although small quantities are said to be nutritious)[65, 76]. Great caution is advised.

ksakta Edible Parts: Root Edible Uses: Root - cooked or raw[2, 27, 46, 61, 105]. Sweet and starchy, it is delicious when baked with a flavour that is somewhat like a sweet potato[183, K]. Taste trials consistently place this root very highly, it is certainly one of our favourites[K]. Unfortunately, yields are rather low and so the plant is only worthwhile growing as a taste treat, not as a staple crop[K].

tcanta Nitrogen fixer. Attractive flowers. Attracts wildlife.

nrakta Europe to W. Asia. Naturalized in Britain in a very few sites in E. England. ksacta Cornfields and hedgerows, avoiding acid soils[17].

propta Pre-soak the seed for 24 hours in warm water and then sow in early spring in a cold frame[200]. When they are large enough to handle, prick the seedlings out into individual pots and plant them out in the summer. If you have sufficient seed, then it can also be sown in situ in mid spring[200]. Division of the tubers when the plant is dormant in spring or autumn.

nwatta An easily grown plant, succeeding in any moderately good garden soil[200]. It prefers a limestone soil in a warm position[13], and likes some shade[1]. A climbing plant, scrambling through other plants and supporting itself by tendrils[219]. It tends to be slightly invasive[187] with new stems emerging at some distance from the parent plant[219]. The earthenut pea has occasionally been cultivated for its edible root[2, 183]. Slugs are inordinately fond of this plant and will totally destroy it given a chance[K]. A good bee plant. 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]. 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 suckering vine sending up suckers some distance main plant [1-2]. The root pattern is tuberous with swollen potato-like roots [1-2].

### 5.1.4 Elaeagnus x ebbingei

Elaeagnus, Ebbing's Silverberry  
tfo2n 5 tlin 9 cyuc 5 keak 4 tcan 2 dwat 5 m hkuc  
pcimhmimhtut cyuti hgatkuyctcup hwicli hyishrasjlutnyik  
hpa7tli flatpriklwis hpa7tmwatli xre7t hjonli

drutta *Elaeagnus x ebbingei* is an evergreen Shrub growing to 5 m (16ft) by 5 m (16ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender. It is in leaf all year, in flower from October to January, and the seeds ripen from April to May. 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 can grow in full shade (deep woodland) semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

ksakta Edible Parts: Fruit Seed Edible Uses: Fruit - raw or cooked[177]. A reasonable size, it is about 20mm long and 13mm wide although it does have a large seed[K]. The fully ripe fruit has a very rich flavour and makes pleasant tasting with a slight acidity[K]. The fruit should be deep red in colour and very soft when it is fully ripe, otherwise it will be astringent[K]. The flavour improves further if the fruit is stored for a day or two after being picked. The fruit ripens intermittently over a period of about 6 weeks from early to mid April until May[K]. Seed - raw or cooked. It can be eaten with the fruit though the seed case is rather fibrous[K]. The taste is vaguely like peanuts[K].

tcanta Companion Hedge Hedge Plants can be grown as a hedge in very exposed positions, tolerating maritime exposure. The plants provide a very good protection from the wind, they are very resistant to damage by salt winds and are also tolerant of regular trimming[75]. They have a strong vigorous growth and are faster growing than *E. macrophylla*[75, 200]. Because they fix atmospheric nitrogen, they make good

companion plants and improve the growth of neighbouring species[K]. They can be planted in the line of an old shelter-belt of trees that is becoming bare at the base and will in time fill up the empty spaces and climb into the bottom parts of the trees[K].

**dwatta Cancer**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 A garden hybrid, E. macrophylla x E. pungens or E. x. reflexa. ksacta** Not known in the wild.

**propta Seed** - this is a hybrid and it will not breed true from seed. If this is not a problem, then the seed is best sown as soon as it is ripe in a cold frame[78]. It should germinate freely within 4 weeks, 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. Rather slow, but you usually get a good percentage rooting[78]. June is the best time to take cuttings[202]. 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 A** very easily grown plant, it succeeds in most soils that are well-drained[11, 200]. Prefers a soil that is only moderately fertile, succeeding in poor soils and in dry soils[11, 200]. A drought resistant plant once established, it can be grown on top of Cornish hedges (drystone walls with earth between two vertical layers of stones). It is very tolerant of shade and grows well under trees[200]. Plants are very tolerant of maritime exposure, growing well right by the coast[K]. Plants are hardy to about -20°C, but they can be deciduous in very cold winters[200]. Fruiting as it does in early April to May, this plant has excellent potential as a commercial fruit crop in Britain. The fruit is of a reasonable size and when fully ripe is very acceptable for dessert[K]. It should be fairly easy to selectively breed for improved fruit size and flavour[K]. Not all plants bear many fruits, though many specimens have been seen that produce very heavy crops on a regular basis[K]. Since this is a hybrid species, yields may be improved by growing a selection of cultivars or one of the parent plants nearby for cross pollination. **E. pungens** is perhaps the best candidate for this and its cultivar **E. pungens 'Variegata'** has been seen on a number of occasions with good crops of fruit next to **E. x ebbingei** plants that are also laden with fruit[K]. The cultivar **E. x ebbingei 'Gilt Edge'** is also probably a good pollinator[K]. Other cultivars worth looking at are '**Salcombe Seedling**', which is said to flower more abundantly than the type[200] and '**Limelight**', which has been seen with a good crop of fruits even on small bushes[K]. 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%. Plants produce very aromatic flowers in late autumn and early winter[182]. This species is notably resistant to honey fungus[88, 200]. Sometimes whole branches die out for no apparent reason. This happens most frequently when it is grafted onto **E. multiflora**[182]. These branches should be removed from the plant. 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 mran

### 5.2.1 *Castanea sativa*

Sweet Chestnut, European chestnut

5 tlin 7 cyuc 5 kcaak 5 tcan 2 dwat 30 m hukc

htut cyutli hgatyuctup hwicli hyishrasjlutnyik hpa7tli frus-flatprik hpa7tmwatli hjonli

**drutta** *Castanea sativa* 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 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 Bees. 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 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. The plant can tolerate maritime exposure.

**kcakta Edible Parts: Seed**Edible Uses: Coffee SweetenerSeed - raw or cooked[2, 4, 5, 9, 12, 34]. A somewhat astringent taste raw, it improves considerably when cooked and is delicious baked with a floury texture and a flavour rather like sweet potatoes[K]. The seed is rich in carbohydrates, it can be dried, then ground and used as a flour in breads, puddings, as a thickener in soups etc[7, 63, 132, 183]. The roasted seed can be used as a coffee substitute[183]. A sugar can be extracted from the seed[183].

**tcanta** **Bark** **Tree Fuel** **Hair** **Starch** **Tannin** **Wood** **Tannin** is obtained from the bark[46, 223]. The wood, leaves and seed husks also contain tannin[223]. The husks contain 10 - 13% tannin[223]. On a 10% moisture basis, the bark contains 6.8% tannin and the wood 13.4%[223]. The meal of the seed has been used as a source of starch and also for whitening linen cloth[4]. A hair shampoo is made from the leaves and the skins of the fruits[7]. It imparts a golden gleam to the hair[7]. Wood - hard, strong, light. The young growing wood is very durable, though older wood becomes brittle and liable to crack[4]. It is used for carpentry, turnery, props, basketry, fence posts etc[4, 6, 7, 23, 46, 100]. A very good fuel[6].

**dwatta** **Anti** **diarrhoeal** **Anti** **inflammatory** **Astringent** **Bach** **Expectorant**Although more commonly thought of as a food crop, sweet chestnut leaves and bark are a good source of tannins and these have an astringent action useful in the treatment of bleeding, diarrhoea etc. The leaves and bark are anti-inflammatory, astringent, expectorant and tonic[4, 7, 165]. They are harvested in June or July and can be used fresh or dried[4]. An infusion has been used in the treatment of fevers and ague, but are mainly employed for their efficacy in treating convulsive coughs such as whooping cough and in other irritable conditions of the respiratory system[4, 7]. The leaves can also be used in the treatment of rheumatism, to ease lower back pains and to relieve stiff muscles and joints[254]. A decoction is a useful gargle for treating sore throats[254]. The plant is used in Bach flower remedies - the keywords for prescribing it are 'Extreme mental anguish', 'Hopelessness' and 'Despair'[209].

