

Alphabetical Index

Acorus calamus , 27
 Acorus gramineus , 50
 Alliaria petiolata , 49
 Allium canadense , 17
 Allium canadense mobilense , 11
 Allium validum , 54
 Arundo donax , 48
 Asclepias incarnata , 7

Bacopa monnieri , 56
 Betula pubescens , 4
 Butomus umbellatus , 28

Cardamine pratensis , 29
 Cirsium foliosum , 44
 Crataegus acclivis , 14
 Crataegus aestivalis , 47
 Crataegus altaica , 21
 Crataegus anomala , 24
 Crataegus aprica , 40
 Crataegus armoldiana , 31
 Crataegus azarolus , 32
 Crataegus caesa , 46
 Crataegus champlainensis , 33
 Crataegus chrysocharpa , 22
 Crataegus coccinoides , 24
 Crataegus columbiana , 25
 Crataegus cuneata , 38
 Crataegus douglasii , 13
 Crataegus durobrivensis , 16
 Crataegus festiva , 45
 Crataegus flabellata , 23
 Crataegus flava , 38
 Crataegus holmesiana , 13
 Crataegus hupehensis , 41
 Crataegus intricata , 26
 Crataegus laciniata , 34
 Crataegus laevigata , 20
 Crataegus missouriensis , 9
 Crataegus mollis , 16
 Crataegus monogyna , 28
 Crataegus opaca , 19
 Crataegus pedicellata , 9
 Crataegus pedicellata gloriosa , 20
 Crataegus pennsylvanica , 31
 Crataegus pentagyna , 40
 Crataegus pinnatifida , 39
 Crataegus pinnatifida major , 36
 Crataegus pruinosa , 21
 Crataegus pubescens , 47
 Crataegus punctata , 18
 Crataegus rotundifolia , 23
 Crataegus schraderana , 32
 Crataegus submollis , 15
 Crataegus succulenta , 15
 Crataegus tanacetifolia , 44
 Crataegus x grignonensis , 15
 Cyperus esculentus , 55

Eucalyptus gunnii , 53
 Eucalyptus viminalis , 52

Gaultheria hispidula , 35
 Gaultheria japonica , 35
 Glyceria fluitans , 30

Hippophae tibetana , 50
 Houttuynia cordata , 37

Ipomoea aquatica , 52

Lycopus uniflorus , 30
 Lysichiton americanus , 43

Malus coronaria , 19
 Mentha aquatica , 42

Nasturtium microphyllum , 43
 Nasturtium officinale , 6
 Nasturtium x sterile , 37

Oenanthe javanica , 41
 Orontium aquaticum , 49
 Oryza hybrids , 51

Pandanus amaryllifolius , 57
 Peltandra virginica , 30
 Petasites japonicus , 44
 Phragmites australis , 10
 Pontederia cordata , 8

Quercus bicolor , 12
 Quercus robur , 11

Saccharum hybrids , 54
 Saccharum officinarum , 54
 Sagittaria cuneata , 36
 Sagittaria latifolia , 46
 Sagittaria rigida , 49
 Sagittaria sagittifolia , 46
 Salix hybrids , 4
 Scirpus lacustris , 27
 Scirpus maritimus , 42
 Stachys palustris , 29
 Syzygium cumini , 55

Typha domingensis , 34
 Typha latifolia , 5
 Typha laxmannii , 17

Vaccinium fuscum , 26
 Viburnum opulus , 6
 Viola cucullata , 8

Wasabia japonica , 51

Plants For a Future 2021CE Hardiness Zone 8, Wet Mildly Acid Loamy Soil, Edibility >= 3

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Contents

1 Introduction	3
1.1 Pronunciation guide	3
1.2 vocabulary	3
2 2 tlin	4
3 3 tlin	5
4 4 tlin	9
5 5 tlin	31
6 6 tlin	44
7 7 tlin	50
7.1 bwon	50
7.2 mran	51
8 8 tlin	54
8.1 bwon	54
8.2 mran	55
9 Alphabetical Index	57

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 months growing season, as very little you can grow in less than that.

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

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

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

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

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

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

1.1 Pronunciation guide

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

1.2 vocabulary

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

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

hgat /hgat/ drought (tolerant), kyuc /kju/ dry, tcup /tʃup/ damp, hja7n /h3a7n/ wet, hs6s /hs6s/ puddle, hwic /hwic/ water (requirement).

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

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

fyif /fjif/ self (fertile), xre7t /ɣre1t/, nyanhjen /njanh3en/ male-female (dioecious, distinct male and female plants), hjon /h3on/ sex.

hmcu /hmuʃ/ purpose, pcis /pʃis/ danger, trot /trot/ temperature, prop /prop/ fertile, tcan /tʃan/ other, hum /hjum/ uses, dwat /dwat/ medicine, drut /drut/ description, kcec /kʃeʃ/ region, tfo2n /tfoʃn/ nitrogen-fixing, xlutklam /ɣlut,kfam/ plant quantity, bwon /bwon/ bean, mran /mran/ corn/grain non-nitrogen-fixing plant, nrak /nrak/ continent (of origin), ksac /ksaʃ/ circumstances/habitat.

8 hmuctrotkcec, hja7n hmucwic, 3 ksankcak, jlut hmuchpa7t, flat hmuchpa7tmwat, 99 xlutklam.

2 2 tlin

2.0.1 Salix hybrids

Hybrid willows

2 tlin 11 cyuc 3 kcak 5 tcan 3 dwat 25 m hkuc

htut cyutli tcuphja7n hwicli hrasjlutnyik hpa7tli flatprikliwis hpa7tmwatli hjonli

drutta Salix hybrids is a deciduous Shrub growing to 25 m (82ft) by 15 m (49ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 2. The flowers are pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist or wet soil.

pcista See individual species.

ksakta Edible Parts: Inner bark LeavesEdible Uses: See individual species. In some species the inner bark and leaves are edible.

tcanta Basketry Biomass Fencing Filter Fodder Soil stabilization Weaving WoodWastewater treatment - converting wastewater to biomass fuel by taking up excess nutrients in warer for fertilizer. A strong, light flexible wood used for basketry, fencing and natural building. Erosion control and bank stabilization akong streams and rivers [1-1]. Carbon Farming Solutions - Industrial Crop: biomass (Crops grown for non-food uses. Industrial crops provide resources in three main categories: materials, chemicals, and energy. Traditional materials include lumber and thatch, paper and cardboard, and textiles) [1-1]. Fodder: bank. The leaves are a good fodder for livestock. Other Systems: SRC. Dynamic accumulator.

dwatta Some. See individual species. Willow bark was the basis for aspirin development. Many cultures have used willow bark for pain relief, thanks to a compound in willow bark called salicin.

nrakta Origin: N. Temperate, Africa, S. America. A wide natural distribution from the tropics to the arctic zones and are extensively cultivated around the world. ksacta Found along streambanks and in wetlands. Willows survive in warm and cold weather zones, although most thrive in moist climates.

propta Seed

nwatta Fodder: Bank Industrial Crop: Biomass Management Coppice Minor Global Crop Other Systems: SRCClimate: , tropical highlands. Humidity: semi-arid to humid, aquatic. There are tree, shrub, and ground cover willows. Usually coppiced or pollarded when managing. Some coppiced willows have lived to 800 years. Easy to breed and hybridize. Willows are very cross-compatible, and numerous hybrids occur, both naturally and in cultivation. A well-known ornamental example is the weeping willow (Salix × sepulcralis), which is a hybrid of Peking willow (Salix babylonica) from China and white willow (Salix alba) from Europe. Breeding work has increased biomass yields 50% in the last few decades. European breeding emphasises Salix viminalis and four or five others while North America is based on Salix purpurea and others. Carbon Farming Solutions - Cultivation: minor global crop. Management: coppice (Describes the non-destructive management systems that are used in cultivation) [1-1].

2.0.2 Betula pubescens

White Birch, Downy birch

2 tlin 9 cyuc 3 kcak 5 tcan 3 dwat 20 m hkuc

htut cyutli kyuctcuphja7n hwicli hyishrasjlutnyikfriip hpa7tli frusflatprikliwis hpa7tmwatli hjonli

drutta Betula pubescens is a deciduous Tree growing to 20 m (65ft) by 10 m (32ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 1. It is in flower in April, and the seeds ripen from August to September. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pol-linated by Wind. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay and nutritionally poor soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid soils. It cannot grow in the shade. It prefers dry moist or wet soil. The plant can tolerates strong winds but not maritime exposure.

pcista The aromatic and aliphatic hydrocarbons in birch tar are irritating to the skin. Do not use in patients with oedema or with poor kidney or heart functions [301]

ksakta Edible Parts: Flowers Inner bark Leaves SapEd-ible Uses: Tealnner bark - cooked or dried, ground into a powder then used with cereals for making bread etc[2, 15, 46]. Inner bark is generally only seen as a famine food, used when other forms of starch are not available or are in short supply[177, K]. Sap - raw or cooked. A sweet flavour[2, 15, 177]. Harvested in early spring, before the leaves unfurl, by tapping the trunk. The flow is best on sunny days following a heavy frost. The sap is often concentrated into a sugar by boiling off the water. Between 4 and 7 litres can be drawn off a mature tree in a day and this will not kill the tree so long as the tap hole is filled up afterwards[115]. However, prolonged or heavy tapping will kill the tree. A beer can be fermented from the sap. An old English recipe for the beer is as follows:- "To every Gallon of Birch-water put a quart of Honey, well stirr'd together; then boil it almost an hour with a few Cloves, and a little Limon-peel, keeping it well scumm'd. When it is sufficiently boil'd, and become cold, add to it three or four Spoonfuls of good Ale to make it work...and when the Test begins to settle, bottle it up . . . it is gentle, and very harm- less in operation within the body, and exceedingly sharpens the Appetite, being drunk ante pastum."[269]. Young leaves - raw or cooked[15, 177]. Young catkins[15]. No more details are given. A tea is made from the leaves[15] and another tea is made from the essential oil in the inner bark[21].

tcanta Adhesive Besom Charcoal Compost Dye Essen- tial Fibre Fungicide Miscellany Paper Pioneer Polish Repel- lent Tannin Thatching Waterproofing WoodThe bark is used to make drinking vessels, canoe skins, roofing tiles etc. It is waterproof, durable, tough and resinous[11, 61]. Only the outer bark is removed, this does not kill the tree. It is most easily removed in late spring to early summer. The bark was pressed flat and stored until the following spring. When re- quired for making canoes it would be heated over a fire to make it pliable for shaping to the canoe frame[257]. A pio- neer species, it readily invades old fields, cleared or burnt- over land and creates conditions suitable for other wood- land trees to become established. Since it is relatively short- lived and intolerant of shade, it is eventually out-competed by these trees[11, 186]. A tar-oil is obtained from the white bark in spring. It has fungicidal properties and is also used as an insect repellent[4, 14, 61, 100]. It makes a good shoe polish[61]. Another report says that an essential oil is ob- tained from the bark and this, called 'Russian Leather' has been used as a perfume[245]. A glue is made from the sap. Cordage can be made from the fibres of the inner bark. This inner bark can also be separated into thin layers and used as a substitute for oiled paper[4]. A decoction of the inner bark is used to preserve cordage, it is rich in tannin. The bark contains up to 16% tannin[223]. A brown dye is ob- tained from the inner bark. An oil similar to Wintergreen oil (obtained from Gaultheria procumbens) is obtained from the inner bark[21, 61]. It is used medicinally and also makes a refreshing tea[21]. The young branches are very flexible and are used to make whisks, besoms etc[6]. They are also used in thatching and to make wattles[4]. The leaves are a good addition to the compost heap, improving fermentation[20]. A black paint is obtained from the soot of the plant[61]. A high quality charcoal is obtained from the bark. It is used by artists, painters etc. Wood - soft, light, durable. It is used for a wide range of purposes including furniture, tool han- dles, carving, toys etc[100, 238]. It is a source of charcoal that is used by artists and is also pulped and used for making paper[238].

applied as a wash on burns[272].

nrakta Found through most of the tropics. ksacta Mud flats in estuarine habitats[200]. Moist and wet places, such as the borders of water channels, wells, irrigated fields etc[304].

propta Seed - Division Softwood cuttings

nwatta Plants can be grown in warmer temperate cli- mates through to tropical zones[254]. Requires a wet soil to shallow water[200]. Tolerant of saline conditions[200].

8.2.4 Pandanus amaryllifolius

Fragrant Pandan

8 tlin 11 cyuc 3 kcak 3 tcan 2 dwat 4 m hkuc hmimhtut cyutli tcuphja7n hwicli hrasjlutnyik hpa7tli flat- prikliwis hpa7tmwatli hjonli

drutta Pandanus amaryllifolius is an evergreen Tree growing to 4 m (13ft) by 3 m (9ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 9. Suit- able 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 or wet soil.

ksakta Edible Parts: Fruit Leaves SeedEdible Uses: Colouring CondimentThe fragrant young leaves are cooked and eaten [301]. They are also often used, both fresh or dried, to flavour rice, cassava etc., especially in sweet dishes [296, 301]. Juice extracted from leaves is used to add fra- grance to various types of teas and desserts. Desserts in- clude cakes and kueh. The aromatic leaves give a garlic-like flavour to food [238]. Delicious, they add a distinctive musky odour and a natural green colour [296, 301]. The chlorophyll pigments in the leaves will colour foods green. The leaves are also used to wrap other foods, such as rice dumplings [301]. The leaves are not consumed but are removed from the dish before serving. In Indonesia, rice is sometimes steamed in baskets made of the leaves. Thai people wrap the leaves around pieces of seasoned chicken and then fry them. In Southeast Asia, the leaves are often used to make small boxes or containers that can hold pudding or jellies. Although no specific records have yet been seen for this species, most members of this genus have more or less edible fruits, seeds and inner leaf bases [193]. The cylindrical fruit is a syncarp made up of several individual drupes [193]. Individual drupes are hard, woody wedges - each containing a few slender seeds [193]. Each wedge has a fleshy base imbued with a sweet-smelling, orange pulp that, in many species, has a de- licious flavour[193]. This pulp needs to be cooked to destroy a harmful substance [193]. The seed often has a delicious nutty flavour when eaten raw or cooked, though it is fiddly to extract [193]. Seeds contain 44 - 50% fat and 20 - 34% protein [193]. The inner base of young leaves - raw [193].

tcanta Basketry Containers Cosmetic Deodorant Es- sential Insecticide Pot-pourri Preservative Repellent Weav- ingThe aromatic leaves are used for perfume [317]. In Thai- land, cab drivers use pandan leaves as a natural air fresh- ener. Freshly chopped leaves are mixed with the petals of various flowers to make potpourris [317]. It has been specu- lated that the scent in fragrant pandan leaves is not an es- sential oil but a volatile product of oxidative degradation of a yellow carotenoid pigment [310]. The leaves do, however,

9 Alphabetical Index

yield a tiny amount of essential oil [310]. The leaves can be woven into small baskets [310]. They are used to make containers for desserts [317]. The leaves are used to make mats for sleeping on [454]. An extract of the leaves is used as an ingredient in commercial cosmetic preparations as a deodorant and masking agent [1243]. The essential oil has insect-repellent activity, for instance, against the ordinary cockroach, Periplaneta americana [310]. Pandan leaves, and the extract is used as food preservatives due to their antibac- terial and antifungal properties (particularly against mould). Bottled pandan extract is available in shops and often con- tains green food colouring. The powdered leaves may be used as a repellent against Callosobruchus chinensis infes- tation of mung-bean seeds [310].

dwatta Antibacterial Antidermatosis Antifungal An- tirheumatic Cardiotonic Deodorant Diuretic Hypoglycaemic-The leaves are diuretic and cardiotonic [317]. An infusion is used as a sedative against restlessness and is also a tra- ditional treatment for diabetes [310]. Externally, the leaves are used in the treatment of skin diseases; as a relaxing soak to counter restlessness [310, 317]. They are soaked in co- conut oil; the oil is then employed as an embrocation for rheumatic troubles [310]. Three piperidine alkaloids have been isolated and identified from the leaves of fragrant pan- dan. The application of the leaves as an antidiabetic drug seems linked to 4-hydroxybenzoic acid, which has been iso- lated from Pandanus amaryllifolius roots [310]. It shows hy- poglycaemic effects and increases serum insulin levels and liver glycogen content [310].

nrakta Cultivated in the Tropics, its original range is un- certain but is probably Indonesia. ksacta Not known in a truly wild location.

propta Seed is not available for this plant because only male forms are known[317]. Suckers during the growing season. Suckers removed from the leaf axils can be planted straight away or rooted in a sandy medium[310]. Cuttings of lateral shoots. Stem cuttings should be inserted obliquely in the planting medium[310].

nwatta Fragrant Pandan is a plant of the humid lowland tropics. Apart from the continuous harvesting of fragrant pandan, there are some indications that ever-wet climatic conditions are less favourable for the large growth form's development, thus assisting in perpetuating the small growth form [310]. Fragrant Pandan succeeds in full sun or light shade in moderately fertile, well-drained soil [200]. Fragrant pandan tolerates shade very well [310]. Continual harvest- ing of the leaves from the shrub form will prevent it from developing into the tree form [310]. When abandoned or al- lowed to develop without hindrance, it grows very slowly but eventually will enter into the 'large' growth phase and de- velop a stout trunk [310]. The odour of the leaves remains the same in both growth forms [310]. Harvesting of fragrant pandan may start about six months after planting and may continue for several years [310]. Individual leaves are cut, leaving the top with 3 - 4 leaves intact [310]. Branches do not have dormant buds and will not resprout if cut back into the old wood [423]. A one-ha plot in the Philippines, with fragrant pandan under pepper and some fruit trees, was har- vested twice a week, yielding 60 kg of fresh leaves per har- vest, or 6 t/ha per year [310]. A dioecious species, but only the male form is known, so seeds cannot be produced[317]. Can be grown in pots (35L+)

hmmihhut cyutli hgactcuphja7n hwicli hrasljutnyik hpa7tli frusflatprikwis hpa7tmwatli hjonli

drutta Szyzygium cumini is an evergreen Shrub growing to 25 m (82ft) by 25 m (82ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 9 and is not frost tender. The flowers are pollinated by Bees, Flies, 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 and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

kcakta Edible Parts: Fruit SeedEdible Uses: Coffee DrinkFruit - raw or made into jams, sherbet, jellies, juice, tarts, puddings etc[301 , 418]. The fruit is juicy, almost odourless, with a pleasant, slightly bitter, astringent taste[303]. The purple, olive-shaped fruit is somewhat astringent[301]. The astringency can be removed by soaking the fruit in salt water prior to cooking it[301]. The fruit tends to be of variable quality, at best it is pleasantly and mildly acidic[200]. The oblong fruit is about 20mm long x 18mm wide[200]. A coffee-like beverage is made from the dried and ground up seeds[348].