**nrakta S. Europe.** Long naturalized in Britain[17]. **ksacta** **Woods** in mountains[100].

**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** **Global** **Crop** **Industrial** **Crop: Biomass** **Industrial** **Crop: Tannin** **Management: Standard** **Staple** **Crop: Balanced** **carb** **Prefers** a good well-drained slightly acid loam in a sunny position but it also succeeds in dry soils[1, 11, 200, 238]. Once established, it is very drought tolerant[1, 11, 200, 238]. Plants are very tolerant of highly acid, infertile dry sands[200]. Averse to calcareous soils but succeeds on harder limestones[11, 200]. Tolerates maritime exposure



though it is slower growing in such a position[75]. The dominant plant is very cold-hardy in Britain, though the young growth in spring, even on mature plants, is frost-tender[K]. The sweet chestnut is often cultivated for its edible seed in warm temperate zones, there are several named varieties[46, 183]. Both 'Marron de Lyon' and 'Paragon' produce fruits with a single large kernel (rather than 2 - 4 smaller kernels) and so are preferred for commercial production[238]. *Castanea sativa* x *crenata*: The hybrid sweet chestnut 'Marigoule' is a good choice if you only want to grow one tree as Marigoule is a partly self-fertile cultivar. Sweet chestnuts require a warm dry summer in order to ripen their fruit properly in Britain[63] and even then these seeds are generally inferior in size and quality to seeds grown in continental climates[4]. Most species in this genus are not very well adapted for the cooler maritime climate of Britain, preferring hotter summers, but this species grows well here[11, 200]. An excellent soil-enriching understorey in pine forests[200]. Flowers are produced on wood of the current year's growth[229] and they are very attractive to bees[71]. Plants are fairly self-sterile[200]. They hybridize freely with other members of this genus[200]. At one time this tree was widely grown in coppiced woodlands for its wood, but the practise of coppicing has fallen into virtual disuse[11]. Trees regrow very quickly after being cut down, producing utilizable timber every 10 years. This species is not often seen in Cornwall though it grows very well there[59]. Trees take 30 years from seed to come into bearing[98]. Plants in this genus are notably resistant to honey fungus[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 fleshy. Thick or swollen - fibrous or tap root [2-1].

## 5.2.2 *Sassafras albidum*

Sassafras, Common Sassafras  
 5 tlin 9 cyuc 5 kcaak 3 tcan 3 dwat 25 m hukc  
 hmimhtut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprik  
 hpa7tmwatli nyanhjen hjonli

*drutta* *Sassafras albidum* is a deciduous Tree growing to 25 m (82ft) by 15 m (49ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in leaf from April to October, in flower from May to June, 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). 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 and neutral soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

*pcista* The extracted essential oil is poisonous in large quantities[4, 165]. The essential oil contains saffrole which is known to be carcinogenic and potentially harmful to the liver[274]. The essential oil has been banned as a food flavouring in America, even though the potential toxicity is lower than that of alcohol[222].

*kcakta* Edible Parts: Leaves Edible Uses: Condiment Tea Leaves - raw or cooked. The young leaves can be added to salads whilst both old and young leaves can be used as a flavouring and as a thickening agent in soups etc[2, 20, 55, 62, 82, 102, 183]. They have a mild aromatic flavour[K]. The leaves are often dried and ground into powder for later use[82, 159, 183]. The young shoots have been used to make a kind of beer[4]. The dried root bark can be boiled with sugar and water until it forms a thick paste[183]. It is then used as a condiment[183]. The root and the berries can also be used as flavourings[55, 142]. Winter buds and young leaves - raw[62, 183]. A tea is made from the root bark, it is considered to be a tonic[18, 20, 55, 62]. The tea can also be made by brewing the root in maple syrup, this can be concentrated into a jelly[183]. A tea can also be made from the leaves and the roots. It is best in spring. A tea can be made from the flowers[2].

*tcanta* Companion Dye Essential Repellent Wood An essential oil is obtained from the bark of the root[61] and also from the fruits[4]. One hundred kilos of root chips yield one litre of essential oil under steam pressure - this oil comprises

about 90% saffrol[245]. The oil is medicinal and is also used in soaps, the coarser kinds of perfumery, toothpastes, soft drinks etc[4, 46, 57, 82]. It is also used as an antiseptic in dentistry[61]. A yellow dye is obtained from the wood and the bark[4, 168]. It is brown to orange[168]. The plant repels mosquitoes and other insects[18, 20]. Wood - coarse-grained, soft, weak, fragrant, brittle, very durable in the soil. It weighs 31lb per cubic foot and is used for fence posts and items requiring lightness[46, 82, 171, 227].

*dwatta* Alternative Anodyne Antirheumatic Antiseptic Aromatic Carminative Diaphoretic Diuretic Stimulant Vasodilator *Sassafras* has a long history of herbal use. It was widely used by many native North American Indian tribes who used it to treat a wide range of complaints, valuing it especially for its tonic effect upon the body[257]. It is still commonly used in herbalism and as a domestic remedy. The root bark and root pith are alternative, anodyne, antiseptic, aromatic, carminative, diaphoretic, diuretic, stimulant and vasodilator[4, 21, 46, 165]. A tea made from the root bark is particularly renowned as a spring tonic and blood purifier as well as a household cure for a wide range of ailments such as gastrointestinal complaints, colds, kidney ailments, rheumatism and skin eruptions[222, 238, 257]. The mucilaginous pith from the twigs has been used as a poultice or wash for eye ailments and is also taken internally as a tea for chest, liver and kidney complaints[222]. An essential oil from the root bark is used as an antiseptic in dentistry and also as an anodyne[213]. The oil contains saffrole, which is said to have carcinogenic activity and has been banned from use in American foods - though it is less likely to cause cancer than alcohol[222]. In large doses the oil is poisonous, causing dilated pupils, vomiting, stupor, collapse and kidney and liver damage[4, 238]. The oil has been applied externally to control lice and treat insect bites, though it can cause skin irritation[238].

*nrakta* Eastern N. America - Maine to Ontario, south to Florida and Texas. *ksacta* Deciduous woodlands and thickets on rich sandy well-drained soils[43, 62, 159, 165]. Found on moist soils[82].

*propta* Seed - best sown as soon as ripe in a cold frame[200]. Stored seed requires 4 months cold stratification at 4°C[113]. It is best sown as early in the year as possible. Prick out the seedlings into individual pots as soon as possible and grow them on in the greenhouse. One report says to harden off the plants as soon as possible[78], but young plants are frost-tender[11] and so we recommend growing them on in the greenhouse for their first winter and then planting them out in early summer. Give the young trees some protection for at least their first winter outdoors[K]. Root cuttings, taken from suckers, 1 - 2cm long taken in December. Plant horizontally in pots in a greenhouse[78]. Suckers in late winter. Plant straight out into their permanent positions[200].

*nwatta* Landscape Uses: Pest tolerant, Massing, Specimen, Woodland garden. Requires a deep, fertile, well-drained, lime-free, near neutral soil in sun or light shade[11, 200]. Does well in a woodland garden[166], especially in a sheltered position along the edge[200]. The plant is tender when young, the young shoots of older trees can also be damaged by late spring frosts[11, 238]. A very ornamental plant[1] with a wide range of uses, it is occasionally cultivated and often gathered from the wild[61]. All parts of the tree contain essential oils and give off a pleasant spicy aroma when crushed[229]. The stem bark is highly aromatic, more so than the wood. The root stem bark is the most pleasant of all[245]. The flowers have a spicy perfume[245]. Trees are long-lived, moderately fast-growing and disease-free in the wild[227, 229]. They can begin flowering when only 10 years old and good seed crops are usually produced every 2 - 3 years[229]. The trees spread by root suckers and can form thickets[229]. Although some flowers appear to be hermaphrodite, they are functionally either male or female and most trees are dioecious[229]. Both male and female plants must be grown if seed is required. Special Features: North American native, Attracts butterflies, Fragrant flowers, Attractive flowers or blooms. The plant is heat tolerant in zones 8 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 tempera-

tree, 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 a tap root similar to a carrot going directly down [1-2]. The root pattern is suckering with new plants from underground runners away from the plant [1-2].

## 5.2.3 *Morus nigra*

Black Mulberry

5 tlin 9 cyuc 5 kcaak 3 tcan 3 dwat 10 m hkuc  
hmmimhtut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprikliwis  
hpa7tmwatli fyif hjonli

drutta *Morus nigra* is a deciduous Tree growing to 10 m (32ft) by 15 m (49ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 5. It is in flower from May to June, 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). 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. It can tolerate atmospheric pollution.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw, cooked or used in preserves[1, 2, 3, 4, 7, 9, 183]. A delicious slightly acid flavour, it makes an excellent dessert fruit and can be eaten in quantity[K]. The fruit is juicy and refreshing, though it must be used as soon as it is ripe (from mid-August to September) otherwise it will start to rot[200]. The fruit falls from the tree as soon as it is fully ripe. It is best, therefore, to grow the tree in short grass to cushion the fall of the fruit but to still make it possible to find and harvest[K]. The fruit can also be dried and ground into a powder[183]. The fruit is up to 25mm in diameter[200, 227]. White Mulberry (*Morus alba*) has edible young leaves and shoots eaten cooked[105, 183] but we have found no information for this plant.

tcanta Dye Fibre WoodA fibre used in weaving is obtained from the bark[7]. A red-violet to dark purple dye is obtained from the fruit[168]. A yellow-green dye is obtained from the leaves[168]. Wood - used in joinery[100].

dwatta Anthelmintic Astringent Homeopathy Hypoglycaemic Laxative Odontalgic Purgative UrinaryThe 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]. The white mulberry (*M. alba*) is normally used, but this species has the same properties[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]. Analgesic, emollient, sedative[7, 176]. The leaves are antibacterial, astringent, diaphoretic, hypoglycaemic, odontalgic and ophthalmic[218, 238]. They are taken internally in the treatment of colds, influenza, eye infections and nosebleeds[238]. The leaves are collected after the first frosts of autumn and can be used fresh but are generally dried[238]. The stems are antirheumatic, diuretic, hypotensive and pectoral[218, 238]. 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[218, 238]. It is used in the treatment of urinary incontinence, tinnitus, premature greying of the hair and constipation in the elderly[238]. Its main use in herbal medicine is as a colouring and flavouring in other medicines[4]. The root bark is antitussive, diuretic, expectorant and hypotensive[238]. It is used internally in the treatment of asthma, coughs, bronchitis, oedema, hypertension and diabetes[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[4, 240]. Extracts of the plant have antibacterial and fungicidal activity[218]. A homeopathic remedy is made from the leaves[9]. It is used in the treatment of diabetes[9].

nrakta W. Asia? ksacta Original habitat is obscure.

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. It is said that cuttings of older wood up to 2.5 metres long can be readily made to strike[4]. The cuttings are taken in February and planted 30cm deep in a shady sheltered position outdoors. The stem is wrapped in moss to prevent water loss by transpiration, with only the top few buds not being covered[4]. Layering in autumn[200].

nwatta Prefers a warm moist but well-drained loamy soil in a sheltered sunny position[1, 11]. Prefers a light soil[37]. Plants are very tolerant of atmospheric pollution[4]. Trees are hardy as far north as southern Sweden[4]. A slow growing[200] but very ornamental tree[1], the mulberry is sometimes cultivated in gardens for its delicious edible fruit[183]. The tree is not grown on a commercial scale because the fruit is too soft and easily damaged to allow it to be transported to market, and is therefore best eaten straight from the tree. There are some named varieties[183]. The mulberry takes many years to settle down and produce good crops of fruit, about 15 years being the norm[4]. Trees fruit well in southern and south-western Britain[59, 200] but they require the protection of a wall further north if the fruit is to ripen[200]. This is a good tree for growing grapes into[20]. It means that the grapes are difficult to pick, but they always seem to be healthier and free from fungal diseases[201]. Plants are late coming into leaf and also lose their leaves at the first autumn frosts though the tree in leaf casts quite a dense shade[200]. 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]. Once considered to be a very long-lived tree, doubts are now being cast on this assumption, it is probably fairly short-lived[11]. 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 a standard with a non-suckering single trunk [1-2].

## 5.2.4 *Cornus kousa chinensis*

Japanese Dogwood

5 tlin 8 cyuc 5 kcaak 2 tcan 0 dwat 10 m hkuc  
hmmimhtut cyutli tcup hwicli hrasjlutnyikfrip hpa7tli flatprikliwis  
hpa7tmwatli xre7t hjonli

drutta *Cornus kousa chinensis* is a deciduous Tree growing to 10 m (32ft) by 6 m (19ft). See above for USDA hardiness. It is hardy to UK zone 5. 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 Insects. 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.

kcakta Edible Parts: Fruit LeavesEdible Uses: Fruit -

raw or cooked[61, 177]. Sweet and juicy[11, 183], it is very nice in small quantities[K]. Very seedy[105]. The skin is rather tough and unpleasant, but the pulp is delicious with a custard-like texture[K]. This fruit gained very high marks from a group of 7 people in a fruit-tasting visit to various gardens[K]. The fruit is about 2cm in diameter[200]. Young leaves - cooked[105, 177, 183].

tcanta WoodWood - very hard and heavy. Used for mallets etc[151].

nrakta E. Asia - China. ksacta Thickets, 1200 - 2200 metres[109].

propta Seed - best sown as soon as it is ripe in a cold frame or in an outdoors seedbed if there is sufficient seed[80, 113]. The seed must be separated from the fruit flesh since this contains germination inhibitors[80, 164]. Stored seed should be cold stratified for 3 - 4 months and sown as early as possible in the year[164]. Scarification may also help as may a period of warm stratification before the cold stratification[80, 164]. Germination, especially of stored seed, can be very slow, taking 18 months or more[164]. Prick out the seedlings of cold-frame sown seeds into individual pots as soon as they are large enough to handle and grow the plants on for their first winter in a greenhouse, planting out in the spring after the last expected frosts. Cuttings of half-ripe side shoots, July/August in a frame[188]. Cuttings of mature wood of the current year's growth, taken with a heel if possible, autumn in a cold frame. High percentage[78]. Layering of new growth in June/July. Takes 9 months[78].

nwatta An easily grown plant, it succeeds in any soil of good or moderate fertility[1], ranging from acid to shallow chalk[200]. Does not like chalky soils according to other reports[184, 188]. Grows well in heavy clay soils. Prefers a rich well-drained loamy soil and a position that is at least partially sunny[11]. A very ornamental plant[1], it is hardy to about -20°C[184]. A number of named forms have been developed for their ornamental value[182]. Plants are slow-growing when young, they speed up somewhat after a few years but then soon slow down again[202]. This sub-species of *C. kousa* grows more freely, flowering and fruiting better in Britain though it barely differs in appearance from the species[11]. Plants in this genus are notably resistant to honey fungus[200].

## 5.2.5 *Cornus kousa*

Japanese Dogwood, Kousa dogwood, Chinese Dogwood, 5 tlin 8 cyuc 5 kcaak 2 tcan 0 dwat 10 m hkuc hmimhtut cyutli tcup hwicli hrasjlutnyikfrip hpa7tli flatprikliwis hpa7tmwatli xre7t hjonli

drutta *Cornus kousa* is a deciduous 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 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 Insects. 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.

kcakta Edible Parts: Fruit Leaves Edible Uses: Fruit - raw or cooked[61, 177]. Sweet and juicy[11, 183], it is very nice in small quantities[K]. Very seedy[105]. The skin is rather tough and unpleasant, but the pulp is delicious with a custard-like texture, it is one of our favourite late summer fruits[K]. The fruit is about 2cm in diameter[200]. Young leaves - cooked[105, 177, 183].

tcanta WoodWood - very hard and heavy. Used for mallets etc[151].

nrakta E. Asia - China, Japan, Korea. ksacta Woods and scrub in the mountains of Sichuan[109]. Valleys, shaded slopes, by streams and roadsides, in mixed, sparse, and dense woods at elevations of 400 - 2200 metres[266].

propta Seed - best sown as soon as it is ripe in a cold frame or in an outdoors seedbed if there is sufficient seed[80, 113]. The seed must be separated from the fruit flesh since this contains germination inhibitors[80, 164]. Stored seed should be cold stratified for 3 - 4 months and sown as early as possible in the year[164]. Scarification may also help as may a period of warm stratification before the cold stratification[80, 164]. Germination, especially of stored seed, can be very slow, taking 18 months or more[164]. Prick out the

seedlings of cold-frame sown seeds into individual pots as soon as they are large enough to handle and grow the plants on for their first winter in a greenhouse, planting out in the spring after the last expected frosts. Cuttings of half-ripe side shoots, July/August in a frame[188]. Cuttings of mature wood of the current year's growth, taken with a heel if possible, autumn in a cold frame. High percentage[78]. Layering of new growth in June/July. Takes 9 months[78].

nwatta Landscape Uses: Pest tolerant, Specimen, Woodland garden. An easily grown plant, it succeeds in any soil of good or moderate fertility, from acid to slightly alkaline but dislikes shallow chalky soils[184, 188]. Grows well in heavy clay soils. Prefers a rich well-drained loamy soil and a position that is at least partially sunny[11]. A very ornamental plant[1], it is hardy to about -20°C[184]. A number of named forms have been developed for their ornamental value[182]. Plants are slow-growing when young, they speed up somewhat after a few years but then soon slow down again[202]. The sub-species of *C. kousa chinensis* grows more freely, flowering and fruiting better in Britain though it barely differs in appearance from the species[11]. This species has been known to hybridize with *C. capitata*[182]. The cultivar 'Norman Hadden' could be such a hybrid[182]. Plants in this genus are notably resistant to honey fungus[200]. Special Features: Attracts birds, Not North American native, Blooms are very showy. 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 standard with a non-suckering single trunk [1-2].