tcanta Containers Cosmetic Furniture Hedge Preservative Shelterbelt Tannin Teeth WoodAgroforestry Uses: The plant is amenable to trimming and can be grown as a hedge or to provide shelter from the wind[418]. In perennial plant systems it is often interplanted as a shade-provider with crops such as bananas, coffee and cocoa[310 , 418]. The flowers are very attractive to bees, yielding a quality honey[418]. Other Uses The bark contains 13 - 19% tannins[272]. It has served in tanning and also yields a brown dye that has been used in colouring and preserving fishnets[303]. The branches are used to whiten the teeth[348]. The reddish-grey or reddish-brown heartwood is fine grained and is utilized in exterior joinery and carpentry. Wood is durable in water, resistant to termites[272 , 303], and although difficult to work, it saws and machines well and is used for construction, boat building, commercial tea and chest plywood, agricultural implements, tool handles, cart wheels, well curbs and troughs, sleepers, furniture and as props for shafts and galleries in mines. It is also used for building bridges and for making musical instruments, especially guitars[303].

dwatta Antidiarrhoeal Astringent Carminative Diuretic Dysentery Epilepsy Hypoglycaemic MouthwashBoth the seeds and the fruit are diuretic and have important carminative and astringent properties[254]. The seeds also reduce blood sugar levels and are useful in the treatment of diabetes[254 , 348]. The seeds and bark are well known in the Far East for the treatment of dysentery and in the control of hyperglycaemia and glycosuria in diabetic patients[303]. The juice of the bark is considered good for treating wounds and enlargement of the spleen[272]. The bark is astringent[303 , 348]. An infusion is used to treat irregular menstruation, diarrhoea, dysentery, children's thrush etc[348]. The bark is used as a gargle to strengthen gums, treat mouth ulcers etc[303]. The ripe fruit is astringent and is used as an effective treatment for diabetes[272]. Fruits are used as a relief for colic and to treat diarrhoea[303 , 348]. An infusion of the leaves is used in the treatment of diabetes and diarrhoea[348]. The wood yields a sulphate pulp that has medicinal uses[303]. The roots are sometimes used as a treatment for epilepsy[254].

nrakta E. Asia - China, India, Malaysia. ksacta Most tropical and subtropical forest habitats in India, ranging from evergreen broadleaved to deciduous and coniferous, from wet to fairly dry areas, near the coast and even in swamps[303].

propta Seed - freshly collected seeds are normally sown in nursery beds at a depth of 20 - 25mm during the rainy season and germinate in 2 - 4 weeks at a rate 20 - 90%[303]. Plants are pricked out when 6 - 9 months old into beds 30 x 30 cm[303]. For development of seedlings, moisture is even more important than shade, as seedlings in the sun develop well, provided the soil is kept moist, but seedlings in the shade die if the soil is dry[303]. Seedlings are somewhat frost tender, particularly on grassy ground, where they are frequently killed back[303. Sapling growth is faster than seedling growth. Seedlings 1-3 years old can be planted out without any difficulty[303]. Air-layering. Grafting.

nwatta A plant of the tropics and subtropics, where it is

found at elevations up to 2,000 metres[303, 418]. It grows best in areas where annual daytime temperatures are within the range 20 - 32°C, but can tolerate 12 - 48°C[418]. Mature growth can be killed by temperatures of -2°C or lower, whilst young growth is killed at -1°C[418]. It prefers a mean annual rainfall in the range 1,500 - 6,000mm, but tolerates 800 - 9,900mm[418]. Plants can withstand a dry season of up to 6 - 7 months[418]. Although it prefers a sunny position, plants are moderately shade-tolerant, especially when young[303 , 418]. A very versatile plant able to grow on a wide range of soils, it can even grow on shallow, rocky soils provided the rainfall is sufficient[303, 418]. It tolerates prolonged flooding, and once established, it can tolerate drought[303]. In dry sites, it generally confines itself to the vicinity of water-courses[303]. Prefers a pH in the range 5.5 - 7, tolerating 4.5 - 8[418]. Plants are tolerant of quite strong winds[310]. Trees self-sow freely and may become serious pests in pastures[303]. The plant is listed as undesirable in Florida[307]. A fast-growing plant[335 , 416]. Seedlings may reach a height of 4 metres in only 2 years[303 , 418]. The tree coppices remarkably well; vigorous shoots are produced in large numbers from small and large stumps alike. Coppice stands along streams have been reported that grew to 4.6 metres in 4 years[303]. The best forms are frequently cultivated in Java and Florida[303]. Flowering Time: Mid Summer. Bloom Color: White/Near White. Spacing: over 40 ft. (12 m).

8.2.3 Bacopa monnieri

Herb of Grace, Brahmi, Smooth Water Hyssop
8 tlin 11 cyuc 3 kcak 1 tcan 4 drwat m hkuc
hmmihhut cyutli tucphja7n hwicli hrasljutnyik hpa7tli frusflatprikwissliphsom hpa7tmwatli hjonli

drutta Bacopa monnieri is a PERENNIAL 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 9 and is frost tender. The flowers are pollinated by Bees, Insects. 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, very alkaline and saline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil.

pcista The most commonly reported adverse side effects of Bacopa monnieri in humans are nausea, increased intestinal motility, and gastrointestinal upset.

kcakta Edible Parts: Flowers LeavesEdible Uses: Edible portion: Leaves, Flowers, Vegetable. The leaves can be eaten raw in mixed salads, or cooked as a vegetable, added to soups or pickled[301]. The flowers are eaten in times of food shortage.

tcanta Other uses rating: Low (1/5). Its ability to grow in water makes it a popular aquarium plant. Attractive to bees, butterflies and birds.

dwatta Antiasthmatic Antitussive Aperient Cancer Cardiac Diuretic Epilepsy Hypotensive Infertility Nervine Sedative Skin Tonic VasoconstrictorBrahmi is a very important Ayurvedic herb, being particularly valued for its beneficial effect upon the nervous system. Its main active substances are steroidal saponins, including bacosides[254]. The whole plant is used - roots, stems and leaves[304]. It is cardiac, nervine tonic, sedative and vasoconstrictor[304]. The leaves and stalks are aperient and diuretic[304]. An alcohol extract of the whole plant has been shown to have anticancer activity against Walker carcinoma[304]. An alcohol extract of plant is a muscle relaxant and cardiovascular relaxant[348]. Research in India suggests that brahmi improves mental function, memory and concentration, and also reduces learning time[254]. The plant contains the alkaloid brahmine, which has been shown to raise blood pressure when administered in therapeutic dosage, but to be hypotensive when given in very strong dosage[348]. A tranquilizing saponin that resembles reserpine is also present[348]. The plant is used principally in the treatment of a range of nervous system disorders including neuralgia, hysteria, epilepsy, insanity, neurasthenia, aphonia and hoarseness[254 , 304]. The plant is also taken internally in a number of other conditions including indigestion, ulcers, wind, constipation, asthma, bronchitis and infertility[254]. A poultice made of the boiled plant is applied to the chests of children in the treatment of acute bronchitis and other coughs[304]. A juice made from the plant is

dwatta Antirheumatic Antiseborrhoeic Astringent Bitter Diaphoretic Diuretic Eczema Lithontripic Miscellany Skin UrinaryAnti-inflammatory, cholagogue, diaphoretic[21, 165, 201]. The bark is diuretic and laxative[7]. The inner bark is bitter and astringent, it is used in treating intermittent fevers[4]. An oil obtained from the inner bark is astringent and is used in the treatment of various skin afflictions, especially eczema and psoriasis[4, 238]. The bark is usually obtained from trees that have been felled for timber and can be distilled at any time of the year[238]. The buds are balsamic[7]. The young shoots and leaves secrete a resinous substance which has acid properties, when combined with alkalis it is a tonic laxative[4]. The leaves are anticholesterolemic and diuretic[7]. They also contain phytoisides, which are effective germicides[7]. An infusion of the leaves is used in the treatment of gout, dropsy and rheumatism, and is recommended as a reliable solvent of kidney stones[4]. The young leaves and leaf buds are harvested in the spring and dried for later use[238]. A decoction of the leaves and bark is used for bathing skin eruptions[4]. The vernal sap is diuretic[4]. The boiled and powdered wood has been applied to chafed skin[257]. Moxa is made from the yellow fungous excrescences of the wood, which sometimes swell out of the fissures[4]. The German Commission E Monographs, a therapeutic guide to herbal medicine, approve Betula species for infections of the urinary tract, kidney and bladder stones, rheumatism (see [302] for critics of commission E).

nrakta Most of Europe, including Britain, east to W. Siberia and central Asia. ksacta Open woodland and heaths, usually on acid soils, from sea level to 830 metres[1, 17, 100].

propta Seed - best sown as soon as it is ripe in a light position in a cold frame[78, 80, 113, 134]. Only just cover the seed and place the pot in a sunny position[78, 80, 134]. Spring sown seed should be surface sown in a sunny position in a cold frame[113, 134]. If the germination is poor, raising the temperature by covering the seed with glass can help[134]. When they are large enough to handle, prick the seedlings out into individual pots and grow them on in a cold frame for at least their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. If you have sufficient seed, it can be sown in an outdoor seedbed, either as soon as it is ripe or in the early spring - do not cover the spring sown seed. Grow the plants on in the seedbed for 2 years before planting them out into their permanent positions in the winter[78, 80, 113, 134].

nwatta Succeeds in a well-drained light loamy soil in a sunny position[11, 200]. Grows well in heavy clay soils. Tolerates a wet position[11, 24], succeeding in poorly drained soils[186]. Fairly wind tolerant[200]. Prefers an acid soil. A very ornamental tree and fast growing, capable of growing 1 metre a year but it is short-lived[186]. It is one of the first trees to colonize open land and it creates a suitable environment for other woodland trees to follow[11]. These trees eventually shade out the birch trees[186]. Trees take about 15 years from seed to produce their own seed[98]. Although closely related, it does not usually hybridize with B. pendula[11]. It hybridizes freely with B. pendula according to another report[186]. A superb tree for encouraging wildlife, it has over 200 associated insect species[24, 30]. A good plant to grow near the compost heap, aiding the fermentation process[14, 20]. It is also a good companion plant, its root activity working to improve the soil[14]. Trees are notably susceptible to honey fungus[200].

3 3 tlin

3.0.1 Typha latifolia

Reedmace, Broadleaf cattail, Bullrush, Nailrod
3 tlin 10 cyuc 5 kcak 4 tcan 3 drwat 2.5 m hkuc
htut cyutli hja7nhs6s hwicli hrasljutnyik hpa7tli flatprikwis hpa7tmwatli hjonli

drutta Typha latifolia is a PERENNIAL growing to 2.5 m (8ft) by 3 m (9ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 3. It is in flower from June to August. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Wind. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and

heavy (clay) soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers wet soil and can grow in water.

kcakta Edible Parts: Flowers Leaves Oil Pollen Root Seed StemEdible Uses: OilRoots - raw or cooked[2, 12]. They can be boiled and eaten like potatoes or macerated and then boiled to yield a sweet syrup. The roots can also be dried and ground into a powder, this powder is rich in protein and can be mixed with wheat flour and then used for making bread, biscuits, muffins etc[55, 62, 95, 183]. One hectare of this plant can produce 8 tonnes of flour from the rootstock[85]. The plant is best harvested from late autumn to early spring since it is richest in starch at this time[9]. The root contains about 80% carbohydrate (30 - 46% starch) and 6 - 8% protein[85]. Young shoots in spring - raw or cooked[12, 55, 62, 94, 102, 183]. An asparagus substitute. They taste like cucumber[212]. The shoots can still be used when they are up to 50cm long[85]. Base of mature stem - raw or cooked[2, 9, 55]. It is best to remove the outer part of the stem[62, 183]. It is called 'Cossack asparagus'[183]. Immature flowering spike - raw, cooked or made into a soup[62, 85, 94]. It tastes like sweet corn[183]. Seed - raw or cooked[2, 257]. The seed is rather small and fiddly to utilize, but has a pleasant nutty taste when roasted[12]. The seed can be ground into a flour and used in making cakes etc[257]. An edible oil is obtained from the seed[55, 85]. Due to the small size of the seed this is probably not a very worthwhile crop[K]. Pollen - raw or cooked. The pollen can be used as a protein rich additive to flour when making bread, porridge etc[12, 55, 62, 94, 102]. It can also be eaten with the young flowers[85], which makes it considerably easier to utilize. The pollen can be harvested by placing the flowering stem over a wide but shallow container and then gently tapping the stem and brushing the pollen off with a fine brush[9]. This will help to pollinate the plant and thereby ensure that both pollen and seeds can be harvested[K].

tcanta Baby care Biomass Fibre Insulation Stuffing Thatching Tinder WeavingThe stems and leaves have many uses. Gathered in the autumn they make a good thatch, can be used in making paper, can be woven into mats, chairs, hats etc[94, 99, 257]. They are a good source of biomass, making an excellent addition to the compost heap or used as a source of fuel etc. The pulp of the plant can be converted into rayon[222]. The stems can be used to make rush lights. The outer stem is removed except for a small strip about 10mm wide which acts as a spine to keep the stem erect. The stem is then soaked in oil and can be lit and used like a candle[55]. The female flowers make an excellent tinder and can be lit from the spark of a flint[212]. A fibre is obtained from the blossom stem and flowers[55, 57, 99]. A fibre obtained from the leaves can be used for making paper[189]The leaves are harvested in summer, autumn or winter and are soaked in water for 24 hours prior to cooking. The fibres are cooked for 2 hours with soda ash and then beaten in a ball mill for 1½ hours. They make a green or brown paper[189]. The hairs of the fruits are used for stuffing pillows etc[257]. They have good insulating and buoyancy properties and have also been used as a wound dressing and a lining for babies nappies[99]. The flowering stems can be dried and used for insulation, they also have good buoyancy properties[55, 171]. The pollen is highly inflammable, it is used in making fireworks etc[115].

dwatta Anticoagulant Astringent Diuretic Emmenagogue Galactagogue Haemostatic Miscellany Refrigerant Sedative Tonic VulneraryThe leaves are diuretic[218]. The leaves have been mixed with oil and used as a poultice on sores[257]. The pollen is astringent, diuretic, emmenagogue, haemostatic, refrigerant, sedative, suppurative and vulnerary[218]. The dried pollen is said to be anticoagulant, but when roasted with charcoal it becomes haemostatic[238]. It is used internally in the treatment of kidney stones, haemorrhage, painful menstruation, abnormal uterine bleeding, post-partum pains, abscesses and cancer of the lymphatic system[222, 238]. It should not be prescribed for pregnant women[238]. Externally, it is used in the treatment of tapeworms, diarrhoea and injuries[238]. A decoction of the stems has been used in the treatment of whooping cough[257]. The roots are diuretic, galactagogue, refrigerant and tonic[218]. The roots are pounded into a jelly-like consistency and applied as a poultice to wounds, cuts, boils, sores, carbuncles, inflammations, burns and scalds[222, 257]. The flowers are used in the treatment

of a wide range of ailments including abdominal pain, amenorrhoea, cystitis, dysuria, metrorrhagia and vaginitis[218]. The young flower heads are eaten as a treatment for diarrhoea[222]. The seed down has been used as a dressing on burns and scalds[257].

nrakta Throughout the world from the Arctic to latitude 30° S, incl Britain but absent from Africa, S. Asia ksacta Shallow water up to 15cm deep in ponds, lakes, ditches, slow-flowing streams etc, succeeding in acid or alkaline conditions[9, 17].

propta Seed - surface sow in a pot and stand it in 3cm of water. Pot up the young seedlings as soon as possible and, as the plants develop, increase the depth of water. Plant out in summer. Division in spring. Very easy, harvest the young shoots when they are about 10 - 30cm tall, making sure there is at least some root attached, and plant them out into their permanent positions.

nwatta Industrial Crop: Biomass Industrial Crop: Fiber Management: Hay Minor Global CropLandscape Uses:Container, Erosion control, Massing, Specimen. A very easily grown plant, succeeding in the boggy margins of ponds or in shallow water up to 15cm deep[17]. It succeeds in acid and calcareous soils and requires a less organic-rich soil than *T. angustifolia* in order to do well[17]. It succeeds in sun or part shade[200]. A very invasive plant spreading freely at the roots when in a suitable site, it is not suitable for growing in small areas[24]. Unless restrained by some means, such as a large bottomless container, the plant will soon completely take over a site and will grow into the pond, gradually filling it in. This species will often form an almost complete monoculture in boggy soil. Provides excellent cover for wild fowl[1]. Special Features: Attracts birds, North American native, Grows submerged, Invasive, Wetlands plant, Suitable for dried flowers.

3.0.2 Nasturtium officinale

Watercress

3 tin 11 cyuc 4 kcaak 2 tcan 3 dwat 0.5 m hkuc htut cyutli hja'nhs6s hwicli hrasjlutnyikrip hpa7tli flatprikliw hpa7tmwatli fyfxre7t hjonli

drutta *Nasturtium officinale* is a PERENNIAL growing to 0.5 m (1ft 8in) by 1 m (3ft 3in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender. It is in flower from May to October, and the seeds ripen from July to October. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees, flies. The plant is self-fertile. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers wet soil and can grow in water.

pcaista Whilst the plant is very wholesome and nutritious, some care should be taken if harvesting it from the wild. Any plants growing in water that drains from fields where animals, particularly sheep, graze should not be used raw. This is due to the risk of it being infested with the liver fluke parasite[5, 244]. Cooking the leaves, however, will destroy any parasites and render the plant perfectly safe to eat[244]. May inhibit the metabolism of paracetamol [301].

kcakta Edible Parts: Leaves SeedEdible Uses: Condi-mentLeaves - raw or cooked[2, 5, 7, 9, 16, 27]. Water cress is mainly used as a garnish or as an addition to salads, the flavour is strong with a characteristic hotness[183]. It has a reputation as a spring tonic, and this is its main season of use, though it can be harvested for most of the year and can give 10 pickings annually[238]. Some caution is advised if gathering the plant from the wild, see the notes above on toxicity. The leaves are exceptionally rich in vitamins and minerals, especially iron[200]. A nutritional analysis is available[218]. The seed can be sprouted and eaten in salads[183]. A hot mustardy flavour[K]. The seed is ground into a powder and used as a mustard[46, 183]. The pungency of mustard develops when cold water is added to the ground-up seed - an enzyme (myrosin) acts on a glycoside (sinigrin) to produce a sulphur compound. The reaction takes 10 - 15 minutes. Mixing with hot water or vinegar, or adding salt, inhibits the enzyme and produces a mild but bitter mustard[238].

tcanta Hair MiscellanyThe juice of the plant is a nicotine solvent and is used as such on strong tobaccos[7]. 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 Antirheumatic Antiscorbatic Appetizer Depurative Diuretic Expectorant Hypoglycaemic Miscellany Odontalgic Purgative Stimulant Stomachic TB Vitamin CWatercress is very rich in vitamins and minerals, and has long been valued as a food and medicinal plant[254]. Considered a cleansing herb, its high content of vitamin C makes it a remedy that is particularly valuable for chronic illnesses[254]. The leaves are antiscorbatic, depurative, diuretic, expectorant, purgative, hypoglycaemic, odontalgic, stimulant and stomachic[4, 7, 9, 21, 46, 222, 238]. The plant has been used as a specific in the treatment of TB[4]. The freshly pressed juice has been used internally and externally in the treatment of chest and kidney complaints, chronic irritations and inflammations of the skin etc[9]. Applied externally, it has a long-standing reputation as an effective hair tonic, helping to promote the growth of thick hair[244]. A poultice of the leaves is said to be an effective treatment for healing glandular tumours or lymphatic swellings[244]. Some caution is advised, excessive use of the plant can lead to stomach upsets[9, 21]. The leaves can be harvested almost throughout the year and are used fresh[238].

nrakta Europe, including Britain, from Sweden and Denmark south and east to N. Africa and W. Asia. ksacta Stream margins, ditches, flushes etc with moving water[17, 27], usually in chalk or limestone areas[52].

propta Seed - sow spring in a pot emmersed to half its depth in water. Germination should take place within a couple of weeks. Prick out seedlings into individual pots whilst they are still small and increase the depth of water gradually until they are submerged. Plant out into a pond in the summer. Cuttings can be taken at any time in the growing season. Virtually any part of the plant, including a single leaf, will form roots if detached from the parent plant[56]. Just put it in a container of water until the roots are well formed and then plant out in shallow water.

nwatta Landscape Uses:Container. Watercress is easily grown when given the correct conditions of slowly flowing clean water, preferably coming from chalky or limestone soils[264]. It prefers to grow in water about 5cm deep[37] with an optimum pH 7.2[200]. Plants can be grown in wet soil if the position is somewhat shaded and protection is given in winter, though the flavour may be hotter[27, 37]. Hardy to about -15°C[200]. Watercress is often cultivated for its edible leaves, there are some named varieties[16, 183]. The plant is very sensitive to pollution so a clean source of water is required[200]. Plants will often continue to grow all through mild winters. A fast-growing plant, the stems trail along the ground or float in water and produce new roots at the leaf nodes, thus making the plant very easy to propagate vegetatively[238]. Unfortunately, virus diseases have become more common in cultivated plants and so most propagation is carried out by seed[264]. This is a diploid species. It has hybridised naturally in the wild with the triploid species *N. microphyllum* to produce the sterile hybrid *N. x sterilis* which is also commonly cultivated as a salad crop[264]. The flowers are a rich source of pollen and so are very attractive to bees[7]. Special Features: Attractive foliage, Edible, Not North American native, Wetlands plant, Flower characteristics are unknown. 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].

3.0.3 Viburnum opulus

Guelder Rose, Cramp Bark, European cranberrybush, American cranberrybush, Crampbark, European Highb 3 tin 8 cyuc 3 kcaak 3 tcan 3 dwat 5 m hkuc hmimhtut cyutli tcuphja7n hwicli hrasjlutnyikrip hpa7tli flatprikliwsslip hpa7tmwatli fyfxre7t hjonli

drutta *Viburnum opulus* is a deciduous 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 3 and is not frost tender. It is in flower from June to July, and the seeds ripen from September to October. The species is hermaphrodite

it is more commonly concentrated to make syrups or dried to make sugar, molasses etc[46]. The core of fresh stems is chewed as a sweet refreshment[301].

tcanta Alcohol Biomass Fibre Fodder Fuel Insulation Paper Polish WaxAgroforestry Uses: Sugar cane is a very greedy crop that soon exhausts the soil. In some countries the plant is intercropped with indigo or other leguminous plants between the rows when the canes are first planted. These legumes are turned into the soil while they are still green and succulent. This process has a very beneficial effect[459]. Other Uses A wax obtained from the stems resembles carnauba wax[46]. It is used in the production of furniture, shoe, and leather polishes, electrical insulating material, and waxed paper[418]. The sweet sap from the stems can be manufactured into alcohol for used as a fuel in infernal combustion engines[46]. The stems are a source of fibre used for making paper[46]. Bagasse is the residue of the cane after the sugar is extracted. It is used as a fuel and for the manufacture of fibreboard, paper pulp, plastic, furfural, and cellulose[46 , 418]. Nitrogen fixation during decomposition of sugarcane (*Saccharum officinarum*) is an important contribution to nutrient supply in traditional dryland agricultural systems of Hawai'i.

dwatta UrinaryThe leaf ash is used to treat sore eyes[311]. The stem juice is used to treat sore throats[311]. The sweet juice in the stem is used to treat snakebite and wounds from poison arrows[348]. Mixed with an infusion of 'wallaba' (*Eperua* sp.) it is used to treat curare poisoning[348] A decoction of the young leaves is used to treat urinary conditions[348].

nrakta Originated in cultivation. ksacta Not known as a wild plant.

propta Seed - Cuttings, consisting of 2 - 3 joints of the upper part of a stem that has been selected from a vigorous, healthy plant. They are placed in the ground with only 2 - 5cm of the cutting projecting above the surface. In about two weeks from planting the 'eyes' at each node will send forth shoots, and roots will grow from the nodes themselves. As the shoots develop, the parent stem decays and the young plants produce roots of their own[459].

nwatta Agroforestry Services: Nitrogen Fodder: Bank Global Crop Industrial Crop: Biomass Industrial Crop: Wax Management: Hay Other Systems: Dyke-pond Other Systems: Homegarden Staple Crop: Sugar-Most commercial sugarcane is grown at latitudes between 35N and S in the tropics, usually at elevations from sea level to 1,600 metres[418]. The plant grows best in areas where the mean annual rainfall is in the range 1,500 - 2,000mm, tolerating 1,000 - 5,000mm[418]. It prefers a mean annual temperature within the range 24° - 37°C, though can tolerate 15 - 41°C[418]. There are large differences between different cultivars in their tolerance to cold and susceptibility to frost[418]. Generally, long-term exposure to temperatures below 10c can be lethal, whilst even short periods at 0°C causes the leaves to become chlorotic, at about -3°C young plants turn brown and the terminal buds and leaves of mature cane die, when the temperature reaches -11.5c the whole plant dies[418]. Grows best in a sunny position. A very greedy plant, soon exhausting the soil of nutrients[459]. The plant is considered to be moderately tolerant to saline soil conditions and relatively tolerant of acid soils[418]. Grows best in a position sheltered from strong winds[418]. Prefers a pH in the range 5 - 8, but can tolerate 4.5 - 9[418]. Well-grown plants can become invasive[200]. When irrigated, yields of 100 - 150 tons of cane can be obtained from mature plants[418]. Young plants can yield 60 - 90 tons[418]. There are many named varieties[301]. The roots develop from the growth ring on the original planting piece and also from the new shoots that develop. The majority of the roots are thin and superficial with four fifths of the roots commonly found in the top 25 - 50cm of the soil. Thicker roots will penetrate to depths of 4 metres or more[418]. Flowering Time: Late Winter/Early Spring. Bloom Color: White/Near White.

8.2 mran

8.2.1 Cyperus esculentus

Tiger Nut, Yellow nutsedge, Nut Grass 8 tin 10 cyuc 4 kcaak 3 tcan 2 dwat 0.9 m hkuc

htut cyutli tcuphja7n hwicli hrasjlutnyikrip hpa7tli flatprikliw hpa7tmwatli xre7t hjonli

drutta *Cyperus esculentus* is a PERENNIAL growing to 0.9 m (3ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 8. 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 can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist or wet soil.

kcakta Edible Parts: Leaves Oil Oil RootEdible Uses: Coffee Oil OilTuber - raw, cooked or dried and ground into a powder[2, 4, 55, 62, 85, 95, 183].They are also used in confectionery[183]. A delicious nut-like flavour[1, 61, 183] but rather chewy and with a tough skin[K]. They taste best when dried[27]. They can be cooked in barley water to give them a sweet flavour and then be used as a dessert nut[183]. A refreshing beverage is made by mixing the ground tubers with water, cinnamon, sugar, vanilla and ice[183]. The ground up tuber can also be made into a plant milk with water, wheat and sugar[183]. An edible oil is obtained from the tuber. It is considered to be a superior oil that compares favourably with olive oil[183]. The roasted tubers are a coffee substitute[2, 62, 183]. The base of the plant can be used in salads[183]. (This probably means the base of the leaf stems)[K]

tcanta Oil Oil WeavingThe tubers contain up to 30% of a non-drying oil, it is used in cooking and in making soap[57, 74, 117, 141]. It does not solidify at 0°C and stores well without going rancid[74]. The leaves can be used for weaving hats and matting etc[178]. The boiled nuts are used in the UK as a bait for carp.

dwatta Aphrodisiac Carminative Digestive Diuretic Dysentery Emmenagogue Stimulant TonicTiger nuts are regarded as a digestive tonic, having a heating and drying effect on the digestive system and alleviating flatulence[254]. They also promote urine production and menstruation[254]. The tubers are said to be aphrodisiac, carminative, diuretic, emmenagogue, stimulant and tonic[240, 254]. In Ayurvedic medicine they are used in the treatment of flatulence, indigestion, colic, diarrhoea, dysentery, debility and excessive thirst[254].

nrakta Original range is obscure, the plant is a widespread weed from the Tropics to the Temperate zone. ksacta Muddy soil and shallow water, also as a weed of cultivated ground in southern Europe[50].

propta Seed - surface sow in the spring and keep the compost moist[164]. The seed usually germinates in 2 - 6 weeks at 18°C[164]. Prick out the seedlings into individual pots as soon as they are large enough to handle. Grow on for their first winter in a greenhouse and plant them out in late spring after the last expected frosts. Division in spring or autumn. This is more a matter of harvesting the tubers and replanting them. If this is done in the autumn, then it is best to store the tubers in a cool frost-free place overwinter and plant them out in the spring.

nwatta Prefers a moist sandy loam[95, 117]. Plants are hardy to about -15°C[200]. The chufa, or tiger nut, is often cultivated for its edible tuber in warm temperate and tropical zones, there is a cultivated variety, var. *sativus*, that produces larger tubers[50]. We have had lots of problems with growing this cultivated form. Once the tubers come into growth then they normally grow vigorously, but the difficulty is getting them to come into growth. We harvest the tubers in the autumn and store them in moist sand, replanting them in the spring. However, they rarely come into new growth until mid to late summer which gives them too short a growing season to produce much of a crop[K]. We need to find a satisfactory way of storing the tubers and exciting them back into growth[K]. In warmer climates this plant is a serious weed of cultivation. It is much harder than was once imagined and is becoming a weed in N. America where it is found as far north as Alaska[95]. The tubers are often formed a metre or more away from the plant, especially if it is growing in a heavy clay soil[159]. The tubers are extremely attractive to mice and require protection from them in the winter[K].

8.2.2 Syzygium cumini

Jambolan, Java Plum, Malabar Plum, Jambu 8 tin 12 cyuc 3 kcaak 4 tcan 3 dwat 25 m hkuc

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].

7.2.6 Allium validum

Swamp Onion, Pacific onion

7 tin 10 cyuc 3 kcaak 0 tcan 2 dwat 0.6 m hkuc htut cyutli tcuphja7n hwicli hrasjlut hpa7tli flatprikliw hpa7tmwatli xre7t hjonli

drutta Allium validum is a BULB growing to 0.6 m (2ft). See above for USDA hardiness. It is hardy to UK zone 8. 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) 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 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 very large quantities and by some mammals, of certain members of this genus. Dogs seem to be particularly susceptible[76].

kcakta Edible Parts: Flowers Leaves RootEdible Uses: Bulb - raw or cooked[257]. The bulb is somewhat fibrous but is very acceptable as a flavouring in soups and stews[183]. The bulb is fairly large, up to 5cm in diameter, and is produced in clusters[200]. The plant has thick iris-like rhizomes[203]. Leaves - raw or cooked. Flowers - raw. Used as a garnish on salads.

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

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

nrakta South-western N. America - Idaho to California. ksacta Swampy meadows at medium to high elevations in the mountains[60].

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

nwatta Prefers a sunny position in a light well-drained soil[1]. This species tolerates much wetter soils than most members of the genus but it dislikes winters with alternating periods of damp and cold and no snow cover, so it is best given a damp though well-drained soil[203]. It requires plenty of moisture in the growing season[203]. This species is not hardy in the colder areas of Britain, it tolerates temperatures down to between -5 and -10°C[200]. The bulbs should be planted fairly deeply[1]. Grows well with most plants, especially roses, carrots, beet and chamomile, but it inhibits the growth of legumes[18, 20, 54]. This plant is a bad companion for alfalfa, each species negatively affecting the other[201]. Members of this genus are rarely if ever troubled by browsing deer[233].

8 8 tlin

8.1 bwon

8.1.1 Saccharum hybrids

Energy Cane

tfo2n 8 tlin 12 cyuc 4 kcaak 4 tcan 2 dwat 6 m hkuc htut cyutli tcuphja7n hwicli hrasjlutnyik hpa7tli frusflatprikliwshom hpa7tmwatli hjonli

drutta Saccharum hybrids is a PERENNIAL growing to 6 m (19ft) by 1.5 m (5ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. It can fix Nitrogen. 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 saline soils. It cannot grow in the shade. It prefers moist or wet soil.

pcista Sugarcane production has probably caused more biodiversity loss than any other crop [1-1].

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

tcanta FodderCarbon Farming Solutions - Industrial Crop: biomass (Crops grown for non-food uses. Industrial crops provide resources in three main categories: materials, chemicals, and energy. Traditional materials include lumber and thatch, paper and cardboard, and textiles) [1-1]. "Noble" cane types are optimized for sugar production while Energy cane types have three times the fiber for use as biofuel. Many energy canes are the result of crosses with biomass grasses like Miscanthus, raising the interesting possibility of cold-tolerant sugarcane [1-1]. Fodder: bank. dwatta Possible. See individual species.

nrakta Not known as a wild plant. Hybrid of Asian species. ksacta Originated in cultivation.

propta Seed - Cuttings, consisting of 2 - 3 joints of the upper part of a stem that has been selected from a vigorous, healthy plant. They are placed in the ground with only 2 - 5cm of the cutting projecting above the surface. In about two weeks from planting the 'eyes' at each node will send forth shoots, and roots will grow from the nodes themselves. As the shoots develop, the parent stem decays and the young plants produce roots of their own[459].

nwatta Fodder: Bank Industrial Crop: Biomass Manage Hay New Crop Staple Crop: SugarClimate: subtropical to tropical. Humidity: humid. Carbon Farming Solutions - Cultivation: new crop. Management: hay (Describes the non-destructive management systems that are used in cultivation) [1-1]. Need not be grown in large monocultures as is common in homegardens around the world [1-1]. Global sugarcane biomass yields averaged 70.2t/ha in 2012 [1-1]. Sugarcane and energy cane breeding is active and ongoing including GMO types.

8.1.2 Saccharum officinarum

Sugarcane, Purple Sugar Cane

tfo2n 8 tlin 12 cyuc 4 kcaak 3 tcan 2 dwat 6 m hkuc htut cyutli tcuphja7n hwicli hrasjlutnyik hpa7tli frusflatprikliwshom hpa7tmwatli hjonli

drutta Saccharum officinarum is a PERENNIAL growing to 6 m (19ft) by 1.5 m (5ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 9. 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 and can grow in very acid and saline soils. It cannot grow in the shade. It prefers moist or wet soil.

pcista Leaves and sheaths of some varieties are covered with a large number of siliceous hairs. These hairs penetrate the skin of cane cutters and are most unpleasant; hence cane cutters prefer varieties with few hairs or burnt cane[418]. (Plant has spines or sharp edges; use extreme caution when handling.)

kcakta Edible Parts: Sap StemEdible Uses: Drink SweetenerThe stems contain a very sweet sap[46]. They are crushed to extract this sap, which is then used in a variety of ways. It can be used as a sweet, refreshing drink, though

(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 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.

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

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[2, 3, 5, 46]. The fruit is up to 8.5mm in diameter but with a large seed[200]. A sour taste, it is best cooked. The crushed fruit has an unpleasant smell[4]. Used as a cranberry substitute in making, jellies, preserves etc[183]. Some caution is advised, see notes on toxicity at top of the page.

tcanta Dye Hedge Hedge Ink WoodA red dye is obtained from the fruit[13]. An ink can be made from the dried berries[4]. Plants can be grown as a tall hedge[29], they are rather bare in winter though[K]. The wood can be used to make skewers[4].

dwatta Antispasmodic Astringent Birthing aid Homeopathy SedativeGuelder rose is a powerful antispasmodic and is much used in the treatment of asthma, cramps and other conditions such as colic or painful menstruation[254]. It is also used as a sedative remedy for unusual conditions[254]. The bark is antispasmodic, astringent and sedative[4, 9, 46, 165, 213]. The bark contains 'scopoletin', a coumarin that has a sedative effect on the uterus[238]. A tea is used internally to relieve all types of spasms, including menstrual cramps, spasms after childbirth and threatened miscarriage[9, 222, 238]. It is also used in the treatment of nervous complaints and debility[4, 46, 165, 213]. The bark is harvested in the autumn before the leaves change colour, or in the spring before the leaf buds open. It is dried for later use[238]. The leaves and fruits are antiscorbutic, emetic and laxative[4, 222]. A homeopathic remedy is made from the fresh bark[9]. It is used in the treatment of menstrual pain and spasms after childbirth[9].

nrakta Europe, including Britain, from Scandinavia south and east to Spain, north and west Asia. ksacta Hedges, scrub and woodland, usually on damp soils[3, 13, 17].

propta Seed - best sown in a cold frame as soon as it is ripe. Germination can be slow, sometimes taking more than 18 months. If the seed is harvested 'green' (when it has fully developed but before it has fully ripened) and sown immediately in a cold frame, it should germinate in the spring[80]. Stored seed will require 2 months warm then 3 months cold stratification and can still take 18 months to germinate[113]. Prick out the seedlings into individual pots when they are large enough to handle and grow them on in a cold frame or greenhouse. Plant out into their permanent positions in late spring or early summer of the following year. Cuttings of soft-wood, early summer in a frame[200]. Pot up into individual pots once they start to root and plant them out in late spring or early summer of the following year. Cuttings of half-ripe wood, 5 - 8 cm long with a heel if possible, July/August in a frame[78, 113]. Plant them into individual pots as soon as they start to root. These cuttings can be difficult to overwinter; it is best to keep them in a greenhouse or cold frame until the following spring before planting them out[113]. Cuttings of mature wood, winter in a frame. They should root in early spring - pot them up when large enough to handle and plant them out in the summer if sufficient new growth is made, otherwise keep them in a cold frame for the next winter and then plant them out in the spring. Layering of current seasons growth in July/August. Takes 15 months[78].

nwatta Landscape Uses:Border, Massing, Screen, Specimen. An easily grown plant, it succeeds in most soils but is ill-adapted for poor soils and for dry situations[1]. It prefers a deep rich moist loamy soil in a sunny position[11]. Succeeds in semi-shade but does not grow or fruit so well in such a position[186]. Grows well in heavy clay soils and on chalk[184]. Does not do well on very acid soils. Best if given shade from the early morning sun in spring[200]. A very ornamental plant[1], it is hardy to about -30°C[184] and is often grown in the flower garden. There are many named varieties[184]. Guelder rose regenerates quickly if it is cut to the ground, it can also produce suckers and will often form thickets[186]. The plant is an alternative host for the broad bean aphid[11].