## 5.2.6 *Crataegus pennsylvanica*

5 tlin 9 cyuc 5 kcaak 0 tcan 2 dwat 9 m hkuc hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfrip hpa7tli flatprikliwis hpa7tmwatli xre7t hjonli

drutta *Crataegus pennsylvanica* 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 from September to 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 Fruit - raw or cooked. A very good size fruit, up to 25mm in diameter, with a lovely semi-sweet flavour even when semi-ripe, it makes a delicious dessert[K]. It is also sometimes made into jellies[82] and can be dried for later use. The fruit is borne in clusters of 4- 12 and is very easily harvested[82, K]. There are up to five fairly large seeds in the centre of each 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 Eastern N. America - Delaware to Pennsylvania and W. Virginia. ksacta Open woods and thickets in moist

soils[43]. Meadows in low, moist 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]. 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 tree about 5 metres tall and wide at Kew fruits regularly and very heavily[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].

## 5.2.7 Amelanchier laevis

Allegheny Shadberry, Allegheny serviceberry, Smooth Serviceberry

5 tlin 8 cyuc 5 kcaek 2 tcan 1 dwat 9 m hkuc  
hmmihtut cyutli tcup hwicli hrasljutnyikfrip hpa7tli frusflat-prik hpa7tmwatli fyifxre7t hjonli

drutta Amelanchier laevis is a deciduous Shrub growing to 9 m (29ft) 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 from April to May, and the seeds ripen from June to July. 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 and can grow in heavy clay 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 moist soil.

kcakta Edible Parts: Fruit Edible Uses: Edible fruit - raw or cooked[2, 11, 105, 159]. Succulent and sweet[82, 183]. This is one of the nicest fruits in the genus, it can be eaten and enjoyed in quantity[K]. The fruit can also be dried for winter use[183]. Up to 18mm in diameter[200]. The fruit is rich in iron and copper[226].

tcanta Miscellany WoodWood - heavy, exceedingly hard, strong, close grained. Used for tool handles etc[82].

dwatta Miscellany An infusion of the bark was used by expectant mothers[257].

nrakta Eastern N. America. Naturalized in Britain. ksacta Dry to moist thickets, woodland edges and edges of

swamps in cool ravines and on hillsides[43, 82]. Naturalized in Britain on light acidic soils[17].

propta Seed - it is best harvested 'green', when the seed is fully formed but before the seed coat has hardened, and then sown immediately in pots outdoors or in a cold frame. If stored seed is obtained early enough in the autumn, it can be given 4 weeks warm stratification before being left out in the winter and it should then germinate in the spring. Otherwise seed can be very slow to germinate, perhaps taking 18 months or more. When large enough to handle, prick the seedlings out into individual pots and grow them on in a sheltered outdoor position, planting them out once they are 20cm or more tall. If there is sufficient seed it is best to sow it thinly in an outdoor seedbed[78, 80]. Grow the seedlings on for two years in the seedbed before planting them out into their permanent positions during the winter. Layering in spring - takes 18 months[78]. Division of suckers in late winter. The suckers need to have been growing for 2 years before you dig them up, otherwise they will not have formed roots. They can be planted out straight into their permanent positions if required.

nwatta Landscape Uses: Firewood, Specimen, Woodland garden. Prefers a rich loamy soil in a sunny position or semi-shade[1, 200] but thrives in any soil that is not too dry or water-logged[11]. Grows well in heavy clay soils. Found in the wild on light acidic soils[17]. All members of this genus have edible fruits and, whilst this is dry and uninteresting in some species, in many others it is sweet and juicy. Many of the species have potential for use in the garden as edible ornamentals, this species is worthy of especial attention because of the quality of its fruit. The main draw-back to this genus is that birds adore the fruit and will often completely strip a tree before it is fully ripe[K]. Trees come into bearing in about 12 years from seed[98]. Considerable confusion has existed between this species and A. arborea, A. canadensis and A. lamarckii, see [11] for the latest (1991) classification. It hybridizes with A. sanguinea, A. huronensis, A. wiegandii, A. stolonifera, A. canadensis, A. arborea and A. bartramiana. Grafting onto seedlings of A. lamarckii or Sorbus aucuparia is sometimes practised in order to avoid the potential problem of hybridizing[1]. Special Features: Attracts birds, North American native, Attracts butterflies, Blooms are very showy.

## 5.2.8 Crataegus arnoldiana

Arnold Hawthorn

5 tlin 9 cyuc 5 kcaek 0 tcan 2 dwat 7 m hkuc  
hmmihtut cyutli hgatyuctuphja7n hwicli hrasljutnyikfrip hpa7tli flatprikkwisslip hpa7tmwatli xre7t hjonli

drutta Crataegus arnoldiana is a deciduous Tree growing to 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 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 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: Fruit Edible Uses: Fruit - raw or cooked[105, 177]. Sub-acid[82]. A delicious flavour, it is sweet with a soft juicy flesh and makes an excellent dessert fruit[K]. It can also be cooked and used in pies, preserves etc and can be dried for later use. The fruit ripens in early September in southern Britain[K]. The fruit is about 2cm 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 Cardiotonic Hypotensive 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

be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta North-eastern N. America - Massachusetts and Connecticut. ksacta Wooded banks[43]. Thickets on a dry bank[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]. This is a tree with an excellent potential as a fruit crop in Britain. The fruit is of very good quality and is freely borne, whilst the tree is of very easy cultivation and rarely troubled by pests or diseases[K]. A tree at the Hillier Arboretum in September 1993 was about 3 metres tall and 1.5 metres wide. The growth looked somewhat weak and the tree was leaning due to wind rock but it was carrying a heavy crop of fruit[K]. 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]. A very ornamental plant[1], it is very closely related to *C. mollis*, and considered to be part of that species by many botanists[229]. 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].

## 5.2.9 *Prunus insititia*

Damson

5 tlin 9 cyuc 5 kcak 3 tcan 1 dwat 6 m hkuc  
hmimhtut cyutli tcup hwicli hrasljutnyikfrip hpa7tli flatprikli-wis hpa7tmwatli xre7t hjonli

drutta *Prunus insititia* is a deciduous Tree growing to 6 m (19ft) by 5 m (16ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 5. It is in flower in April, and the seeds ripen in 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, 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. 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.

kcka Edible Parts: Fruit Seed Edible Uses: Fruit - raw or cooked[1, 2, 46]. More acid than a plum but it is very acceptable raw when fully ripe, especially after being touched by frost[12, 34, K]. The fruit is about 3cm 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 Hedge Hedge Shelterbelt A green dye can be obtained from the leaves[168]. A dark grey to green dye can be obtained from the fruit[168]. Trees are fairly wind resistant and can be grown as a shelterbelt hedge[200].

dwatta Febrifuge Purgative Styptic The bark of the root and branches is febrifuge and considerably styptic[4]. An infusion of the flowers has been used as a mild purgative for children[4]. 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 S. W. Asia. Naturalized and often considered a native of Britain. ksacta Thickets, hedges and open woods[4, 17].

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]. Succeeds in light shade but fruits better in a sunny position[11, 200]. Thrives in a loamy soil, doing well on limestone[11]. Grows well in heavy clay soils. Prefers some chalk in the soil but apt to become chlorotic if too much is present[1]. Occasionally cultivated for its edible fruit, there are some named varieties[200]. It has been derived in cultivation from the bullace, differing in having a sweeter fruit[200]. Damsons can be grown successfully against a north facing wall[219]. 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]. *Prunus insititia* L. is a synonym of *Prunus domestica* subsp. *insititia* (L.) Bonnier and Layens. 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].

## 5.2.10 *Crataegus ellwangeriana*

Scarlet Hawthorn

5 tlin 7 cyuc 5 kcak 2 tcan 2 dwat 6 m hkuc  
hmimhtut cyutli hgattcuphja7n hwicli hrasljutnyikfrip hpa7tli flatprikliwislip hpa7tmwatli xre7t hjonli

drutta *Crataegus ellwangeriana* is a deciduous Tree growing to 6 m (19ft) by 6 m (19ft). 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.

kcka Edible Parts: Fruit Edible Uses: Fruit - raw or cooked. Juicy and acid[82]. An excellent dessert fruit, it has an acid yet sweet flavour, is juicy but with a mealy texture, it

makes very pleasant eating[K]. The fruit is also used in making pies, preserves etc, and can be dried for later use. A reasonable size, it is about 15mm in diameter[200]. A specimen at Kew has fruits up to 25mm 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 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 Eastern N. America. ksacta Not known in the wild, it is possibly of hybrid origin.

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 possibly of hybrid origin, involving *C. pedicellata*, though some botanists view it as no more than part of *C. pedicellata*[82]. 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].