Special Features: Not North American native, Naturalizing, Attractive flowers or blooms. In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is fleshy. Thick or swollen - fibrous or tap root [2-1].

3.0.4 Asclepias incarnata

Swamp Milkweed, Swamp Butterfly Weed, Marsh Milkweed 3 tin 8 cyuc 3 kcaak 3 tcan 2 dwat 1.2 m hkuc hmimhut cyutli kyuctcuphja7n hwicli hrasjlutnyikfrp hpa7tli flatprikliw hpa7tmwatli fyifkre7t hjonli

drutta Asclepias incarnata is a PERENNIAL growing to 1.2 m (4ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 3. It is in flower from July to August, and the seeds ripen in September. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees, insects, Lepidoptera (Moths and Butterflies). The plant is self-fertile. It is noted for attracting wildlife. Suitable for: light (sandy) and medium (loamy) 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 moist or wet soil.

pcista Although no specific reports have been seen for this species, many, if not all, members of this genus contain toxic resinoids, alkaloids and cardiac glycosides[274]. They are usually avoided by grazing animals[274]. The leaves and the stems might be poisonous[20].

kcakta Edible Parts: Flowers Leaves Oil SeedpodEdible Uses: Oil SweetenerUnopened flower buds - cooked[46, 61, 161]. Tasting somewhat like peas[85]. They can also be dried and stored for later use[183]. Young shoots - cooked. An asparagus substitute[85, 106]. Tips of older shoots are cooked like spinach[85]. Young seed pods, harvested when 3 - 4 cm long - cooked. A pea-like flavour, they are very appetizing[85]. The flower clusters can be boiled down to make a sugary syrup[85].

tcanta Fibre Latex Oil Pollution Stuffing WaxA good quality fibre is obtained from the bark[46, 57, 61, 95, 112, 169]. It is used in twine, cloth etc[112]. It is easily harvested in late autumn, after the plants have died down, by simply pulling it off the dead stems[112]. The seed floss is used to stuff pillows etc or is mixed with other fibres to make cloth[57, 171]. It is a Kapok substitute, it is used in Life Jackets or as a stuffing material[169, 171]. It is very water repellent. The floss has also been used to mop up oil spills at sea. Rubber can be made from latex contained in the leaves and stems[57]. Pods contain an oil and a wax which are of potential importance[171]. The dogbane-milkweed family Asclepias, Apocynum, Calotropis, and Trachomitum spp) has been used for fiber industrial crops for millennia with a number in cultivation as regional crops. All of these crops are dual-purpose fibres, offering bast fibres from the stem and seed finer or 'floss' in the fruit pods. Many have also been identified as potential hydrocarbon crops due to high latex content. Could be integrated into various agroforestry systems rather than as monocultures [1-1].

dwatta Anthelmintic Carminative Diuretic Emetic Laxative StomachicA tea made from the roots is anthelmintic, carminative, diuretic, emetic, strongly laxative and stomachic[4, 61, 222, 257]. The tea is said to remove tapeworms from the body in one hour[257]. It has also been used in the treatment of asthma, rheumatism, syphilis, worms and as a heart tonic[4, 207, 222]. An infusion of the roots is used as a strengthening bath for children and adults[257].

nrakta N. America - Quebec to Manitoba and Wyoming, south to Texas and New Mexico. ksacta Swamps, wet thickets and shores[43].

propta Seed - best sown in a greenhouse as soon as it is ripe in the autumn or in late winter[134, 169]. We have also had good results from sowing the seed in the greenhouse in early spring[K], though stored seed might need 2 - 3 weeks cold stratification[134]. Germination usually takes place in 1 - 3 months at 18°C[134]. As soon as the seedlings are large enough to handle, prick them out into individual pots and grow them on in the greenhouse for their first winter. Plant out when they are in active growth in late spring or early summer and give them some protection from slugs until they are growing away strongly. Division in spring. With great care

since the plant resents root disturbance. Pot the divisions up and place them in a lightly shaded position in the greenhouse until they are growing away strongly, then plant them out in the summer, giving them some protection from slugs until they are established.. Basal cuttings in late spring. Use shoots about 10cm long with as much of their white underground stem as possible. Pot them up individually and place them in a lightly shaded position in a greenhouse until they are rooting and growing actively. If the plants grow sufficiently, they can be put into their permanent positions in the summer, otherwise keep them in the greenhouse until the following spring and when they are in active growth plant them out into their permanent positions. Give them some protection from slugs until they are established.

nwatta Experimental Crop Industrial Crop: Hydrocarbon Management: HayLandscape Uses:Border, Foundation, Massing. Prefers a well-drained light rich or peaty soil[1, 200]. Requires a moist soil and a sunny position, doing well by water[111, 134]. Succeeds on dry soils and on all soil types[112]. Plants are hardy to at least -25°C[187]. A very ornamental plant[1], the flowers are very attractive to butterflies[169]. The flower of many members of this genus can trap insects between its anther cells, the struggles of the insect in escaping ensure the pollination of the plant[207]. Many members of this genus seem to be particularly prone to damage by slugs. The young growth in spring is especially vulnerable, but older growth is also attacked and even well-established plants have been destroyed in wet years[K]. Plants resent root disturbance and are best planted into their final positions whilst small[134]. Special Features:Attractive foliage, North American native, Naturalizing, Wetlands plant, Attracts butterflies, Suitable for cut flowers, Fragrant flowers. 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 clumper with limited spread [1-2]. The root pattern is rhizomatous with underground stems sending roots and shoots along their length [1-2].

3.0.5 Viola cucullata

Marsh Blue Violet
3 tlin 8 cyuc 3 kcak 3 tcan 1 dwat 0.2 m hkuc
hmmihtut cyutli tcuphja7n hwicli hrasjlutnyik hpa7tli flatprikliws hpa7tmwatli fyfixre7t hjonli
drutta Viola cucullata is a PERENNIAL growing to 0.2 m (0ft 8in) by 0.2 m (0ft 8in). See above for USDA hardiness. It is hardy to UK zone 3. It is in flower from May to July. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects, Cleistogomy (self-pollinating without flowers ever opening). 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 can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil.

kcakta Edible Parts: Flowers LeavesEdible Uses: TeaY-oung leaves and flower buds - raw or cooked[61, 105]. When added to soup they thicken it in much the same way as okra[85, 159, 177]. A tea can be made from the leaves[85].

tcanta RepellentA good ground cover plant but it is slow to thicken up and may need weeding for the first year or so[197]. An infusion of the root has been used to soak corn seeds before planting them in order to keep off insects[257]. Faunal Associations: The floral nectar of Marsh Violet attracts bumblebees, mason bees (*Osmia* spp.), Halictid bees, Andrenid bees, bee flies (*Bomblyliidae*), butterflies, and skippers (Robertson, 1929). Some of the bees also collect pollen. An oligolectic bee, *Andrena violae*, visits the flowers of Marsh Violet and other *Viola* spp. (violets). The caterpillars of sev-

eral Fritillary butterflies feed on the foliage of violets primarily in open areas: *Boloria bellona* (Meadow Fritillary), *Boloria selene myrina* (Silver-Bordered Fritillary), *Eupoieta claudia* (Variegated Fritillary), *Speyeria aphrodite* (Aphrodite Fritillary), *Speyeria atlantis* (Atlantis Fritillary), *Speyeria cybele* (Great Spangled Fritillary), and *Speyeria idalia* (Regal Fritillary). Other insect feeders include caterpillars of the moths *Elaphria grata* (Grateful Midget) and *Eubaphe mendica* (The Beggar), the leaf-mining larvae of *Ametastegia pallipes* (Violet Sawfly), the aphid *Neotoxoptera violae*, and the thrips *Odontothrips pictipennis*. The seeds and other parts of violets are occasionally eaten by such birds as the Ruffed Grouse, Wild Turkey, and Mourning Dove, and they are also consumed by the White-Footed Mouse, Pine Mouse, and Eastern Chipmunk. Similarly, the foliage of these low-growing plants is a source of food for the Cottontail Rabbit and Wood Turtle (*Clemmys insculpta*) [1-6].

dwatta Analgesic Dysentery PoulitceAn infusion of the plant has been used in the treatment of coughs, colds and dysentery[257]. A poultice of the leaves has been used to reduce the pain of headaches[257]. A poultice of the crushed root has been applied to boils[257].

nrakta Eastern N. America - Quebec to Ontario and south to Georgia. ksacta Wet places, often in open woods[187]. Wet meadows, springs, bogs, swamps etc[43].

propta Seed - best sown in the autumn in a cold frame. Sow stored seed in early spring in a cold frame. 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.

nwatta Prefers a cool moist well-drained humus-rich soil in partial or dappled shade and protection from scorching winds. Very intolerant of drought[187]. Succeeds in dense shade[197]. Tolerates sandstone and limestone soils but becomes chlorotic if the pH is too high. Prefers a pH between 6 and 6.5. This plant produces cleistogamous flowers as well as the usual insect pollinated flowers[187]. It usually self-sows freely[188]. 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]. A polymorphic species[188]. there are many named forms, selected for their ornamental value[200].

3.0.6 Pontederia cordata

Pickereel Weed
3 tlin 11 cyuc 3 kcak 0 tcan 1 dwat 0.8 m hkuc
htut cyutli hja7nhs6s hwicli hrasjlutnyik hpa7tli flatprikliws hpa7tmwatli xre7t hjonli

drutta *Pontederia cordata* is a PERENNIAL growing to 0.8 m (2ft 7in) by 0.5 m (1ft 8in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 3. It is in flower from July to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers wet soil and can grow in water.

kcakta Edible Parts: Leaves SeedEdible Uses: Seed - raw, cooked like rice or dried and ground into a powder[55, 62, 106, 183]. A very acceptable nutty flavour and texture when raw, they are said to be excellent if the seed is lightly roasted in an oven[183]. Young leafstalks - raw or cooked[62]. The whole plant is edible cooked or raw[106]. It can be added to salads, cooked like spinach or added to soups[183].

dwatta ContraceptiveAn infusion of the plant has been used as a contraceptive[257].

nrakta Eastern N. America - Nova Scotia to Florida and Texas. A garden escape occ naturalized in Britain[17] ksacta Marshes and borders of muddy ponds[55].

propta Seed - best sown as soon as it is ripe in pots standing in 2cm of water in a cold frame. Cover the seed lightly with silver sand. Submerge in 3cm depth of water after the seedlings emerge[200]. When they are large enough to handle, prick the seedlings out into individual pots and

nrakta Australia - Tasmania. ksacta Cool moist sites, usually on better soils, to 1400 metres[77, 152].

propta Seed - surface sow February/March in a sunny position in a greenhouse[11, 78, 134]. Species that come from high altitudes appreciate 6 - 8 weeks cold stratification at 2°C[200]. Pot up the seedlings into individual pots as soon as the second set of seed leaves has developed, if left longer than this they might not move well. Plant out into their permanent positions in early summer and give them some protection from the cold in their first winter. The seed can also be sown in June, the young trees being planted in their final positions in late spring of the following year. The seed has a long viability[200].

nwatta Prefers a sunny position in a moderately fertile well-drained moisture retentive circum-neutral soil[200]. Tolerates poor soils, especially those low in mineral elements[200]. Tolerates dry soils and also drought once it is established[200]. A fairly hardy species, one report suggests that it is hardy to between -15°C and -20°C[200] whilst another says that plants succumb to hard frosts[11]. *Eucalyptus* species have not adopted a deciduous habit and continue to grow until it is too cold for them to do so. This makes them more susceptible to damage from sudden cold snaps. If temperature fluctuations are more gradual, as in a woodland for example, the plants have the opportunity to stop growing and become dormant, thus making them more cold resistant. A deep mulch around the roots to prevent the soil from freezing also helps the trees to survive cold conditions. The members of this genus are remarkably adaptable however, there can be a dramatic increase in the hardness of subsequent generations from the seed of survivors growing in temperate zones[200]. *Eucalyptus* monocultures are an environmental disaster; they are voracious, allelopathic and encourage the worst possible attitudes to land use and conservation[200]. A fast growing tree, it is often cultivated in S.W. Europe for timber, soil stabilization shelter and as an anti-malarial measure, the trees are capable of drying out wet ground, making it unsuitable for mosquitoes to breed in[50]. This species is very easily confused with *E. dalrympleana*[11]. Plants are shallow-rooting and, especially in windy areas, should be planted out into their permanent positions when small to ensure that they do not suffer from wind-rock[245]. They strongly resent root disturbance and should be container grown before planting out into their permanent position[11]. The flowers are rich in nectar and are a good bee crop[200].

7.2.5 Eucalyptus gunnii

Cider Gum
7 tlin 10 cyuc 3 kcak 3 tcan 3 dwat 30 m hkuc
htut cyutli hgatkyuctcuphja7n hwicli hyishrasjlutnyik hpa7tli flatprikliws hpa7tmwatli xre7t hjonli

drutta *Eucalyptus gunnii* is an evergreen Tree growing to 30 m (98ft) by 6 m (19ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 8. It is in leaf all year, in flower from July to August. The species is hermaphrodite (has both male and female organs) and is pollinated by 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, 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 Citronellal, an essential oil found in most *Eucalyptus* species is reported to be mutagenic when used in isolation[269]. In large doses, oil of eucalyptus, like so many essential oils has caused fatalities from intestinal irritation[269]. Death is reported from ingestion of 4 - 24 ml of essential oils, but recoveries are also reported for the same amount[269]. Symptoms include gastroenteric burning and irritation, nausea, vomiting, diarrhoea, oxygen deficiency, weakness, dizziness, stupor, difficult respiration, delirium, paralysis, convulsions, and death, usually due to respiratory failure[269].

kcakta Edible Parts: Manna SapEdible Uses: The sap[2, 77] (it is a stem exudate according to some reports[61, 177]) has a sweet taste. The sap is obtained by making wounds in the bark during spring[2]. A tapped trunk yields up to ½ litre a day[144]. Another report says that the sap exudes from the trunk and can be drunk directly or fermented into

a cider[183]. This same report says that the plant also produces an edible manna[183].

tcanta Essential Fuel Fungicide RepellentLeaves yield between 0.4 to 0.8% of an essential oil that contains antifungal substances[152, 154]. Coppiced for fuel. The wood must be dried for at least 12 months before use[107]. Trees can be planted in wet ground to dry it up and make it unsuitable for mosquitoes to breed in[50].

dwatta AntisepticEucalyptus leaves are a traditional Aboriginal herbal remedy. The essential oil found in the leaves is a powerful antiseptic and is used all over the world for relieving coughs and colds, sore throats and other infections[254]. The essential oil is a common ingredient in many over-the-counter cold remedies[254]. An essential oil obtained from the leaves is antiseptic[152]. The essential oil obtained from various species of eucalyptus is a very powerful antiseptic, especially when it is old, because ozone is formed in it on exposure to air. It has a decided disinfectant action, destroying the lower forms of life[4]. The oil can be used externally, applied to cuts, skin infections etc, it can also be inhaled for treating blocked nasal passages, it can be gargled for sore throat and can also be taken internally for a wide range of complaints[4]. Some caution is advised, however, because like all essential oils, it can have a deleterious effect on the body in larger doses[4].

nrakta Australia - South Australia, Tasmania. ksacta Alpine areas on rocky well-drained soils, sometimes also found on marshy soils[77].

propta Seed - surface sow February/March in a sunny position in a greenhouse[11, 78, 134]. Species that come from high altitudes appreciate 6 - 8 weeks cold stratification at 2°C[200]. Pot up the seedlings into individual pots as soon as the second set of seed leaves has developed, if left longer than this they might not move well. Plant out into their permanent positions in early summer and give them some protection from the cold in their first winter. The seed can also be sown in June, the young trees being planted in their final positions in late spring of the following year. The seed has a long viability[200].

nwatta Prefers a sunny position in a moderately fertile well-drained moisture retentive circum-neutral soil[200]. Dislikes clay or chalk soils but succeeds in most other soils[98]. Tolerates poor soils[98], especially those low in mineral elements[200]. Dislikes shade[98]. Tolerates dry soils and also drought once it is established[200]. One of the hardest *Eucalyptus* species[11], it is very frost resistant, tolerating long periods down to -14°C and short periods down to -18°C[107, 200]. *Eucalyptus* species have not adopted a deciduous habit and continue to grow until it is too cold for them to do so. This makes them more susceptible to damage from sudden cold snaps. If temperature fluctuations are more gradual, as in a woodland for example, the plants have the opportunity to stop growing and become dormant, thus making them more cold resistant[200]. A deep mulch around the roots to prevent the soil from freezing also helps the trees to survive cold conditions. The members of this genus are remarkably adaptable however, there can be a dramatic increase in the hardness of subsequent generations from the seed of survivors growing in temperate zones[200]. A very ornamental tree, it is very fast growing when young and requires shelter from strong winds if it is not to become very wind-shaped[K]. Trees can tolerate salt-laden winds[200]. The plant has juvenile foliage which is quite different from the adult leaves[188]. The leaves, especially when bruised, are very aromatic[245]. Plants respond well to coppicing. Commonly planted in S.W. Europe as a timber tree and also for shelter, soil conservation and as an anti-malarial measure since it will dry out wet land that is suitable for mosquitoes to breed in[50]. Plants are shallow-rooting and, especially in windy areas, should be planted out into their permanent positions when small to ensure that they do not suffer from wind-rock[245]. They strongly resent root disturbance and should be container grown before planting out into their permanent position[11]. *Eucalyptus* monocultures are an environmental disaster; they are voracious, allelopathic and encourage the worst possible attitudes to land use and conservation[200]. The flowers are rich in nectar and are a good bee crop[200]. The plant is heat tolerant in zones 10 through 8. (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

7.2.3 Ipomoea aquatica

Kangkong, Swamp Morning Glory
7 tlin 12 cyuc 4 kcaok 0 tcan 2 dwat 0.5 m hkuc
htuc cyutli tucphja7nhs6s hwicli hrasjlutnyikfrjp hpa7tli frus-flatprikwis hpa7tmwatli hwj7t hjonli

drutta Ipomoea aquatica is an evergreen Annual/Perennial growing to 0.5 m (1ft 8in) by 0.3 m (1ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 8. The flowers are pollinated by Bees, Butterflies. 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 and can grow in very acid soils. It cannot grow in the shade. It prefers moist or wet soil and can grow in water.

pcista Accumulation of heavy metals in the plant has been reported in Asia, mainly because the plants are often grown in polluted water[299].

kcaakta Edible Parts: Leaves Root ShootsEdible Uses: Leaves and young shoots - raw or cooked[296 , 298]. The tasty leaves are produced all year round[296]. The youngest shoot tips can be added to salads, older leaves are cooked and make a mild-flavoured spinach[298]. The leaves can be stir-fried, steamed, boiled for a few minutes or lightly fried in oil and eaten in various dishes. They are often mixed with hot peppers and garlic and prepared with a savoury dish[299]. Very nutritious, the leaves are a good source of protein as well as providing good quantities of vitamin A, iron, calcium and phosphorus[298]. Roots - occasionally cooked and eaten[29 , 301].

dwatta Antidote Antihæmorrhoidal Antitussive Febrifuge Hypoglycaemic Laxative Laxative Poultice Skin TonicThe young shoots are mildly laxative and are used by diabetic patients[272]. A decoction of the leaves is used to treat coughs[272]. The fried leaves are eaten to cool down a fever[310]. The crushed leaves are applied as a poultice on sores and boils[310 , 348]. A paste made from the buds is used to treat ringworm[272 , 299]. The roots are laxative, tonic and antidote[310]. They are used in the treatment of opium or arsenic poisoning, and also to counter the effects of drinking unhealthy water[310]. A decoction of the roots is used as a wash against hæmorrhoids[310 , 348]. The plant has shown oral hypoglycaemic activity in tests with diabetic humans; it was shown that an aqueous leaf extract can be as effective as tolbutamide in reducing blood glucose levels[299].

nrakta Pantropical. ksacta Moist, marshy or inundated localities, shallow pools, ditches, rice fields, forming dense masses[310]. Also found along roadsides at elevations from sea-level up to 1,000 metres[310].

propta Seed - sown in situ in moist to wet soil[300]. Germination rates of local cultivars are often low (less than 60%) because of hard-seededness induced by long storage. Reliable seed companies supply improved cultivars with a high (in excess of 80%) germination percentage. The seeds do not germinate well at temperatures lower than 25°C[299]. Cuttings of young shoots at any time of the year. The shoots readily produce roots, even whilst still on the parent plant[300].

nwatta Swamp morning glory is a plant of the moist to wet, lowland tropics, where it is found at elevations up to 1,000 metres. It grows best in areas where annual daytime temperatures are within the range 15 - 35°C, but can tolerate 10 - 40°C[418]. It prefers a mean annual rainfall in the range 2,000 - 2,500mm, but tolerates 700 - 4,200mm[418]. Plants grow well in full sun[296]. A very easy plant to grow, it succeeds in bathtubs, ponds and still water[296]. Succeeds in a wide range of soils, including heavy clays[300]. Best leaf production comes from plants grown in soils rich in organic matter[298]. Prefers a pH in the range 5 - 7, tolerating 4.3 - 7.5[418]. The plant is widespread as a swamp weed in all tropical and many subtropical lowland areas. It is a declared aquatic or terrestrial noxious weed in the south-eastern United States[299]. A very fast-growing plant, it starts developing lateral branches from cotyledonary buds 2 - 3 weeks after sowing. Thereafter the main axis and both laterals each produce about one leaf every 2 - 3 days[298 , 299]. Cultivars selected for once-over harvest or uprighting have retarded branching or almost no branching. Their harvest takes place 21 - 30 days after sowing[296 , 299]. Cut and

come again harvesting of vegetatively propagated plants or wild plants can start about one month after plant establishment[299]. Flowering commences after 2 - 5 months, but the plant continues to form new leaves and branches[299]. Swamp morning glory is a quantitative short-day plant, early flowering being induced by short days of less than 12 hours. Flowering is also stimulated by drought[299]. There are some named varieties[301]. Two main forms exist in cultivation:- A short-lived perennial form grows in very wet soils and water (it has been named Ipomoea aquatica aquatica by some authorities). This form can produce yields up to 90 tonnes per hectare in Thailand[300]. An annual creeping form tolerates drier conditions (this has been named Ipomoea aquatica reptans)[300]. Under dryland cultivation, yields per crop can range from 7 - 30 tonnes per hectare, averaging 20 tonnes. In theory one crop can be produced every month leading to a potential yield of around 240 tonnes per hectare in a year[299] produce.

7.2.4 Eucalyptus viminalis

Manna Gum

7 tlin 10 cyuc 3 kcaok 0 tcan 2 dwat 30 m hkuc
htuc cyutli hgatkyuctucphja7n hwicli hyhshrasjlutnyik hpa7tli flatprikwis hpa7tmwatli xre7t hjonli

drutta Eucalyptus viminalis is an evergreen Tree growing to 30 m (98ft) by 15 m (49ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 8. It is in leaf all year, in flower from July to August. The species is hermaphrodite (has both male and female organs) and is pollinated by 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, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry moist or wet soil and can tolerate drought.

pcista Citronellal, an essential oil found in most Eucalyptus species is reported to be mutagenic when used in isolation[269]. In large doses, oil of eucalyptus, like so many essential oils has caused fatalities from intestinal irritation[269]. Death is reported from ingestion of 4 - 24 ml of essential oils, but recoveries are also reported for the same amount[269]. Symptoms include gastroenteric burning and irritation, nausea, vomiting, diarrhoea, oxygen deficiency, weakness, dizziness, stupor, difficult respiration, delirium, paralysis, convulsions, and death, usually due to respiratory failure[269].

kcaakta Edible Parts: MannaEdible Uses: A manna is exuded from the leaves[4, 11, 177] (from the bark as well according to some reports[61, 177]) as a result of insect damage[44]. The red gum or manna exuding from cracks in the bark is eaten eagerly by boys[269]. Eucalyptus manna, which exudes from punctures in summer months, is sometimes consumed[269]. A very pleasant sweet taste[46, 105], it is slightly laxative[152]. The aboriginal Australians collected it after it fell to the ground, or they scraped it from the leaves[183]. Heavily covered leaves were pounded and baked[183]. Since the manna is probably formed as a result of insect damage, it is quite possible that it will not be formed in Britain because the same insects will not be able to live here[K]. The manna contains the sugars arabinose, raffinose, dextrose, and sucrose[269].

tcanta Adhesive Essential Fuel Repellent Soil stabilization WoodThe leaves contain between 0.35 - 0.75% essential oil, of which 50 - 65% is cineol, 5% is pinene, and 10% is eudesmol[154, 269]. The bark contains 4.8 - 8% tannin[269]. The red gum or manna exuding from cracks in the bark has been used for making adhesives[269]. Planted in S. Europe for soil stabilization and to drain marshes in order to get rid of malarial mosquitoes[50]. Wood - coarse grained, durable in the soil[46, 61], excellent quality[77]. In rich soils the wood is not so hard or durable[155]. The wood, which weighs about 51 lb./cu ft, is used for building, construction, joinery, and vehicles[269]. It is considered suitable for paper pulp[269] and is a moderately good fuel[155].

dwatta Antiviral LaxativeA sweet manna exuded from the plant has a mild laxative effect[152, 238]. The essential oil found in the leaves shows an antiviral effect and can be used in the treatment of influenza[269]. The leaves inhibit the growth of Staphylococcus aureus[269]. The leafy twig decoction was used to bathe rheumatic limbs[269].

grow them on in water in the greenhouse for their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. Division is best in April but it can be done at almost any time of the year[1]. Very easy, 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. Lateral shoots.

nwatta Landscape Uses:Container, Specimen. A water or bog garden plant, it requires a rich soil[56] and prefers growing in water 15 - 30 cm deep[1]. Plants are hardy to about -25°C[187]. A very ornamental plant, it forms spreading patches by means of a thick creeping rhizome[187]. There is a species of bee (*Dufourea novae-angliae*) which visits this plant for nectar and pollen and does not visit any other species of plant[103]. The reproductive biology of *Pontederia cordata* has been well studied. It is a tristylous species, and most populations contain all three forms. At least some degree of self-incompatibility exists, being strongest with the short-style forms and weakest with the midstyle forms[270]. Special Features:Attracts birds, Attractive foliage, North American native, Grows submerged, Invasive, Naturalizing, Wetlands plant, Suitable for cut flowers, Extended bloom season in Zones 9A and above, Attractive flowers or blooms.

4 4 tlin

4.0.1 Crataegus missouriensis

4 tlin 8 cyuc 5 kcaok 0 tcan 2 dwat m hkuc
hmimhtut cyutli hgattucphja7n hwicli hrasjlutnyikfrjp hpa7tli flatprikwis 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.

kcaakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked. The size of a large cherry, the flesh is sweet, soft and fairly juicy[K]. The fruit is only about 10mm thick according to another report[235]. The fruit ripens in mid to late September in southern Britain[K], it makes a delicious dessert fruit and can also be used in making pies, preserves etc[K]. The fruit can be dried for later use. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, 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 South-eastern N. America - Virginia to North Carolina and Missouri. ksacta Rocky bluffs and river banks[235].

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

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

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. This species has a good potential as a fruit crop in Britain. It regularly produces heavy crops of high quality, the tree is very easily grown and is little troubled by pests or diseases. It also requires very little attention, once the trees are established virtually the only work needed is to harvest the fruit each year[K]. A plant growing at Hillier Arboretum was about 3 metres tall (with a trunk 2 metres long) and 3 metres wide, it was fruiting well in 1993 and 1994[K]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

4.0.2 Crataegus pedicellata

Scarlet Haw, Scarlet Hawthorn
4 tlin 8 cyuc 5 kcaok 2 tcan 2 dwat 7 m hkuc
hmimhtut cyutli hgattucphja7n hwicli hrasjlutnyikfrjp hpa7tli flatprikwisslip hpa7tmwatli xre7t hjonli

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

kcaakta 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 undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Plants are hardy to at least -18°C[202]. A very variable species, it has been divided up into several different species by some botanists[82]. The sub-species *C. pedicellata gloriosa*. Sarg. has larger fruits than the type[11]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. A user in Poland says that *Crataegus pedicellata* exists in the wild in Eastern Poland and can support winter temperatures at least until -30C.

4.0.3 Phragmites australis

Common Reed, American common reed, Hybrid common reed, European common reed, Subtropical common ree 4 tin 10 cyuc 5 kcaak 4 tcan 2awat 3.6 m hkuc hmimhtut cyutli tcuphja7nhs6s hwicli hrasljutnyik hpa7tli flatpriklwissiphsom 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 hardness. 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) soils 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.

kcaakta Edible Parts: Leaves Root Seed Shoots StemEdible Uses: Condiment Drink SweetenerRoot - 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 liquorice-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 WeavingThe 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 Lithontripic Miscellany Odontalgic Refrigerant Sedative Sialogogue Skin Stomachic Styptic UrinaryThe 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, lithontripic, 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 ab-

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 Open sunny places in montane areas, rarely found below 3000 metres[214]. Rocky and sandy ground at elevations of 3800 - 4200 metres in Nepal[272].

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 if they are not too dry[200]. Grows well by water[1, 11]. A fast-growing and very wind-resistant tree, an excellent pioneer species[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.

7.2 mran

7.2.1 Oryza hybrids

Perennial Rice

7 tin 12 cyuc 4 kcaak 2 tcan 2awat 2 m hkuc htut cyutli tcuphja7nhs6s hwicli hrasljutnyik hpa7tli flatpriklw hpa7tmwatli hjonli

drutta Oryza hybrids is a PERENNIAL growing to 2 m (6ft) by 0.3 m (1ft in) at a fast rate. See above for USDA hardness. It is hardy to UK zone 8. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist or wet soil and can grow in water.

kcaakta Edible Parts: SeedEdible Uses: Carbon Farming Solutions - Staple Crop: balanced carb (The term staple crop typically refers to a food that is eaten routinely and accounts for a dominant part of people's diets in a particular region of the world) [1-1]. Under development as new cereal, annual *O. sativa* crossed with its perennial ancestors, *O. longistaminata* and *O. rufipogon*.

tcanta The straw, which may attain considerable length if the plant has grown in flood water, is valued for thatching[299 , 332]. Because they are a source of resistance to or tolerance of biotic and abiotic stresses, the most important use of the various species of wild rice is probably in breeding programmes to improve the species of cultivated rice[1040].

dwatta UrinaryRice is a nutritive, soothing, tonic herb that is diuretic, reduces lactation, improves digestion and controls sweating[238]. The seeds are taken internally in the treatment of urinary dysfunction[238]. The seeds, or the germinated seeds, are taken to treat excessive lactation[238]. The germinated seeds are used to treat poor appetite, indigestion abdominal discomfort and bloating[238]. The grains

are often cooked with herbs to make a medicinal gruel[238]. The rhizome is taken internally in the treatment of night sweats, especially in cases of tuberculosis and chronic pneumonia[238]. The rhizomes are harvested at the end of the growing season and dried for use in decoctions[238].

nrakta Origin: hypothetical hybrid. ksacta Various depending on the species.

propta Seed. The seed of wild rice less than 12 months old often exhibits strong dormancy, which implies (though this has not been established) that the seed retains its viability for a considerable period[1040]. Heat treatment is generally effective in breaking dormancy - alternating temperatures between 34°C for 16 hours then 11°C for 8 hours is usually effective, though the time taken varies between species[1040]. Surface sow the seed in light shade and do not allow to dry out. Seed should germinate within 7 days at 30°C[1040]. Prick out 2 - 3 seedlings into individual pots when large enough to handle and, after a few days, move to a sunny position. Grow on until large enough to plant out. Division.

nwatta Staple Crop: Balanced carb Under DevelopmentClimate: cold temperate to tropical, tropical highlands. Humidity: humid, aquatic. Succeeds in full sun and in moderate shade[1040]. Requires a wet soil or shallow water[1040].

7.2.2 Wasabia japonica

Japanese Horseradish, Wasabi 7 tin 10 cyuc 4 kcaak 0 tcan 1awat 0.3 m hkuc hmimhtut cyutli hja7nhs6s hwicli hrasljutnyik hpa7tli flatpriklw hpa7tmwatli xre7t hjonli

drutta Wasabia japonica is a PERENNIAL growing to 0.3 m (1ft) by 0.2 m (0ft 8in). See above for USDA hardness. It is hardy to UK zone 8. It is in flower from April to May. The species is hermaphrodite (has both male and female organs). 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 wet soil and can grow in water.

kcaakta Edible Parts: Leaves RootEdible Uses: CondimentRoot - a horseradish substitute[2, 46, 58, 61, 105]. The fleshy rhizomes are finely grated and prepared into an attractive fresh green paste which is much used as a condiment in Japan[183]. It is considered to have a distinct flavour and pungency that is superior to horseradish, *Armoracia rusticana*[183]. The pungency rapidly deteriorates once the root has been cut[200]. Roots of plants 15 - 24 months old are best[238]. Leaves, flowers and petioles - cooked[105, 179, 200]. The leaves, flowers, leafstalks and freshly sliced rhizome are soaked in salt water and then mixed with saki lees to make a popular Japanese pickle called 'wasabi-zuke'[183]. The following analysis is said to belong to the leaves but it looks more like a root analysis[K]. The leaves contain about 6.1% protein, 0.2% fat, 22.3% carbohydrate, 1.3% ash[179].

dwatta DigestiveThe root is a pungent warming herb that stimulates the digestion[238]. It is used internally as an antidote to fish poisoning[238]. (This probably refers to food poisoning caused by eating fish[K]).

nrakta E. Asia - Japan. ksacta Wet places and by streams, in lowland and mountain areas[58]. Usually found near the coast[200].

propta Seed - sow spring in a greenhouse and keep the seed permanently moist[238]. 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. Stand the pots in shallow water to ensure the plants do not dry out. Plant them out in late spring or early summer. Division in spring as the plant comes into growth. Very easy, the larger divisions can be planted out direct into their permanent positions. We have found that it is best to pot up smaller divisions and grow them on in light shade in a greenhouse or cold frame until they are growing away well. Plant them out in the summer or the following spring.

nwatta Prefers a position in wet soil or shallow water. The best quality roots are produced from plants growing in semi-shade in clear running spring water at a temperature between 11 - 14°C[200]. This species is cultivated in eastern Asia for its edible root which is used in much the same way as horseradish[58], it takes 3 - 5 years to produce marketable roots[116]. The roots are finger-thick and up to 18cm long[206].

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 - North Carolina to Mississippi. ksacta Found on the outer coastal plain in seasonally flooded depressions, in floodplains or in uplands. It is commonly found in river swamps, pond areas, and along stream banks[277].

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

nwatta Landscape Uses:Border, Espalier, Pollard, Specimen, Street tree. A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200, 277]. Once established, it succeeds in excessively moist soils and also tolerates drought[200, 277]. It grows well on a chalk soil and also in heavy clay soils[200]. It thrives in acid soils[160]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. It succeeds well in exposed positions and tolerates atmospheric pollution[200, 277]. A very hardy species, tolerating temperatures down to about -30°C[160]. This species is closely related to *C. opaca* and is included in that species by some botanists. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. Occasionally cultivated for its fruit in America, there are some named varieties[183]. Special Features:North American native, Attractive flowers or blooms. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2].