## 5.2.11 *Crataegus schraderana*

Blue hawthorn

5 tlin 9 cyuc 5 kcaak 0 tcan 2 dwat 6 m hkuc  
hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfrip hpa7ti  
flatpruklwisslip hpa7tmwatli xre7t hjonli

drutta *Crataegus schraderana* is a deciduous Tree growing to 6 m (19ft 8in). It 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 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 is tolerant of strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kaakta Fruit - raw or cooked[74]. A reasonable size, about 15 - 20mm in diameter[K]. This is one of the nicest tasting fruits of the genus I have tried to date. When fully ripe it is juicy with an extremely pleasant flavour and almost literally melts in the mouth[K]. I would far rather eat this fruit than a strawberry[K]. It ripens in late September and hangs on the tree in good condition for at least 4 weeks[K]. The ripe fruit is so soft that it is best eaten fresh from the tree[K]. The fruit can also be used in making pies, preserves etc, and 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, 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 S. Europe - Greece. ksacta Mountainous areas[50].

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 an excellent potential as a fruit crop in Britain. The fruit is about the size of a cherry, it is very freely borne and the best forms are of excellent dessert quality[K]. 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]. Grafted specimens can produce fruit in their third year[K]. A very ornamental plant[74], it grows well in Britain flowering and fruiting well at Kew and Wisley[K]. 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].

## 5.2.12 Prunus persica

Peach, Flowering Peach, Ornamental Peach, Common Peach  
5 tin 9 cyuc 5 kcaak 3 tcan 3 dwat 6 m hkuc

htut cyutli tcup hwicli hrasljutnyik hpa7tli flatprikwlis  
hpa7tmwatli fyifkre7t hjonli

drutta *Prunus persica* is a deciduous Tree growing to 6 m (19ft) by 6 m (19ft) 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 in April, and the seeds ripen from July to August. 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 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.

pcista The seed can contain high levels of hydrogen cyanide, a poison that gives almonds their characteristic flavour. This toxin is readily detected by its bitter taste. Usually present in too small a quantity to do any harm, any very bitter seed or fruit should not be eaten[65]. 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.

kcaakta Edible Parts: Flowers Fruit Oil Oil Seed Edible Uses: Gum Oil Oil Tea Fruit - raw, cooked or dried for later use[1, 2, 34, 46]. The fruit is often used in ice creams, pies, jams etc[183]. When fully ripe, the fruit of the best forms are very juicy with a rich delicate flavour[K]. Wild trees in the Himalayas yield about 36.5kg of fruit a year[194]. The fruit of the wild form contains about 5.2% sugars, 2% protein, 1.6% ash. Vitamin C content is 2.3mg per 100g[194]. The fruit is a good source of vitamin A[201]. Fruits of the wild peach are richer in nutrients than the cultivated forms[194]. The size of fruit varies widely between cultivars and the wild form, it can be up to 7cm in diameter and contains one seed[200]. Flowers - raw or cooked. Added to salads or used as a garnish[183]. They can also be brewed into a tea[183]. The distilled flowers yield a white liquid which can be used to impart a flavour resembling the seed[183]. Seed - raw or cooked. Do not eat if it is too bitter, seed can contain high concentrations of hydrocyanic acid. See the notes above on toxicity. A semi-drying oil is obtained from the seed[57]. Although the report does not mention edibility it can be assumed that it is edible. The seed contains up to 45% oil[218]. A gum is obtained from the stem. It can be used for chewing[64].

tcanta Adhesive Cleanser Dye Gum Oil Oil A green dye can be obtained from the leaves[168]. Yellow according to another report[257]. A dark grey to green dye can be obtained from the fruit[168]. A semi-drying oil is obtained from the seed[57]. It is used as a substitute for almond oil in skin creams[238]. The bruised leaves, when rubbed within any container, will remove strong odours such as garlic or cloves so long as any grease has first been fully cleaned off[4]. A gum obtained from the stem is used as an adhesive[64].

dwatta Alterative Anthelmintic Antiasthmatic Antihalitosis Antitussive Astringent Demulcent Diuretic Emollient Expectorant Febrifuge Haemolytic Laxative Sedative Vitamin C Antihalitosis[194]. The leaves are astringent, demulcent, diuretic, expectorant, febrifuge, laxative, parasiticide and mildly sedative[21, 218]. They are used internally in the treatment of gastritis, whooping cough, coughs and bronchitis[238]. They also help to relieve vomiting and morning sickness during pregnancy, though the dose must be carefully monitored because of their diuretic action[21]. The dried and powdered leaves have sometimes been used to help heal sores and wounds[21]. The leaves are harvested in June and July then dried for later use[4]. The flowers are diuretic, sedative and vermifuge[4, 21, 176, 194, 218]. They are used internally in the treatment of constipation and oedema[238]. A gum from the stems is alterative, astringent, demulcent and sedative[4, 21, 176, 194, 218]. The seed is antiasthmatic, antitussive, emollient, haemolytic, laxative and sedative[4, 21, 176, 194, 218]. It is used internally in the treatment of constipation in the elderly, coughs, asthma and menstrual disorders[238]. The bark is demulcent, diuretic, expectorant and sedative[4]. It is used internally in the treatment of gastritis, whooping cough, coughs and bronchitis[238]. The root bark is used in the treatment of dropsy and jaundice[218]. The bark is harvested from young trees in the spring and is dried for later use[4]. The seed contains 'laetrile', a sub-

stance that has also been called vitamin B17[218]. This has been claimed to have a positive effect in the treatment of cancer, but there does not at present seem to be much evidence to support this[K]. The pure substance is almost harmless, but on hydrolysis it yields hydrocyanic acid, a very rapidly acting poison - it should thus be treated with caution[218]. In small amounts this exceedingly poisonous compound stimulates respiration, improves digestion and gives a sense of well-being[238].

nrakta E. Asia - China. ksacta Not known in a truly wild situation, it is possibly derived in cultivation from *P. davidiana*.

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]. The stored seed is best given 2 months warm followed by 3 months cold stratification[113]. 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]. A very low percentage[113]. Softwood cuttings from strongly growing plants in spring to early summer in a frame[200]. Layering in spring.

nwatta Landscape Uses: Container, Espalier, Firewood. Requires a well-drained moisture retentive soil[1, 11]. Thrives in a loamy soil, doing well on limestone[11]. Best not grown in acid soils. Prefers some chalk in the soil but it is apt to become chlorotic if too much is present[1]. Prefers a pH in the range 6 to 7[200]. Succeeds in light shade but fruits better in a sunny position[11]. Requires shelter from north and north-east winds[11] and also from spring frosts[200]. Widely cultivated for its edible fruit in warm temperate areas and continental climates, there are many named varieties[183]. There are numerous divisions of the varieties according to skin colour etc. Perhaps the most useful from the eaters point of view is whether it is free-stone (the flesh parts easily from the seed) or cling-stone (the flesh adheres to the seed)[200, K]. Trees are normally hardy in southern Britain[11], tolerating temperatures down to about -20°C when they are dormant[184], but they require some protection if cropping is to be at all reliable[11]. This is not due so much to lack of cold hardiness, more to the cooler summers in Britain which do not fully ripen the wood and the fruit, plus the unpredictable winters and springs which, in a mild spell, can excite the tree into premature flowering and growth which is then very liable to damage in any following cold spell. Hand pollination at this time can improve fruit-set[200]. The cultivar 'Rochester' is more likely than most cultivars to succeed outdoors in Britain[200]. In general it is best to site peaches in a very warm sheltered sunny position, preferably against a south or west facing wall[200, 219]. Most cultivars are self-fertile[200]. Trees are often grafted onto plum or other rootstocks but are said to be better when grown on their own roots in southern Britain[11]. Trees are not generally long-lived[200], this is partly because of the need for the tree to produce a constant supply of new wood since most fruit is formed on one-year old wood (though some fruit spurs are formed)[200]. Garlic is a good companion for this plant, helping to prevent disease, especially peach leaf curl[20, 201]. Tansy grown below peach trees helps to keep them healthier[201]. Peach leaf curl can also be prevented by protecting the plants from winter and early spring rains, perhaps by covering them in plastic[200]. Plants grown or overwintered indoors do not suffer from leaf curl[260]. 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]. Special Features: Edible, Not North American native, All or parts of this plant are poisonous, 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

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]. 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. The root pattern is suckering with new plants from runners away from the plant [2-1].