6.0.8 Arundo donax

Giant Reed, Giant Reed Grass

6 tlin 10 cyuc 3 kcaak 4 tcan 2 dwat 6 m hkuc htut cyutli tcuphja7n hwicli hrasjlutnyik hpa7tli flatprikwisslip hpa7tmwatli xre7t hjonli

drutta Arundo donax is a PERENNIAL growing to 6 m (19ft) by 4 m (13ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 6. It is in flower in September, and the seeds ripen in 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 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

or wet soil. The plant can tolerate strong winds but not maritime exposure.

kcaakta Edible Parts: Leaves RootEdible Uses: Rhizome - raw or cooked[84]. The rhizome can be dried and ground into a powder to make bread, usually in conjunction with cereal flours[7, K]. It can also be roasted or boiled[84]. Leaves - cooked as a potherb[84]. They are very bitter[177]. The young shoots are used[177].

tcanta Basketry Biomass Broom Dye Fodder Hedge Hedge Musical Paper Pipes Plant support Shelterbelt Soil stabilization Thatching WeavingBrooms are made from the terminal panicles[7]. Plants are grown alongside irrigation canals to check soil erosion[169]. The plant can be grown as a windbreak screen[1, 169]. If cut down, the culms branch and in this form the plants can be used as a hedge[236]. The leaves can be woven into mats etc, whilst the split and flattened stems are used to make screens, walls of houses etc[46, 50, 61, 84]. A yellow dye is obtained from the pollen[257]. The stems of the plant have a multitude of applications. They are used as plant supports for vines and other climbing plants[7, 169, 269] and to make clarinets, bag-pipes etc[46, 61, 103]. They are also used as pipe stems[84], for roofing[46], to make screens, walking sticks and in basketry[100, 195]. They are used to make the reeds of clarinets and organ pipes[236]. The stems can be harvested as desired at any time of the year[269]. The fibre from the stems can be used to make a good quality paper[269]. This plant is currently (1995) under investigation at Rosewarne in Cornwall as a potential commercial paper crop for small-scale industries in SW England[K]. Because of rather high yields from natural stands, the plant has been suggested as a source of biomass for energy production[7, 269]. Dry cane yields of ca 10, 15, and 20 tonnes per hectare were reported respectively from infertile, partly fertile and fertile soils[269]. According to the phytomass files annual productivity ranges from 10 to 59 tonnes per hectare, the latter figure from Westlake's (1963) estimate of 57 - 59 tonnes[269]. In addendum, Westlake cites evidence that Arundo donax can produce 40-75 MT/ha/yr. in warm temperate and tropical regions. Early vegetative growth has ME (metabolizable energy) of 2.22 megacalories/kg DM, while hay has an ME of only 1.37 (Gohl, 1981). Such annual productivity, if sustainable, makes this a notable energy candidate, especially when one considers the energy as a by-product, with leaf protein and potential pharmaceutical as primary products[269]. A particular type of cellulose is obtained from the plant[7]. In Italy, the plant is used in the manufacture of rayon[269]. Bio-fuel crop.

dwatta Diaphoretic Diuretic Emollient Galactofuge HypotensiveThe root is diaphoretic, diuretic, emollient and galactofuge[7]. An infusion is said to stimulate menstrual discharge and diminish milk flow[240, 272]. A paste of the root is applied to the forehead to treat headaches[272]. Isolated alkaloids have been experimentally shown to raise the blood pressure and contract the intestine and uterus[240]. The rhizome or rootstock is used in the treatment of dropsy. Boiled in wine with honey, the root or rhizome has been used for treating cancer[269]. The plant contains the alkaloid gramine. This is said to be a vasopressor, raising the blood pressure in dogs after small doses, causing a fall in larger doses[269]. The stems have been used as splints for broken limbs[257].

nrakta S. Europe ksacta Ditches, riversides and marshland[7, 200].

propta Seed - surface sow in a greenhouse in February to April. Stand the pots in about 3cm of water to keep the soil moist until the seed germinates. It 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 the greenhouse for at least their first winter. Once they are 20cm or more tall, plant them out into their permanent positions in late spring or early summer. Division in spring[1]. Whilst large divisions can be planted out direct into their permanent positions, we have found that it is best to pot the divisions up and keep them in light shade in a greenhouse until they are rooting away well. Stem cuttings, placed in water, root easily[1].

nwatta Fodder: Bank Industrial Crop: Biomass Manage Hay Minor Global Crop:Landscape Uses:Container, Screen, Specimen, Winter interest. Prefers a moist fertile soil in a sunny sheltered position, preferably by water[1, 134, 200]. Tolerates a pH in the range 5.5 to 8.3. Plants can be grown as a specimen in lawns etc, succeeding in quite coarse

permanent positions as soon as possible, in fact seed sown in situ will produce the best trees[11]. Trees should not be left in a nursery bed for more than 2 growing seasons without being moved or they will transplant very badly.

nwatta Landscape Uses:Pest tolerant, Specimen, Street tree. Prefers a good deep fertile loam which can be on the stiff side[1, 11]. Young plants tolerate reasonable levels of side shade[200]. Tolerates moderate exposure, surviving well but being somewhat stunted[200]. Prefers warmer summers than are usually experienced in Britain, trees often grow poorly in this country and fail to properly ripen their wood resulting in frost damage overwinter[200]. A relatively fast-growing tree in the wild, living 300 - 350 years[229], though it is relatively shallow-rooted and is considerably more susceptible to forest fires than most other oaks[226]. This species is one of the best of the white oaks for growing in this country[1]. However, it is said that the seed is rarely formed in Britain[105]. The tree flowers on new growth produced in spring, the seed ripening in its first year[200, 229]. Trees do not commence bearing until about 25 - 30 years old, large crops being produced every 3 - 5 years[229]. Intolerant of root disturbance, trees should be planted in their permanent positions whilst young[11]. The seed of this species is attached to the tree by unusually long (by oak tree standards) stems[183]. Hybridizes freely with other members of the genus[200]. Plants in this genus are notably resistant to honey fungus[200]. Special Features: Attracts birds, North American native, Attracts butterflies, 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. The plant growth habit is a standard with a non-suckering single trunk [1-2].

4.0.7 Crataegus holmesiana

Holmes' hawthorn

4 tlin 8 cyuc 4 kcaak 0 tcan 2 dwat 10 m hkuc hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfrip hpa7tli flatprikwisslip hpa7tmwatli xre7t hjonli

drutta Crataegus holmesiana is a deciduous Tree growing to 10 m (32ft) by 8 m (26ft). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower in May, and the seeds ripen from August to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcaakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked. An excellent dessert fruit, it has an acid yet sweet flavour, is juicy but with a mealy texture, it makes very pleasant eating[K]. Some forms have fruits with a disagreeable flavour[82]. The fruit can also be used in making pies, preserves etc, and can be dried for later use. The fruit is about 10mm in diameter[200]. A specimen at Cambridge Botanical garden has fruits up to 20mm in diameter[K]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

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

dwatta Cardiac HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as

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

nrakta Eastern N. America - Ontario to Maine, south to New York and Pennsylvania. ksacta Rich moist hillsides and the borders of streams and swamps[82].

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

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

4.0.8 Crataegus douglasii

Black Hawthorn

4 tlin 8 cyuc 4 kcaak 0 tcan 2 dwat 9 m hkuc hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfrip hpa7tli flatprikwisslip hpa7tmwatli xre7t hjonli

drutta Crataegus douglasii is a deciduous Tree growing to 9 m (29ft 6in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower in May, and the seeds ripen in September. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcaakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[2, 3, 95, 99, 101]. A very pleasant flavour with a sweet and juicy succulent flesh[46, 82, K], it makes an excellent dessert fruit and can be eaten in quantity[K]. The fruit can also be used for making pies, preserves etc, and can be dried for later use[183]. The fruit is about 8mm in diameter and is borne in small clusters[200]. The fruits I have eaten have been considerably larger than this[K]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

taanta Needles WoodThe spines on the branches are used as needles for lancing boils, removing splinters etc[99]. Wood - close-grained, heavy, hard and tough. Used for tool handles etc[82, 99, 101].

dwatta Antirheumatic Astringent Cardiotonic Dysentery Hypotensive Poultrice StomachicAn infusion of the shoots has been used to treat diarrhoea in children and sores in babies mouths[257]. A poultice of the chewed leaves has been applied to swellings[257]. An infusion of the bark has been used in the treatment of diarrhoea and dysentery[257]. An infusion of the sapwood, bark and roots has been used as a stomach medicine[257]. The thorns have been used as a treatment for arthritis[257].The point of the thorn was used to pierce an area affected by arthritic pain. The other end of the thorn was ignited and burned down to the point buried into the skin. This treatment was very painful but it was said that after a scab had formed and disappeared, the arthritic pain had also disappeared[257]. The thorns have been used as probes for boils and ulcers[257]. Although no other specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta Western N. America - British Columbia to Michigan, south to California. ksacta Open woods, banks of mountain streams and on rocky banks[43, 82].

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

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

4.0.9 Crataegus acclivis

4 tlin 8 cyuc 4 kcaak 0 tcan 2 dwat 8 m hku hminhtut cyuti hgattcuphja7n hwicli hrsajlutnyikfrip hpa7tli flatprikwislip hpa7tmwatli xre7t hjonli

drutta Crataegus acclivis is a deciduous Tree growing to 8 m (26ft) by 7 m (23ft). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from

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

kcaakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[K]. The fruit ripens in early September, it is about 18mm long with a pleasantly sweet juicy flesh and makes an excellent dessert fruit[K]. The fruit contains up to 5 seeds in the centre, these usually stick together and so the effect is like eating a cherry with its single large seed[K].

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

nrakta North-eastern N. America - New York to the borders of southern Canada. ksacta Banks of streams and steep gorges[235].

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

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Plants are hardy to at least -18°c[202]. We have very little specific information on this plant, and it is regarded as no more than a form of *C. pedicellata* by most botanists[235]. However, a tree seen at Kew in early September 1997 had a good crop of almost ripe fruit. This fruit was more elongated than *C. pedicellata* and was also ripe about 4 weeks before that species[K]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

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 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 We have very little information on this species, and do not know how hardy it will be in this country, or even its country of origin. However, a specimen growing in an open position at Kew Botanical Gardens is about 3 metres tall and wide and regularly carries a heavy crop of fruit[K]. 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[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Hybridizes freely with other members of this genus[200]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

6.0.6 Crataegus pubescens

Manzanilla

6 tlin 9 cyuc 3 kcaak 0 tcan 2 dwat 10 m hku hminhtut cyuti hgattcuphja7n hwicli hrsajlutnyikfrip hpa7tli flatprikwislip hpa7tmwatli xre7t hjonli

drutta Crataegus pubescens is a deciduous Tree growing to 10 m (32ft 10in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 7 and is not frost tender. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcaakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[177, 200]. A mealy texture, it is often used in preserves[183]. For stewing, they are first boiled with wood ashes to remove the skin, then boiled in hot syrup with red colouring for a short time and hung on nails stuck into poles, much like candied apples[183]. 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].

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

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

nrakta Southern N. America - Mexico. ksacta Not known propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°c and then cold stratified for another 3 months at 4°c[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them 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]. 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].

6.0.7 Crataegus aestivalis

Eastern Mayhaw, May hawthorn, Mayhaw, Apple Hawthorn

6 tlin 11 cyuc 3 kcaak 5 tcan 2 dwat 9 m hku hminhtut cyuti hgattcuphja7n hwicli hrsajlutnyikfrip hpa7tli flatprikwislip hpa7tmwatli xre7t hjonli

drutta Crataegus aestivalis is a deciduous Shrub growing to 9 m (29ft) by 8 m (26ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 4 and is not frost tender. It is in flower in March, and the seeds ripen from May to June. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcaakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[160]. Juicy and acid with a pleasant flavour[2]. It is up to 12cm in diameter[227]. The fruit is frequently used and much prized in parts of southern N. America where it is often gathered in quantity from the wild. Its acid flavour makes it a favourite for preserves and jellies[82, 183, 227]. The fruit can also be dried for later use. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

taanta Shelterbelt Soil stabilization WoodBecause it tolerates a wide variety of sites, this species can be used to stabilize banks, for shelterbelts, and to give protection from wind and water erosion[277]. Wood - heavy, hard and strong, but not large enough for commercial use[227]. Useful for making tool handles, mallets and other small items[82].

dwatta Cardiotonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine

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

4.0.12 *Crataegus mollis*

Red Haw, Downy hawthorn
 4 tlin 8 cyuc 4 kcaak 2 tcan 2 dwat m hkuc
 hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfriphpa7tli
 flatprikwissiip hpa7tmwatli xre7t hjonli

drutta *Crataegus mollis* is a deciduous Tree growing to 9 m (29ft) by 12 m (39ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from May to June, and the seeds ripen in September. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcakta Edible Parts: FruitEdible Uses: TeaFruit - raw or cooked[22, 46, 62, 101, 183]. Sub-acid, dry and mealy[82, 227]. The fruit is also used for making jellies and preserves[61, 95, 183]. Fairly large, it is about 20 - 25mm in diameter[200], with a thick flesh[229]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K]. A tea-like beverage can be made from the twigs[257].

tcanta Hedge HedgeThe plant is tolerant of being trimmed and will even resprout if cut back into very old wood. It can be used as a hedge[50]. Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82].

dwatta 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 and Central N. America - Ontario to Alabama, west to Oklahoma. ksakta Open woods, usually in alluvial or fertile soils[43]. Frequently found in limestone soils[229].

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

pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta Landscape Uses:Espalier, Pollard, Specimen, Street tree. A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. A very hardy plant, tolerating temperatures down to at least -18°C[202]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. A very ornamental plant[11], the branches are almost thornless[229]. A rather variable species, it has been separated into several different species by some botanists[82]. This species is much confused with *C. chrysocarpa*[11] and with *C. coccinea*[50]. It is very closely related to *C. submollis*, differing in having 20 stamens to a flower (as compared to 10 in *C. submollis*)[202]. Special Features: North American native, Attractive flowers or blooms. The plant is heat tolerant in zones 6 through 1. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of "heat days" experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2]. The root pattern is a tap root similar to a carrot going directly down [1-2].

4.0.13 *Crataegus durobrivensis*

Caughuawaga Hawthorn
 4 tlin 8 cyuc 4 kcaak 2 tcan 2 dwat 5 m hkuc
 hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfriphpa7tli
 flatprikwissiip hpa7tmwatli xre7t hjonli

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

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked. A reasonable size, it is up to 15mm in diameter[200], and is very acceptable for raw eating[K]. It is sweet and fairly juicy when fully ripe with a hint of apple in its flavour[K]. The fruit can be used in making pies, preserves, etc, and can also be dried for later use. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

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

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[2, 3, 105]. A good size with a soft juicy texture and an acid/sweet apple-like flavour that is very nice raw when fully ripe[11, 183, K]. The fruit can also be used in making pies, preserves, etc, and can be dried for later use. The fruit is up to 25mm in diameter[200]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

tcanta WoodWood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[74, 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 W. Asia. ksakta Dry slopes[74].
 propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. Unlike most members of this genus, the flowers are sweetly scented and free from the smell of decaying fish[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. This species has an excellent potential as a fruit crop in Britain. The fruit is of a reasonable size, it is usually very freely borne and the quality is very acceptable for dessert[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]. A tree at Cambridge Botanical Gardens was about 6 metres tall and 4 metres wide in September 1993. It usually carries a very good crop of fruit[K]. A very ornamental plant[1], it is closely related to *C. laciniata*[11].

6.0.2 *Crataegus festiva*

6 tlin 9 cyuc 5 kcaak 2 tcan 2 dwat 3 m hkuc
 hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfriphpa7tli

flatprikwliis hpa7tmwatli xre7t hjonli

drutta *Crataegus festiva* is a deciduous Shrub growing to 3 m (9ft) by 3 m (9ft). See above for USDA hardiness. It is hardy to UK zone 7 and is not frost tender. 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. 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. About 15mm in diameter with a delicious sweet flavour and juicy though slightly mealy texture[K]. This is a very acceptable dessert fruit that makes very enjoyable eating[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 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. ksakta Not known
 propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°C and then cold stratified for another 3 months at 4°C[164]. It may still take another 18 months to germinate[78]. Scarifying the seed before stratifying it might reduce this time[80]. Fermenting the seed for a few days in its own pulp may also speed up the germination process[K]. Another possibility is to harvest the seed 'green' (as soon as the embryo has fully developed but before the seedcoat hardens) and sow it immediately in a cold frame. If timed well, it can germinate in the spring[80]. If you are only growing small quantities of plants, it is best to pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

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

away quickly and can be large enough to plant out in late summer, though consider giving them some protection from the cold in their first winter. Otherwise, keep them in pots in a cold frame and plant them out in late spring of the following year. Cuttings of mature wood, November in a frame[11].

nwatta An easily grown plant, it succeeds in most fertile soils, preferring a moisture retentive well-drained loamy soil[1, 200]. Grows well in heavy clay soils. Prefers a sunny position but succeeds in partial shade, though it fruits less well in such a situation[200]. A slow-growing and short-lived tree in the wild[229]. The fruit is a good wildlife food source, especially for birds[200]. The flowers are sweetly scented[245]. This species is closely related to *M. ionensis*[1]. Plants in this genus are notably susceptible to honey fungus[200].

4.0.19 Crataegus pedicellata gloriosa

Scarlet Haw

4 tlin 8 cyuc 3 kcaak 3 tcan 2 dwat 7 m hkuc
hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnykfrip hpa7tli flatprikliwssip hpa7tmwatli xre7t hjonli

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

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

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

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

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

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

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

4.0.20 Crataegus laevigata

Midland Hawthorn, Smooth hawthorn, English Hawthorn

4 tlin 8 cyuc 3 kcaak 5 tcan 5 dwat 6 m hkuc
pcimhmimhtut cyutli hgattcuphja7n hwicli hrasjlutnykfrip hpa7tli flatprikliwssip hpa7tmwatli xre7t hjonli

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

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

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

dwatta Antiarrhythmic Antispasmodic Astringent Cardiotonic Diuretic Hypotensive Malaria Sedative Tonic VasodilatorHawthorn is an extremely valuable medicinal herb. It is used mainly for treating disorders of the heart and circulation system, especially angina[254]. Western herbalists consider it a 'food for the heart', it increases the blood flow to the heart muscles and restores normal heart beat[254]. This effect is brought about by the presence of bioflavonoids in the fruit, these bioflavonoids are also strongly antioxidant, helping to prevent or reduce degeneration of the blood vessels[254]. The fruit is antispasmodic, cardiac, diuretic, sedative, tonic and vasodilator[4, 9, 21, 46, 165]. Both the fruits and flowers of hawthorns are well-known in herbal folk

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]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

5.0.19 Crataegus hupehensis

5 tlin 9 cyuc 3 kcaak 0 tcan 2 dwat 5 m hkuc
hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnykfrip hpa7tli flatprikliwssip hpa7tmwatli xre7t hjonli

drutta *Crataegus hupehensis* is a deciduous Tree growing to 5 m (16ft 5in). See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender. It is in flower from May to 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 can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[46, 105, 177, 200]. Esteemed in China, the fruit is large but insipid[61]. The fruit is up to 2.5cm in diameter[200, 266]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

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

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

nrakta E. Asia - W. China. ksacta Thickets on slopes at elevations of 500 - 2000 metres in Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shanxi, Sichuan and Zhejiang Provinces[266].

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

pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. Cultivated for its edible fruit in China[46, 61, 109].