## 5.2.13 *Prunus domestica italica*

Gages, Greengage

5 tlin 8 cyuc 5 kcaak 2 tcan 2 dwat 5 m hkuc  
hmimhtut cyutli tcup hwicli hrasljutnyikfrip hpa7tli flatprikli-wisslip hpa7tmwatli hjonli

drutta *Prunus domestica italica* is a deciduous Tree growing to 5 m (16ft) by 4 m (13ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 6. The flowers are pollinated by Bees, 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 and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

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: Flowers Fruit Oil SeedEdible Uses: OilFruit - raw or cooked. Often considered to be the finest of the dessert plums, they have a delicious flavour[K ].The greengages. The usually green, globose fruit is usually 30 - 400mm in diameter. Seed - raw or cooked. Do not eat the seed if it is too bitter - see the notes above on toxicity. An edible gum is obtained from points of damage on the trunk[64 ]. The seed contains about 20% of an edible semi-drying oil[4 , 57 ]. It has an agreeable almond smell and flavour[4 ]. The flowers are eaten. They are used as a garnish for salads and ice cream or brewed into a tea[183 ].

tcanta Adhesive Cosmetic Dye Oil WoodA green dye can be obtained from the leaves [168 ]. A dark grey to green dye can be obtained from the fruit [168 ]. A yellow dye is obtained from the bark [115 ]. A gum obtained from points of damage along the stem can be used as an adhesive [64 ]. The ground up seeds are used cosmetically in the production of face-masks for dry skin [7 ]. A semi-drying oil is obtained from the seed [64 ]. No details of its uses. The reddish-brown wood is very close-grained, hard, compact. Liable to warp and split. It is used for musical instruments [115 , 146 ].

dwatta Digestive Febrifuge Laxative Purgative Stomachic StypticThe dried fruit, known as prunes, is a safe and effective laxative and is also stomachic [4 , 7 , 21 , 238 ]. The bark is sometimes used as a febrifuge and is styptic [4 , 7 ]. An infusion of the flowers has been used as a mild purgative for children [4 ]. 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 A cultivated plant, not known in the wild. ksacta Not known in a truly wild situation

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. The various cultivars of plum are unlikely to breed true (though the green forms of the gage generally do) - they will usually produce a range of plants from seed with differing characteristics from their parent. Cuttings of half-ripe wood with a heel, mid summer in a frame [11 , 200 ]. Softwood cuttings from strongly growing plants in spring to early summer in a frame [200 ]. Layering in spring.

nwatta The greengages are a group of cultivars of the common European plum. Gages are often cultivated as a fruit crop, especially in western Europe. Of excellent quality, though their delicate skins makes it difficult to get them to market in good condition and so they are more likely to be grown on a garden scale or be used for canning etc. *Prunus domestica* subsp. *italica* requires a well-drained moisture retentive soil [1 , 11 ]. Succeeds in light shade but fruits better in a sunny position [11 , 200 ]. Thrives in a loamy soil, doing well on limestone [11 ]. Grows well in heavy clay soils. Prefers some chalk in the soil but apt to become chlorotic if too much is present [1 ]. The various gages are often cultivated for their edible fruits, especially on a garden scale. There are some named varieties [200 ]. The gage was first developed from the plum in the Middle East, later spreading via France into much of western Europe. Its cultivation has spread into most temperate regions, though it is often only grown on a small scale because of the difficulty of getting it to market in good condition. 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 ]. 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]. *Prunus domestica italica* is a deciduous shrub or a tree usually growing 2 - 6 metres tall, occasionally to 15 metres. We can infer from its cultivation that the species grows optimally in areas with cold winters and long warm summers as vernalisation is required for flowering. The species can tolerate frost, however, when this occurs after flowering the fruit quality is poor (Lim 2002). Widely grown cultivars include: Boddarts Reneklade (Germany), Bryanston (UK), Cambridge Gage (UK), Canerik (Turkey), Denniston's Superb (USA), Gojeh Sabz (Iran), Yasil Alca or Göy Alca (Azerbaijan), Golden Transparent (UK), Graf Althanns Reneklade (Germany), Green Vanilla (Mount Pelion, Greece), Große Grüne Reneklade (Germany) / Reine Claude Verte (France), Laxton's Gage (UK), Laxton's Supreme (UK), Meroldts Reneklade (Germany), Rainha Cláudia (Portugal), Regina Claudia (Italy), Reine Claude de Bavy (France), Reine Claude d'Oullins (France), Uhinks Reneklade (Germany), Washington (USA).

## 5.2.14 *Rubus fruticosus*

Blackberry, Shrubby blackberry

5 tlin 9 cyuc 5 kcaak 2 tcan 3 dwat 3 m hkuc  
pcimhmimhtut cyutli hgattcup hwicli hyishrasljutnyik hpa7tli frusflatprikliwsslip hpa7tmwatli fyifxre7t hjonli

drutta *Rubus fruticosus* is a deciduous Shrub growing to 3 m (9ft) by 3 m (9ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender. It is in leaf from March to November, in flower from May to September, and the seeds ripen from July to October. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects, Apomictic (reproduce by seeds formed without sexual fusion). The plant is self-fertile. 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 acid and very 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. The plant can tolerate strong winds but not maritime exposure.

kcakta Edible Parts: Fruit Leaves Root ShootsEdible Uses: TeaFruit - raw or cooked[5, 7, 9, 12, 183]. The best forms have delicious fruits and, with a range of types, it is possible to obtain ripe fruits from late July to November[K]. The fruit is also made into syrups, jams and other pre-



erves[238]. Some people find that if they eat the fruit before it is very ripe and quite soft then it can give them stomach upsets[K]. Root - cooked. The root should be neither to young nor too old and requires a lot of boiling[7]. A tea is made from the dried leaves[21] - the young leaves are best[61]. The leaves are often used in herbal tea blends[238]. Young shoots - raw. They are harvested as they emerge through the ground in the spring, peeled and then eaten in salads[244].

tcanta Dye Fibre PioneerA purple to dull blue dye is obtained from the fruit[168]. A fibre is obtained from the stem and used to make twine[66]. Plants are spread by seed deposited in the droppings of birds and mammals. They often sprout in burnt-over, logged or abandoned land and make an excellent pioneer species, creating the right conditions for woodland trees to move in. The trees will often grow in the middle of a clump of blackberries, the prickly stems protecting them from rabbits[K].

dwata Antidiarrhoeal Astringent Depurative Diuretic Dysentery Tonic VulneraryThe root-bark and the leaves are strongly astringent, depurative, diuretic, tonic and vulnerary[4, 7, 9, 165, 254]. They make an excellent remedy for dysentery, diarrhoea, haemorrhoids, cystitis etc, the root is the more astringent[4, 238]. Externally, they are used as a gargle to treat sore throats, mouth ulcers and gum inflammations[238, 254]. A decoction of the leaves is useful as a gargle in treating thrush and also makes a good general mouthwash[7].

nrakta Europe, including Britain, to the Mediterranean and Macaronesia. ksacta A very common and adaptable plant, found in hedgerows, woodland, meadows, waste ground etc[17, 244].

propta Seed - requires stratification and is best sown in early autumn in a cold frame. Stored seed requires one month stratification at about 3°C and is best sown as early as possible in the year. Prick out the seedlings when they are large enough to handle and grow on in a cold frame. Plant them out into their permanent positions in late spring of the following year. Cuttings of half-ripe wood, July/August in a frame[200]. Tip layering in July. Plant out in autumn. Division in early spring or just before leaf-fall in the autumn[200].

nwatta Easily grown in a good well-drained loamy soil[1, 11, 200]. Succeeds in acid and calcareous soils[186]. Tolerates poor soils[202]. Established plants are drought resistant[132]. Succeeds in sun or semi-shade[1, 11, 200], though it fruits less well in the shade[202]. Plants will also fruit when grown in fairly deep shade or against a north facing wall, though the fruit will ripen later[219]. Plants tolerate quite severe exposure[186]. Hardy to at least -18°C[202]. *R. fruticosus* is an aggregate species made up of several hundred slightly differing species. The reason for this is that most seed is produced by a non-sexual method (Apomixis) and is therefore genetically identical to the parent plant. On occasions when sexual production of seed takes place the offspring will all be slightly different from the parent plant and will then usually reproduce as a new species by means of apomixy. Modern treatment of this aggregate usually does not use the name *R. fruticosus* because of the confusion over which species it should apply to, the type species of the aggregate should be called *R. ulmifolius*[150]. The following members of the aggregate have been highly recommended for their fruit[150]. *R. badius*. *R. cyclophorus*. *R. gratus*. *R. memorialis*. *R. oxyanchus*. *R. pyramidalis*. *R. separinus*. *R. winteri*. The following members are said to be nearly as good. *R. balfourianus*. *R. broensis*. *R. carpinifolius*. *R. foliosus*. *R. fuscoviridis*. *R. infestus*. *R. insericatus* newbouldianus. *R. koehleri*. *R. largificus*. *R. londinensis*. *R. ludensis*. *R. macrophyllus*. *R. obscurus*. *R. pseudo-bifrons*. *R. rhombifolius*. *R. riddellsdellii*. *R. scaber*. *R. thyrsiflorus*. *R. vallisparus*. *R. vestitus*. Plants form dense thickets and this makes excellent cover for birds[186]. They regenerate freely after being cut back[186]. This species is also a good plant for bees and butterflies[24]. This species has biennial stems, it produces a number of new stems each year from the perennial rootstock, these stems fruit in their second year and then die[200]. 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 a running thicket former forming a colony from shoots away from the crown spreading indefinitely [1-2]. The root pattern is suckering with new plants from underground runners away from

the plant [1-2].

## 5.2.15 Ribes x culverwellii

Jostaberry

5 tlin 9 cyuc 5 kcak 0 tcan 0 dwat 1.8 m hkuc hmimhtut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprikwis hpa7tmwatli fyifxre7t hjonli

drutta *Ribes x culverwellii* is a deciduous Shrub growing to 1.8 m (6ft). See above for USDA hardiness. It is hardy to UK zone 6. It is in leaf from April to October, in flower from April to May, and the seeds ripen from August 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 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.

ksakta Edible Parts: Fruit Edible Uses: Fruit - raw or cooked in pies, jams etc[200]. Intermediate in size and flavour between gooseberries and blackcurrants, tasting more like a gooseberry when under-ripe and more like a blackcurrant when fully ripe[K]. The fruit is rich in vitamin C[183].

nrakta A range of garden hybrids. ksacta Not known in the wild.

propta Seed - best sown as soon as it is ripe in the autumn in a cold frame. Stored seed requires 3 months cold stratification at between 0 and 5°C and should be sown as early in the year as possible[113, 164]. Under normal storage conditions the seed can remain viable for 17 years or more. Prick out the seedlings into individual pots when they are large enough to handle and grow them on in a cold frame for their first winter, planting them out in late spring of the following year. This plant is a cultivar and will not breed true from seed. Cuttings of half-ripe wood, 10 - 15cm with a heel, July/August in a frame[78, 113]. Cuttings of mature wood of the current year's growth, preferably with a heel of the previous year's growth, November to February in a cold frame or sheltered bed outdoors[78, 200].

nwatta Easily grown in a moisture retentive but well-drained loamy soil of at least moderate quality[11, 200]. Best grown on a deep sandy loam[1]. Dislikes very heavy clay, chalky soils and thin dry soils, but it can succeed on most soil types if plenty of organic matter is incorporated[1]. Quite tolerant of shade though not fruiting so well in such a position[11]. A group of cultivars of hybrid origin, basically a cross between blackcurrants and gooseberries. Very vigorous plants, producing prolific crops of fruit. They are being grown increasingly in gardens. In general they resist American gooseberry mildew, blackcurrant leaf spot and gall mite. 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 multi-stemmed with multiple stems from the crown [1-2]. The root pattern is suckering with new plants from underground runners away from the plant [1-2].

## 5.2.16 Allium ampeloprasum

Wild Leek, Broadleaf wild leek

5 tlin 9 cyuc 5 kcak 2 tcan 3 dwat 1.8 m hkuc htut cyutli kyuctup hwicli hrasjlutnyikfrp hpa7tli flatprikwislpp hpa7tmwatli xre7t hjonli

drutta *Allium ampeloprasum* is a BULB growing to 1.8 m (6ft) by 0.1 m (0ft 4in). See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender. It is in leaf from October to August, in flower from July to August, and the seeds ripen in August. 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, 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 cannot grow in the shade. It prefers dry or moist soil. The plant can tolerate strong winds but not maritime exposure.

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[2, 27, 61, 105]. The small bulbs can vary considerably in size from 2 - 6cm[200], they have a fairly strong leek to garlic flavour and are nice as a flavouring in cooked foods[K]. The bulbs of selected cultivars are very large with a mild garlic flavour[183]. Leaves - raw or cooked[2]. A pleasant mild to strong garlic flavour, they are available from late autumn to the spring though they can become rather tough and fibrous as they get older[K]. Flowers - raw. A similar flavour to the leaves but they have a somewhat dry texture and are best used as a flavouring in cooked foods[K]. The bulbils have a mild garlic flavour and make a nice flavouring in salads and cooked foods. Although produced abundantly, they are quite fiddly to use because they are small[K]. They can also be pickled[142].

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

**dwatta Anthelmintic Antiasthmatic Anticholesterolemic Antiseptic Antispasmodic Cholagogue Diaphoretic Diuretic Expectorant Febrifuge Stimulant Stings Stomachic Tonic Vasodilator**This species has the same medicinal virtues as garlic, but in a much milder and less effective form[238]. These virtues are as follows:- Garlic has a very long folk history of use in a wide range of ailments, particularly ailments such as ringworm, Candida and vaginitis where its fungicidal, antiseptic, tonic and parasitocidal properties have proved of benefit[218]. It is also said to have anticancer activity[218]. Daily use of garlic in the diet has been shown to have a very beneficial effect on the body, especially the blood system and the heart. For example, demographic studies suggest that garlic is responsible for the low incidence of arteriosclerosis in areas of Italy and Spain where consumption of the bulb is heavy[222]. The bulb is said to be anthelmintic, antiasthmatic, anticholesterolemic, antiseptic, antispasmodic, cholagogue, diaphoretic, diuretic, expectorant, febrifuge, stimulant, stomachic, tonic, vasodilator[4, 9, 14, 21, 46, 165]. The crushed bulb may be applied as a poultice to ease the pain of bites, stings etc[4, 9, 14, 21].

**nrakta S. Europe to W. Asia.** Possibly native in Britain in S.W. England and Wales[17]. **ksakta Rocky** places near the coast in S.W. England and Wales[17].

**propta Seed** - best sown as soon as it is ripe in a cold frame, though it can also be sown in a cold frame in the spring[200]. Prick out the seedlings into individual pots when they are large enough to handle. Well-grown plants can be planted out into their final positions in late summer or the autumn, otherwise grow them on for a further year in pots and plant them out the following summer. Division in late summer or early autumn. Dig up the bulbs when the plants are dormant and divide the small bulbets at the base of the larger bulb. Replant immediately, either in the open ground or in pots in a cold frame. Bulbils - plant out as soon as they are ripe in late summer. The bulbils can be planted direct into their permanent positions, though you get better results if you pot them up and plant them out the following spring.

**nwatta** Prefers a sunny position in a light well-drained soil[1]. Prefers a dry position[45]. Succeeds in clay soils[203]. Tolerates a pH in the range 5.2 to 8.3. The bulbs should be planted fairly deeply[1]. The wild leek is a rare native of Britain, found only in the south-west and Wales, though it should be hardy in most parts of the country. It comes into growth in the autumn, dying down in the summer, and makes a very pleasant winter leaf, either raw or cooked. It is a rather variable plant, especially in the amount of flowers and bulbils produced. The species produces mainly flowers with almost no bulbils, whilst the sub-species *A. ampeloprasum babbingtonii* (Babbington's Leek) produces lots of bulbils and almost no flowers[17]. The cultivated leek (*A. ampeloprasum porrum*) is believed to have been developed from this plant whilst, in Germany and Italy, other forms have been selected for their edible bulbils[142]. *Allium ampeloprasum* comprises several vegetables, of which the most important ones are: leek, elephant garlic or great-headed garlic, pearl onion, kurrat, Egyptian leek or salad leek, and Persian leek (*Allium ampeloprasum ssp. persicum*). The cultivar 'Perizweibel' is often used, the bulbils are solid rather than made up of layers and are popularly used for making

pickles[183]. This cultivar does not set seed[183]. Another cultivated form of this plant produces very large, mild-garlic flavoured bulbs that are up to 500g in weight[183]. They are known as elephant garlic[183]. The wild leek 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]. 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.

## 5.2.17 *Allium fistulosum*

Welsh Onion

5 tlin 9 cyuc 5 kcak 2 tcan 2 dwat 0.6 m hkuc htut cyuti tcup hwicli hrasjlutnyik hpa7tli flatprikwlis hpa7tmwatli xre7t hjonli

**drutta** *Allium fistulosum* is a BULB growing to 0.6 m (2ft) by 0.2 m (0ft 8in). See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender. It is in flower in July. 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. It cannot grow in the shade. It prefers moist soil.

**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[2]. A strong onion flavour, it can be used in salads, as a cooked vegetable or as a flavouring in cooked foods[22, K]. The bulbs are rather small, usually 10 - 25mm in diameter though they can be up to 45mm[266], and are sometimes used as spring onions[183]. A nutritional analysis is available[218]. Leaves - raw or cooked[2]. They have a mild onion flavour[183] and can be added to salads or cooked as a vegetable[116]. The leaves are often available all through the winter if the weather is not too severe[K]. They contain about 1.4% protein, 0.3% fat, 4.6% carbohydrate, 0.8% ash, some vitamin B1 and moderate levels of vitamin C[179]. Flowers - raw. A pleasant onion flavour, but they are rather on the dry side[K].