5.0.20 Oenanthe javanica

Water Dropwort, Java waterdropwort, Stolon waterdropwort
5 tlin 11 cyuc 3 kcaak 3 tcan 2 dwat 1 m hkuc
htut cyutli hja7nhs6s hwicli hrasjlutnykfrip hpa7tli flatprikliwssip hpa7tmwatli fyfkr7e hjonli

drutta *Oenanthe javanica* is a PERENNIAL growing to 1 m (3ft 3in). See above for USDA hardiness. It is hardy to UK zone 5. 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. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers wet soil and can grow in water.

pcista Although no specific mention of toxicity has been seen for this species, it belongs to a genus that contains a number of very poisonous plants and so some caution is advised[K]. It is said to contain the alleged 'psychotherp' myristicine[218].

kcakta Edible Parts: Leaves Root SeedEdible Uses: CondimentYoung leaves and stems - raw or cooked[2, 46, 61, 105]. The leaves are also used as a seasoning in soups etc[179, 183]. The flavour is reminiscent of carrots or parsley[206]. The young shoots that sprout from the root in winter are best[116, 206]. A major vegetable in many parts of the Orient, the leaves are a rich source of vitamins and minerals (Analysis available)[218]. Root - cooked. Highly esteemed in Japan[116], the roots can grow up to 30cm long in water[183]. Some caution is advised, see the notes above on toxicity. Seed is said to be edible[183].

tcanta EssentialSpreading rapidly by means of suckers, it makes a good ground cover plant for wet situations. The variegated cultivar 'Flamingo' has been especially recommended[200].

dwatta Depurative Febrifuge StypticThe whole plant is depurative, febrifuge and styptic[147, 178]. A decoction is used in the treatment of epidemic influenza, fever and discomfort, jaundice, haematuria and metrorrhagia[147]. The seed contains 3.5% essential oil. This is effective at large dilutions against pathogenic fungi[218].

nrakta E. Asia - China, Japan, Korea to Australia. ksacta Ditches, ponds and wet places in lowland areas all over Japan[58]. Marshlands, lakeshores, muddy stream banks and shallow water at elevations of 600 - 3000 metres in most parts of China[266].

propta Seed - sow spring in a cold frame. Germination is erratic[206]. When they are large enough to handle, prick the seedlings out into individual pots and plant them out in the summer. Division in spring[206]. Large divisions can be planted out direct into their permanent positions. We have

on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Most trees have very few thorns, some forms are thorn-free[202]. A very ornamental plant[1, 11]. The sub-species *C. pinnatifida* major has larger fruit than the type species, it is cultivated for this fruit in China[46, 178, 200] Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a standard with a non-suckering single trunk [1-2]. The root pattern is a tap root similar to a carrot going directly down [1-2].

5.0.17 *Crataegus pentagyna*

5 tlin 9 cyuc 3 kcaak 0 tcan 2 dwat 6 m hkuc
 hmimhtut cyutli hgattcuphja7n hwicli hrasjlyutnykfrip hpa7tli flatprikwisslip hpa7tmwatli xre7t hjonli
 drutta *Crataegus pentagyna* is a deciduous Tree growing to 6 m (19ft 8in). See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender. It is in flower in June. The species is hermaphrodite (has both male and female organs) and is pollinated by 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[2, 46, 105]. It can also be made into preserves[61] and can be dried for later use. The fruit is about 1cm in diameter[200]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

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 S.E. Europe to the Caucasus. ksacta Woodland margins[45, 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]. Cultivated in China for its edible fruit, it is sold in the local markets[46, 61]. This report might be a mistake, probably applying instead to *C. pinnatifida*[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].

5.0.18 *Crataegus aprica*

5 tlin 9 cyuc 3 kcaak 0 tcan 2 dwat 6 m hkuc
 hmimhtut cyutli hgattcuphja7n hwicli hrasjlyutnykfrip hpa7tli flatprikwisslip hpa7tmwatli xre7t hjonli

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

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked. A good dessert fruit, it is sweet and rather juicy[82]. The fruit can be used in making pies, preserves, etc, and can also be dried for later use. The fruit is about 12mm in diameter[200]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

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 South-eastern N. America - Virginia to Tennessee and Georgia. ksacta Dry woods in the foothills of the Appalachians, 450 - 1000 metres[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,

medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222], they are also used to treat a heart muscle weakened by age, for inflammation of the heart muscle, arteriosclerosis and for nervous heart problems[21]. Prolonged use is necessary for the treatment to be efficacious[222]. It is normally used either as a tea or a tincture[222]. Hawthorn is combined with ginkgo (*Ginkgo biloba*) to enhance poor memory, working by improving the blood supply to the brain[254]. The bark is astringent and has been used in the treatment of malaria and other fevers[7]. The roots are said to stimulate the arteries of the heart[218].

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

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

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

4.0.21 *Crataegus pruinosa*

Frosted Hawthorn, Waxyfruit hawthorn
 4 tlin 8 cyuc 3 kcaak 0 tcan 2 dwat 6 m hkuc
 hmimhtut cyutli hgattcuphja7n hwicli hrasjlyutnykfrip hpa7tli flatprikwisslip hpa7tmwatli xre7t hjonli

drutta *Crataegus pruinosa* is a deciduous Tree growing to 6 m (19ft 8in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower

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

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

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

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

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

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

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

4.0.22 *Crataegus altaica*

Altai Mountain Thorn
 4 tlin 8 cyuc 3 kcaak 0 tcan 2 dwat 6 m hkuc

hmmihtut cyutli hgattcuphja7n hwicli hrasjlutnykfrp hpa7tli flatprikwlis hpa7tmwatli xre7t hjonli

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

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

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

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

nrakta W. Asia - Altai Mountains. ksacta Not known

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

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

4.0.23 *Crataegus chrysoarpa*

Fireberry Hawthorn. Red haw, Piper's hawthorn, 4 tin 8 cyuc 3 kcaak 0 tcan 2 dwat 6 m hkuc hmihtut cyutli hgattcuphja7n hwicli hrasjlutnykfrp hpa7tli flatprikwlis hpa7tmwatli xre7t hjonli

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

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

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

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

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

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

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

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

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[46, 61, 95, 161]. well-flavoured[2]. Dry and mealy[82], it is highly esteemed in N. America as a wild fruit gathered for making jellies[183]. The yellow fruit is pear-shaped[245], it is up to 16mm in diameter and is borne in small clusters[229]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

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

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

nrakta South-eastern N. America - Virginia to Florida, west to Mississippi. ksacta Open woods and low hills in dry sandy or gravelly soils[43, 82].

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

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. 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]. The fruit is sparsely produced in Britain[11]. A tree at Kew in September 1993 was fruiting heavily[K].

5.0.16 *Crataegus pinnatifida*

Chinae Haw 5 tin 9 cyuc 3 kcaak 2 tcan 3 dwat 7 m hkuc hmihtut cyutli hgattcuphja7n hwicli hrasjlutnykfrp hpa7tli flatprikwlis hpa7tmwatli xre7t hjonli

drutta *Crataegus pinnatifida* is a deciduous Tree growing to 7 m (23ft) by 7 m (23ft). See above for USDA hardness. It is hardy to UK zone 6 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 Edible Parts: FruitEdible Uses: Fruit - raw or cooked[105, 177]. A pleasant flavour[178]. The orange fruit has a mealy texture with an acid taste and a slight bitterness but is fairly nice raw[K]. It ripens fairly late, specimens seen at the end of October 1998 were not quite fully ripe[K]. The fruit can be used in making pies, preserves, etc, and can also be dried for later use. The fruit is about 15mm in diameter[200], though in some forms it can be 25mm in diameter[266]. A nutritional analysis is available[218]. 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 Alternative Antibacterial Anticholesterolemic Antidote Antiscorbutic Cardiotonic Deobstruent Hypotensive Laxative Stimulant Stomachic VasodilatorThe fruit is antibacterial, anticholesterolemic, cardiotonic, hypotensive, stomachic, vasodilator. It contains several medically active constituents including flavonoids and organic acids[279]. It has been shown to lower blood cholesterol levels and to improve blood circulation[176, 238, 279]. It is used in Korea in the treatment of abdominal distension, pain, diarrhoea and to induce menstruation[279]. The dried fruit is alternative, antiscorbutic, deobstruent, laxative, stimulant and stomachic[218]. The fruits and flowers of hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222]. The seed is recommended in the treatment of difficult labour, hernia and swollen genitals[218]. The leaves and twigs are used as an antidote to varnish poisoning (from certain *Rhus* spp)[218]. The root is used in the treatment of nausea and vomiting[218].

nrakta E. Asia - N. China, Korea. ksacta Riverbanks, on sandy soils or stony slopes[74]. Among shrubs, on slopes at elevations of 100 - 2000 metres[266].

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 Industrial Crop: Medicinal Management: Standard Minor Global CropA 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

diseases of women[240, 243]. The rhizomes yield a sterol, resembling sitosterol, which stimulates the secretion of antibiotic substances from a gram-positive spore-forming bacillus[240]. An active substance, effective in the treatment of stomach ulcers, has been extracted from the plant[240].

nrakta E. Asia - China, Japan, Himalayas. ksacta Shrubberies and damp places to 2400 metres in the Himalayas[51]. Often found as a weed in wet fields[187].

propta Seed - sow spring in a greenhouse. Prick out the seedlings into individual pots as soon as they are large enough to handle and plant them out in the summer. Division in spring[31, 56]. Very quick and easy, it can be done successfully at almost any time in the growing season[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, Container, Foundation, Ground cover, Massing, Woodland garden. Requires a moist to wet soil or shallow water, partial shade and a sheltered position[1, 31, 56, 238]. Whilst it grows best in a bog garden, it will succeed in moist garden borders[233] and has also grown fairly well in a dry soil in Cornwall[K]. It succeeds in full shade[208]. Plants are hardy to about -15°c[187], the top growth is killed back by frost though the roots are much harder. Even the roots, though, can be killed in severe winters[56]. A very ornamental plant, there are some named varieties[187]. 'Chameleon' has very attractively variegated leaves with the same flavour as the species[K]. The bruised leaves emit a strong citrus smell rather like orange peel[K]. Plants have a widely spreading root system and are very invasive, though they are easier to control in drier soils[200]. Creeps harmlessly between ferns[187]. Cultivated as a salad crop in Vietnam[103] and in W. China[187]. Plants seem to be immune to the predations of rabbits[233]. Plants growing in an area with a high rabbit population were not eaten by them although other plants growing nearby were attacked[K]. Special Features: Attractive foliage, Fragrant foliage, Not North American native, Invasive, Naturalizing, Wetlands plant, Inconspicuous flowers or blooms. 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]. The root pattern is rhizomatous with underground stems sending roots and shoots along their length [1-2].

5.0.14 Crataegus cuneata

Sanzashi, Chinese hawthorn

5 tlin 9 cyuc 3 kcaak 3 tcan 3 dwat 15 m hkuc hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfrp hpa7tli flatprkwiwslip hpa7tmwatli xre7t hjonli

drutta Crataegus cuneata is a deciduous Shrub growing to 15 m (49ft 3in). See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender. It is in flower from May to June. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils 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 and used in pies, preserves etc[147, 183]. It can also be dried for later use[177, 183]. A pleasant flavour; it is sold in local markets in China and Japan[178]. The fruit contains about 0.44% protein, 1% fat, 22.1% carbohydrate, 0.8% ash,

it is rich in vitamin C, fruit acids and pectin[179]. 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 Anodyne Anticholesterolemic Astringent Blood tonic Cardiotoxic Dysentery Haemostatic Hypotensive Stomachic Vitamin CThe fruits and flowers of hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222]. The fruit is anodyne, anticholesterolemic, antiarrhythmic, antidiabetic, antidiarrhetic, astringent, blood tonic, cardiotoxic, haemostatic and stomachic[61, 147, 176, 218]. It is used in the treatment of dyspepsia, stagnation of fatty food, abdominal fullness, retention of lochia, amenorrhoea, postpartum abdominal pain, hypertension and coronary heart disease[176].

nrakta E. Asia - China, Japan. ksacta Sunny places in upland wilds[147]. Valleys, thickets and hills at elevations of 200 - 2000 metres[266].

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]. Although perfectly cold-hardy in most of Britain when dormant, the young growth of this species might be susceptible to spring frosts[11]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

5.0.15 Crataegus flava

Summer Haw, Yellowleaf hawthorn

5 tlin 9 cyuc 3 kcaak 3 tcan 2 dwat 8 m hkuc hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfrp hpa7tli flatprkwiwslip hpa7tmwatli xre7t hjonli

drutta Crataegus flava is a deciduous Shrub growing to 8 m (26ft) by 10 m (32ft). See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender. It is in flower from May to June. The species is hermaphrodite (has both

will often flower heavily in their third year[K]. A ten year old tree was seen at Kew Gardens in 2002. It was about 2.5 metres tall and was bearing a very good crop of fruit[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Hybridizes freely with other members of this genus[200]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

4.0.24 Crataegus rotundifolia

4 tlin 8 cyuc 3 kcaak 0 tcan 2 dwat 6 m hkuc hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfrp hpa7tli flatprkwiwslip hpa7tmwatli xre7t hjonli

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

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

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

dwatta 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

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

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit,

they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. A tree bearing this name at Kew in September 1993 was fruiting abundantly[K]. There is some confusion over the correct name of this species. *C. rotundifolia* Moench. is said to be a synonym for *C. chrysoarpa* phoenicea, *C. rotundifolia* Borchk. is a synonym of *C. chrysoarpa*. There is also a *C. rotundifolia* Lam, which is a synonym of *Amelanchier rotundifolia*[200].

4.0.25 Crataegus flabellata

Fanleaf hawthorn

4 tlin 8 cyuc 3 kcaak 3 tcan 2 dwat 6 m hkuc hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfrp hpa7tli flatprkwiwslip hpa7tmwatli xre7t hjonli

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

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked. A sweet but very soft and mealy flesh, it makes an acceptable dessert fruit[K]. The fruit can be used in making pies, preserves, etc, and can also be dried for later use. The fruit is up to 15mm long and 8mm wide, it is borne in small clusters[82, 222]. 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 - Quebec to South Carolina, west to Louisiana. ksacta Thickets and open woods[204]. Dry open places, borders of woods and the margins of high banks of streams[82].

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

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

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

4.0.26 Crataegus coccinoides

Kansas Hawthorn

4 tlin 8 cyuc 3 kcaak 0 tcan 2 dwat 6 m hkuc hmimhtut cyutli hgatkycuctcuphja7n hwicli hrasjlutnyikfrjp hpa7tli flatprikwisslip hpa7tmwatli xre7t hjonli

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

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

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

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

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

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

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

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

4.0.27 Crataegus anomala

Arnold hawthorn

4 tlin 8 cyuc 3 kcaak 3 tcan 2 dwat 5 m hkuc hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfrjp hpa7tli flatprikwisslip hpa7tmwatli xre7t hjonli

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

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

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

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

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

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

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. A very ornamental plant, this sub-species is widely cultivated for its edible fruit in China[266], it is larger than the type species[46, 178, 200].

5.0.12 Nasturtium x sterile

Brown Watercress

5 tlin 9 cyuc 4 kcaak 0 tcan 3 dwat 0.5 m hkuc htut cyutli hja7nhs6s hwicli hrasjlutnyik hpa7tli flatprikwis hpa7tmwatli fyfxre7t hjonli

drutta Nasturtium x sterile is a PERENNIAL growing to 0.5 m (1ft 8in) by 1 m (3ft 3in). See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender. It is in flower from May to October, and the seeds ripen from July to October. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees, flies. The plant is self-fertile. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers wet soil and can grow in water.

pcista Whilst the plant is very wholesome and nutritious, some care should be taken if harvesting it from the wild. Any plants growing in water that drains from fields where animals, particularly sheep, graze should not be used raw. This is due to the risk of it being infested with the liver fluke parasite[5, 244]. Cooking the leaves, however, will destroy any parasites and render the plant perfectly safe to eat[244].

kaakta Edible Parts: LeavesEdible Uses: Leaves - raw or cooked[2, 5, 7, 9, 16, 27]. Water cress is mainly used as a garnish or as an addition to salads, the flavour is strong with a characteristic hotness[183]. It has a reputation as a spring tonic, and this is its main season of use, though it can be harvested for most of the year and can give 10 pickings annually[238]. Some caution is advised if gathering the plant from the wild, see the notes above on toxicity. The leaves are exceptionally rich in vitamins and minerals, especially iron[200]. A nutritional analysis is available[218].

tcanta Hair MiscellanyThe juice of the plant is a nicotine solvent and is used as such on strong tobaccos[7].

dwatta Antiscorbutic Depurative Diuretic Expectorant Hypoglycaemic Miscellany Odontalgic Purgative Stimulant Stomachic TB Vitamin CWatercress is very rich in vitamins and minerals, and has long been valued as a food and medicinal plant[254]. Considered a cleansing herb, its high content of vitamin C makes it a remedy that is particularly valuable for chronic illnesses[254]. The leaves are antiscorbutic, depurative, diuretic, expectorant, purgative, hypoglycaemic, odontalgic, stimulant and stomachic[4, 7, 9, 21, 46, 222, 238]. The plant has been used as a specific in the treatment of TB[4]. The freshly pressed juice has been used internally and externally in the treatment of chest and kidney complaints, chronic irritations and inflammations of the skin etc[9]. Applied externally, it has a long-standing reputation as an effective hair tonic, helping to promote the growth of thick hair[244]. A poultice of the leaves is said to be an effective treatment for healing glandular tumours or lymphatic swellings[244]. Some caution is advised, excessive use of the plant can lead to stomach upsets[9, 21]. The leaves can be harvested almost throughout the year and are used fresh[238].

nrakta Western Britain in Britain and France. ksacata Stream margins, ditches, flushes etc with moving water[17,

27], usually in chalk or limestone areas[52].

propta Cuttings can be taken at any time in the growing season. Virtually any part of the plant, including a single leaf, will form roots if detached from the parent plant[56]. Just put it in a container of water until the roots are well formed and then plant out in shallow water.

nwatta Watercress is easily grown when given the correct conditions of slowly flowing clean water, preferably coming from chalky or limestone soils[264]. It prefers to grow in water about 5cm deep[37] with an optimum pH 7.2[200]. Plants can be grown in wet soil if the position is somewhat shaded and protection is given in winter, though the flavour may be hotter[27, 37]. Hardy to about -15°C[200]. Brown watercress is often cultivated for its edible leaves, there are some named varieties[16, 183]. The plant is very sensitive to pollution so a clean source of water is required[200]. Plants will often continue to grow all through mild winters. A fast-growing plant, the stems trail along the ground or float in water and produce new roots at the leaf nodes, thus making the plant very easy to propagate vegetatively[238]. Unfortunately, virus diseases have become more common in cultivated plants and so this species is seldom cultivated at present[264]. This is a sterile hybrid, so does not form seed. It has been produced in the wild by natural hybridisation between the diploid species *N. officinale* and the triploid *N. microphyllum*[264]. The flowers are a rich source of pollen and so are very attractive to bees[7].