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

**dwatta Antibacterial Antifungal Antipyretic Diuretic Expectorant Stomachic Vitamin C**The bulb contains an essential oil that is rich in sulphur compounds[283]. It is antibacterial, antiseptic, diaphoretic, diuretic, galactagogue, stomachic, vermifuge and vulnerary[176, 218]. It is used in the treatment of colds and abnormal coldness and fullness[176]. A tea made from the roots is a children's sedative[218]. Use of the bulb in the diet impedes internal parasites[218]. Externally, the bulb can be made into a poultice to drain pus from sores, boils and abscesses[254].

**nrakta E. Asia,** possibly western China, though the original habitat is obscure. **ksakta Cultivated** for over 1000 years, it is not known in the wild.

**propta Seed** - sow spring in a greenhouse. The seed germinates over a wide range of temperatures, it is faster at higher temperatures[206]. Prick out the seedlings into individual pots when they are large enough to handle. When well-grown, the plants should be ready to be planted out in the summer. If they are not large enough at this time, grow them on in the greenhouse for their first winter and plant them out in late spring. Division of the plants is very easy and can be done at almost any time of the year though the spring is probably best. The divisions can be planted out straight into their permanent positions if required.

**nwatta** An easily grown plant[203], it prefers a sunny position in a light well-drained soil[1] but tolerates most soils[1, 52] including those that are damp and acid[203]. Prefers a pH in the range 6.5 to 7.5[206], but it tolerates a pH in the range 4.9 to 7.5. A very hardy species, it is related

the cultivated onion (*A. cepa*) and could be of value in breeding programmes. It is sometimes cultivated in the garden for its edible leaves which can be produced throughout the winter if the weather is not too severe[K]. A very popular cultivated vegetable in the Orient[206], it probably arose through cultivation from *A. altaicum*[203]. The oriental forms of this species, known as bunching onions, tend to be hardier and more robust than the Welsh onion[206]. There are two basic forms, multi-stem types and single-stem types. The single-stem types divide less freely than the multi-stems[206]. Plants will often retain their leaves even when covered in snow[206]. They are also tolerant of high temperatures and can be grown in the tropics[206]. The plants are often eaten by slugs[K]. 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]. 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.

## 5.2.18 *Allium schoenoprasum*

Chives, Wild chives, Flowering Onion  
 5 tlin 11 cyuc 5 kcak 3 tcan 2 dwat 0.3 m hkuc  
 hmimhtut cyutli tcup hwicli hras|lutnyikfrip hpa7tli flatprikli-wisslip hpa7tmwatli fyfxre7t hjonli

*drutta* *Allium schoenoprasum* is a BULB growing to 0.3 m (1ft) by 0.3 m (1ft in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in leaf from February to December, 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, flies, Lepidoptera (Moths and Butterflies). The plant is self-fertile. 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 and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

*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 Root Edible Uses: Leaves - raw, cooked or dried for later use. The leaves have a mild onion flavour and are an excellent addition to mixed salads, they can also be used as a flavouring in soups etc[2, 4, 5, 9, 27, 33]. The leaves are often available from late winter and can continue to produce leaves until early the following winter, especially if they are in a warm, sheltered position[K]. A good source of sulphur and iron[201]. A nutritional analysis is available[218]. The bulbs are rather small, and rarely exceed 10mm in diameter[200]. They can be harvested with the leaves still attached and be used as spring onions[K]. They have a pleasant mild onion flavour. The flowers can be used as a garnish in salads etc[183]. The flowers of this species are rather dry and less desirable than the flowers of many other species[K].

*tcanta* Fungicide Repellent Landscape Uses: Border, Container, Massing, Rock garden, Forest Garden. The juice of the plant is used as an insect repellent, it also has fungicidal properties and is effective against scab, mildew etc[14, 18, 20, 201]. The growing plant is said to repel insects and moles[14, 20, 200]. Dynamic accumulator. Ground cover,nectary, Ground Cover. Aromatic.

*dwatta* Appetizer Digestive Hypotensive Tonic The whole plant has a beneficial effect on the digestive system and the blood circulation. It improves the appetite, is digestive, hypotensive and tonic[201]. It has similar properties to garlic (*A. sativum*), but in a much milder form, and it is rarely used medicinally[238].

nakra Most of Europe, including Britain, east to the Himalayas and Japan. ksacta Rocky pastures and damp meadows, preferring calcareous soils[17, 90].

*propta* Seed - sow spring in a cold frame. Germination is usually free and easy, pot up the seedlings as soon as they are large enough to handle easily and plant out in the following spring. Division can be carried out at almost any time of the year but is probably best done in spring. The clumps should be divided at least every 3 or 4 years in order to maintain vigour[200], the divisions can be planted out direct into their permanent positions.

*nwatta* An easily grown plant[203], it prefers a sunny position in a rich moist but well-drained soil[14, 37], though it succeeds in most soils[1, 37, 200] and also in light shade[203]. Grows well in heavy clay soils[203]. Tolerates a pH in the range 5.2 to 8.3. Chives are commonly cultivated in the garden for their edible leaves which are available from late winter to the beginning of the following winter[K]. The bulbs divide rapidly and large clumps are quickly formed. There are some named varieties[183, 200, 203]. Chives are very tolerant of heavy harvesting, regular cutting of the leaves ensures a continuous supply of young leaves and prevents the plants flowering[33]. Plants can be moved into a frame or other protected environment in the autumn and will then produce leaves throughout the winter[33]. Do not do this every year or it weakens the plants. The bulbs should be planted fairly deeply[1]. A good bee plant[24]. Grows well with most plants, especially roses, carrots, beet and chamomile, but it inhibits the growth of legumes[18, 20, 54]. Helps to reduce the incidence of scab when it is grown under apple trees[201]. 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: North American native, Edible, Fragrant foliage, Invasive, Naturalizing, Attracts butterflies, Suitable for cut flowers, Suitable for dried flowers, Fragrant 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 a bulb.

## 5.2.19 *Allium cernuum*

Nodding Onion, New Mexican nodding onion  
 5 tlin 9 cyuc 5 kcak 2 tcan 2 dwat 0.5 m hkuc  
 htut cyutli hgattcup hwicli hras|lutnyik hpa7tli flatprikli-wisslip hpa7tmwatli xre7t hjonli

*drutta* *Allium cernuum* is a BULB growing to 0.5 m (1ft 8in) by 0.3 m (1ft). See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender. It is in leaf from February to December, in flower from June to July. 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. It cannot grow in the shade. It prefers moist soil and can tolerate drought. The plant can tolerate maritime exposure.

*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[2, 22, 161]. Strongly flavoured[46, 61, 159], it is mainly used as a flavouring[183, K]. The bulb is about 50mm tall and 15mm wide[235]. Leaves - raw or cooked[62, 85, 159]. A delicious, strong-onion flavour, they are very nice in salads[K]. The leaves are available from spring until the autumn and are one of the most favourite

onions we are growing on our Cornish trial grounds[K]. Flowers - raw or cooked. A delicious strong onion flavour, somewhat stronger than the leaves especially if the seeds are starting to set[K]. They make a very decorative and tasty addition to the salad bowl[K].

tcanta RepellentThe juice of the plant is used as a moth repellent. The whole plant is said to repel insects and moles[20]. The juice can be applied to exposed skin in order to repel biting insects[257].

dwatta Lithotropic PoulticeThe whole plant has mild medicinal activity similar to the action of garlic (*Allium sativum*)[222]. It is used specifically as a poultice on the chest for the treatment of respiratory ailments and the juice has been used in the treatment of kidney stones[222]. The juice of the plant is used in treating colds, croup, sore throats etc[257]. A poultice of the plant is applied externally to various infections such as sore throats, sores, swellings, chest and pleurisy pains[257].

nrakta N. America - Canada to Mexico. ksacta Ledges, gravels, rocky or wooded slopes and crests ascending to high altitudes[43]. Widely distributed on moist soils in mountainous and cool regions to 3500 metres[270].

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 An easily grown plant[203], it prefers a sunny position in a light well-drained soil[1]. Succeeds in clay soils[203]. Established plants are fairly drought tolerant[190]. Plants succeed in maritime gardens[233]. A very ornamental plant, it makes a very decorative edging to flower beds[K]. This species is self-sowing quite freely in our Cornwall garden[K]. The bulbs should be planted fairly deeply[1]. Most members of this genus are intolerant of competition from other growing plants[203], though this species has tolerated considerable neglect in our Cornwall garden[K]. The cultivar 'Major' is a more vigorous form with larger flower clusters[90]. 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]. A widespread and very variable species[1]. It is closely allied to *A. stellatum*[1, 270]. Members of this genus are rarely if ever troubled by browsing deer[233]. 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.

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