5.0.13 Houttuynia cordata

Tsi, Chameleon, Rainbow Plant, Chameleon Plant

5 tlin 10 cyuc 4 kcaak 2 tcan 3 dwat 0.6 m hkuc pimchmim cyutli tcuphja7nhs6s hwicli hrasjlutnyik hpa7tli flatprikwis hpa7tmwatli xre7t hjonli

drutta Houttuynia cordata is a PERENNIAL growing to 0.6 m (2ft) by 1 m (3ft 3in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower in June. The species is hermaphrodite (has both male and female organs). 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 or wet soil and can grow in water.

kaakta Edible Parts: Fruit Leaves Root ShootsEdible Uses: Teder young shoots and leaves - raw or cooked as a pot-herb[2, 61, 103, 183, 272]. The leaves and young shoots are harvested in the spring when about 8cm long[264]. Strongly aromatic according to one report[183] whilst others say that it is rather smelly and somewhat like rotten fish[105, 178]. Our experience is that the leaves have a delicious orange-like smell and make a marvellous flavouring in salads[K]. One report says that there are two distinct chemotypes of this species. Plants from Japan have an orange scent, whilst those from China have a smell resembling coriander leaves (*Coriandrum sativum*)[238]. Some people seem to really like this leaf, others are indifferent to it or strongly dislike it[K]. It also varies quite considerably according to the time of year. In the spring and summer it has a very acceptable flavour, but by autumn a distinct bitterness has crept in[K]. Root - cooked[177, 183]. Same comments on the smell as for the leaves[105]. Fruit[183]. No further details[K], but the fruit is a capsule that contains many small seeds[200].

tcanta A good ground cover plant[200]. Plants do not form a weed-suppressing cover[K]. A spreading plant, it should be spaced about 45cm apart each way[208].

dwatta Antibacterial Antidote Antiinflammatory Antiphlogistic Antiviral Astringent Depurative Diuretic Dysentery Emmenagogue Febrifuge Hypoglycaemic Laxative Ophthalmic Women's complaintsThe whole plant is antibacterial, antiinflammatory, antimicrobial, antiphlogistic, antiviral, depurative, diuretic, emmenagogue, febrifuge, hypoglycaemic, laxative and ophthalmic[103, 116, 147, 174, 176, 218, 238, 240, 279]. A decoction is used internally in the treatment of many ailments including cancer, coughs, dysentery, enteritis and fever[218]. Its use is said to strengthen the immune system[176]. Externally, it is used in the treatment of snake bites and skin disorders[238]. The leaves and stems are harvested during the growing season and used fresh in decoctions[238]. The leaf juice is antidote and astringent[218]. A root extract is diuretic[218, 240]. The root is also said to be used in medicinal preparations for certain

dwatta CancerThe plant is said to remove the cancerous taint from the body[4]. An infusion of the leaves has been used as a tonic for a person who has overeaten[257].

nrakta E. Asia - central and northern Japan. ksacta Mossy grounds under conifers at elevations of 1600 - 2000 metres[275].

propta The seed requires a period of cold stratification. Pre-chill for 4 - 10 weeks and then surface sow in a lime-free compost in a shady part of the greenhouse and keep the compost moist[78]. The seed usually germinates well, usually within 1 - 2 months at 20°c, but the seedlings are liable to damp off. It is important to water them with care and to ensure that they get plenty of ventilation. Watering them with a garlic infusion can also help to prevent damping off[K]. Prick out the seedlings into individual pots when they are about 25mm tall and grow them on in light shade in the greenhouse for at least their first winter[K]. Plant them out in late spring or early summer. The seedlings are susceptible to spring frosts so might need some protection for their first few years outdoors. The leaves remain very small for the first few years[11]. Cuttings of half-ripe wood 3 - 6cm long, July/August in a frame in a shady position. They form roots in late summer or spring[78]. A good percentage usually take. Division in spring just before new growth begins[200]. 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. Layering.

nwatta Prefers a moist but not boggy humus rich soil in shade or semi-shade[11]. A peat and moisture loving species, it requires a lime-free soil[11]. A fast growing plant[200]. The plant can make a good nesting place for mice, these mice then eat the bark of the stems in winter causing die-back. Plants in this genus are notably resistant to honey fungus[200]. Gaultheria japonica bears a close resemblance to G. hispida (L.) Bigelow of N. America and sometimes treated as a variety or subspecies of the latter. G. japonica, however, has calyx much longer than the bracteoles, ovate and acute calyx lobes, and shorter anther projections. In G. hispida the calyx is as long as or slightly longer than the bracteoles, the calyx lobes are broadly ovate and obtuse or subacute, and the anthers have distinct projections.

5.0.10 Sagittaria cuneata

Wapato, arumleaf arrowhead

5 tlin 9 cyuc 4 kcaak 0 tcan 1 dwat 0.8 m hkuc hmihmtt cyutli hgattcuphja7n hwicli hrasjlutnyikfrip hpa7tli flatprikwisslip hpa7tmwatli hjonli

drutta Sagittaria cuneata is a PERENNIAL growing to 0.8 m (2ft 7in). See above for USDA hardiness. It is hardy to UK zone 6. It is in flower from July to August. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Insects. 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 cannot grow in the shade. It prefers wet soil and can grow in water.

kcaakta Edible Parts: RootEdible Uses: Root - raw or cooked[257]. Slightly bitter raw[212], the roasted tubers are sweet-tasting[159, 161]. Those tubers found at the end of the rootstock are the best[159]. When broken off from the roots the tubers rise to the water surface and are then easily gathered[212].

dwatta Analgesic StomachicThe plant has been used to treat headaches[257]. The corns have been eaten as a treatment for indigestion[257].

nrakta N. America - Nova Scotia to British Columbia, south to Connecticut, Kansas, and California. ksacta Calcareous or muddy shores and shallow waters of rivers, lakes, ponds, pastures, and ditches, occasional in tidal waters, or in deep flowing water with slow current; 100 - 2500 metres[43, 270].

propta Seed - best sown as soon as it is ripe in a pot standing in about 5cm of water. Prick out the seedlings into individual pots when they are large enough to handle, and gradually increase the depth of water as the plants grow until it is about 5cm above the top of the pot. Plant out in late spring or early summer of the following year. Division of the

tubers in spring or autumn. Easy. Runners potted up at any time in the growing season.

nwatta A pond or bog garden plant, it requires a moist or wet loamy soil in a sunny position[1, 200]. Succeeds in shallow, still or slowly flowing water. Plants are usually monoecious but dioecious forms are sometimes found[43]. A very polymorphic species[43]. In mud or shallow water the leaves are broad, but in deep water the plant only produces long slender leafstalks[212]. This plant has potential for commercial cultivation as a root crop[212].

5.0.11 Crataegus pinnatifida major

Chinese Haw

5 tlin 9 cyuc 4 kcaak 2 tcan 3 dwat m hkuc hmihmtt cyutli hgattcuphja7n hwicli hrasjlutnyikfrip hpa7tli flatprikwisslip hpa7tmwatli xre7t hjonli

drutta Crataegus pinnatifida major is a deciduous Tree growing to 7.5 m (24ft 7in). See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender. It is in flower in May. The species is hermaphrodite (has both male and female organs) and is pollinated by Midgees. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcaakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[3, 105, 177]. A pleasant flavour, it is sold in local markets in China[178]. The fruit can be used in making pies, preserves, etc, and can also be dried for later use. A good size, it is up to 25mm in diameter[200]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

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

dwatta Anticholesterolemic Cardiotonic Hypotensive Stomachic VasodilatorThe fruits and flowers of Hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222]. The fruits are anticholesterolemic, cardiotonic, stomachic and vasodilator. Their use improves the blood circulation and lowers blood pressure[176]. The fruits are used in the treatment of dyspepsia, stagnation of fatty foods, abdominal fullness, retention of lochia, amenorrhoea, postpartum abdominal pain, hypertension and coronary heart disease[176].

nrakta E. Asia - China. ksacta Riverbanks, on sandy soils or stony slopes[74].

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.

pot up the seedlings as soon as they are large enough to handle and grow them on in individual pots for their first year, planting them out in late spring into nursery beds or their final positions. When growing larger quantities, it might be best to sow them directly outdoors in a seedbed, but with protection from mice and other seed-eating creatures. Grow them on in the seedbed until large enough to plant out, but undercut the roots if they are to be left undisturbed for more than two years.

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

4.0.28 Crataegus columbiana

Columbian Hawthorn

4 tlin 8 cyuc 3 kcaak 0 tcan 2 dwat 5 m hkuc hmihmtt cyutli hgattcuphja7n hwicli hrasjlutnyikfrip hpa7tli flatprikwisslip hpa7tmwatli xre7t hjonli

drutta Crataegus columbiana is a deciduous Tree growing to 5 m (16ft 5in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. The species is hermaphrodite (has both male and female organs) and is pollinated by Midgees. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

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

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

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

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

propta Seed - this is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°c and then cold stratified for another 3 months at 4°c[164]. It may still take

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

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

4.0.29 Crataegus x grignonensis

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

hmihmtt cyutli hgattcuphja7n hwicli hrasjlutnyikfrip hpa7tli flatprikwisslip hpa7tmwatli xre7t hjonli

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

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

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

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

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

propta Seed - this is a hybrid species and it will not breed true from seed. If this is no problem, then the seed is best sown as soon as it is ripe in the autumn in a cold frame, some of the seed will germinate in the spring, though most will probably take another year. Stored seed can be very slow and erratic to germinate, it should be warm stratified for 3 months at 15°c and then cold stratified for another 3 months

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

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

4.0.30 *Crataegus intricata*

Copenhagen hawthorn

4 tlin 8 cyuc 3 kcak 3 tcan 2 dwat 3 m hkuc hmimhtut cyutli hgattucphja7n hwicli hrasljutnykfrkip hpa7tli flatprikliwsslip hpa7tmwatli xre7t hjonli

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

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

tcanta Wood - heavy, hard, tough, close-grained. Useful for making tool handles, mallets and other small items[82]. dwatta Cardiotonic HypotensiveAlthough no specific mention has been seen for this species, the fruits and flowers of many hawthorns are well-known in herbal folk medicine as a heart tonic and modern research has borne out this use. The fruits and flowers have a hypotensive effect as well as acting as a direct and mild heart tonic[222]. They are especially indicated in the treatment of weak heart combined with high blood pressure[222]. Prolonged use is necessary for it to be efficacious[222]. It is normally used either as a tea or a tincture[222].

nrakta Eastern N. America - Maine to Georgia, west to Michigan and Oklahoma. ksacta Thickets and open rocky woods[43, 235].

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

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

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

4.0.31 *Vaccinium fuscatum*

Black Highbush Blueberry

4 tlin 8 cyuc 3 kcak 0 tcan 0 dwat 3.5 m hkuc hmimhtut cyutli tcuphja7n hwicli hrasljut hpa7tli frusflat hpa7tmwatli dyatxre7t hjonli

drutta *Vaccinium fuscatum* is a deciduous Shrub growing to 3.5 m (11ft 6in). See above for USDA hardiness. It is hardy to UK zone 4. It is in flower from March 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) and medium (loamy) soils and prefers well-drained soil. Suitable pH: mildly acid soils and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[3, 105, 200]. Large, sweet, juicy and very flavourful[183]. The fruit is about 8mm in diameter[200].

nrakta Eastern N. America - New Hampshire, Ontario and Indiana south to Florida and Arkansas. ksacta Swamps and pine barrens, wet woods and the edges of lakes[43, 184].

propta Seed - sow late winter in a greenhouse in a lime-free potting mix and only just cover the seed[78]. Stored seed might require a period of up to 3 months cold stratification[113]. Another report says that it is best to sow the seed in a greenhouse as soon as it is ripe[200]. Once they are about 5cm tall, prick the seedlings out into individual pots and grow them on in a lightly shaded position in the greenhouse for at least their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. Cuttings of half-ripe wood, 5 - 8cm with a heel, August in a frame[78]. Slow and difficult. Layering in late summer or early autumn[78]. Another report says that spring is the best time to layer[200]. Takes 18 months[78]. Division of suckers in spring or early autumn[113].

nwatta Requires a moist or wet lime free soil[11, 184, 200], preferring one that is rich in peat or a light loamy soil with added leaf-mould[11, 200]. Prefers a very acid soil with a pH in the range of 4.5 to 6, plants soon become chlorotic when lime is present. Succeeds in full sun or light shade though it fruits better in a sunny position[200]. Requires

ple, be used for alcohol manufacture[270]. On a domestic level, the stems make an excellent addition to the compost heap or can be dried and used as a source of fuel etc. The hairs of the fruits are used as a stuffing material for pillows, mattresses, toys etc[46, 57, 159]. They have good buoyancy properties and have been used in life preservers. They also have excellent insulation properties and have been used in construction[171, 270]. The female flowers make an excellent tinder and can be lit from the spark of a flint[212]. The pollen is highly inflammable and is used in making fireworks[115].

dwatta Astringent Diuretic Haemostatic Miscellany VulneraryThe leaves are diuretic[218]. The pollen is astringent, desiccant, diuretic, haemostatic and vulnerary[176, 218]. It is used in the treatment of nose bleeds, haematemesis, haematuria, uterine bleeding, dysmenorrhoea, postpartum abdominal pain and gastralgia, scrofula and abscesses[176]. It is contraindicated for pregnant women[176]. The seed down is haemostatic[218]. The rootstock is astringent and diuretic[240].

nrakta Widespread in tropical, subtropical and warm temperate regions. ksacta Brackish to fresh marshes and pools in N. America at elevations from sea level to 2000 metres[43, 270].

propta Seed - surface sow in a pot and stand it in 3cm of water. Pot up the young seedlings as soon as possible and, as the plants develop, increase the depth of water. Plant out in summer. Division in spring. Very easy, making the young shoots when they are about 10 - 30cm tall, harvest sure there is at least some root attached, and plant them out into their permanent positions.

nwatta A plant of the warm temperate zone through to the tropics, where it is found at elevations up to 1,500 metres. It grows best in areas where annual daytime temperatures are within the range 16 - 28°c, but can tolerate 14 - 30°c[418]

1. When dormant, the plant can survive temperatures down to about -25°c, but young growth can be severely damaged at 0°c[418]

1. It prefers a mean annual rainfall in the range 400 - 1,400mm, but tolerates 250 - 1,600mm[418]

1. Succeeds in sun or part shade[200]

1. Grows in boggy pond margins or shallow water to 15cm deep[1, 200]

1. Requires a rich wet soil if it is to well[200]

1. Tolerates moderate levels of salt[418]

1. Prefers a pH in the range 6.5 - 7.5, tolerating 6 - 8[418]

1. Plants can be very invasive, spreading freely at the roots when in a suitable site[200]

1. *Typha domingensis* aggressively invades and forms nearly pure stands in brackish or nutrient-enriched wetlands in the Florida Everglades and elsewhere. It is established but does not mature fruits on the cold coast of northern California[270]

1.

5.0.8 *Gaultheria hispida*

Creeping Snowberry

5 tlin 9 cyuc 4 kcak 4 tcan 1 dwat 0.1 m hkuc hmim cyutli tcuphja7n hwicli hrasljut hpa7tli frusflatprik hpa7tmwatli xre7t hjonli

drutta *Gaultheria hispida* is an evergreen Shrub growing to 0.1 m (0ft 4in) by 1 m (3ft 3in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 6. It is in leaf all year, in flower from May to June, 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) and medium (loamy) soils. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It can grow in semi-shade (light woodland). It prefers moist or wet soil.

kcakta Edible Parts: Fruit LeavesEdible Uses: TeaFruit - raw or cooked. Pleasantly acid and refreshing[3, 101], with a delicate flavour of wintergreen[183]. An agreeable sub-acid taste, similar to G. shallon[2, 11]. They can be made into delicious preserves[183]. The fruit is about 6mm in diameter[200]. Leaves - raw or cooked[207]. The leaves are used to make a tea[2, 95, 161, 257]. A mild flavour of wintergreen[183]. Said to be superior to china tea[207].

tcanta MiscellanyA useful fast growing ground cover plant for shady positions.

dwatta Cancer Cytostatic MiscellanyThe plant is said to remove the cancerous taint from the body[4]. An infusion of the leaves has been used as a tonic for a person who has overeaten[257].

nrakta Northern N. America. ksacta Coniferous forests and mountains in the alpine and sub-alpine zones[62]. Cold wet woods and bogs[235].

propta The seed requires a period of cold stratification. Pre-chill for 4 - 10 weeks and then surface sow in a lime-free compost in a shady part of the greenhouse and keep the compost moist[78]. The seed usually germinates well, usually within 1 - 2 months at 20°c, but the seedlings are liable to damp off. It is important to water them with care and to ensure that they get plenty of ventilation. Watering them with a garlic infusion can also help to prevent damping off[K]. Prick out the seedlings into individual pots when they are about 25mm tall and grow them on in light shade in the greenhouse for at least their first winter[K]. Plant them out in late spring or early summer. The seedlings are susceptible to spring frosts so might need some protection for their first few years outdoors. The leaves remain very small for the first few years[11]. Cuttings of half-ripe wood 3 - 6cm long, July/August in a frame in a shady position. They form roots in late summer or spring[78]. A good percentage usually take. Division in spring just before new growth begins[200]. 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. Layering.

nwatta Prefers a moist but not boggy humus rich soil in shade or semi-shade[11]. A peat and moisture loving species, it requires a lime-free soil[11]. The fruit is sometimes sold in local markets[61]. A fast growing plant[200]. The plant can make a good nesting place for mice, these mice then eat the bark of the stems in winter causing die-back. Plants in this genus are notably resistant to honey fungus[200]. *Gaultheria japonica* bears a close resemblance to *G. hispida* (L.) Bigelow of N. America and sometimes treated as a variety or subspecies of the latter. *G. japonica*, however, has calyx much longer than the bracteoles, ovate and acute calyx lobes, and shorter anther projections. In *G. hispida* the calyx is as long as or slightly longer than the bracteoles, the calyx lobes are broadly ovate and obtuse or subacute, and the anthers have distinct projections. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. An evergreen. A clumping mat former. Forming a dense prostrate carpet spreading indefinitely [1-2]. The root pattern is flat with shallow roots forming a plate near the soil surface [1-2]. The root pattern is stoloniferous rooting from creeping stems above the ground [1-2].

5.0.9 *Gaultheria japonica*

Creeping Snowberry

5 tlin 9 cyuc 4 kcak 3 tcan 1 dwat 0.1 m hkuc hmim cyutli tcuphja7n hwicli hrasljut hpa7tli frusflatprik hpa7tmwatli xre7t hjonli

drutta *Gaultheria japonica* is an evergreen Shrub growing to 0.1 m (0ft 4in) by 1 m (3ft 3in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 6. It is in leaf all year, in flower from May to June, 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) and medium (loamy) soils. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It can grow in semi-shade (light woodland). It prefers moist or wet soil.

kcakta Edible Parts: Fruit LeavesEdible Uses: TeaFruit - raw or cooked. Pleasantly acid and refreshing[3, 101], with a delicate flavour of wintergreen[183]. An agreeable sub-acid taste, similar to G. shallon[2, 11]. They can be made into delicious preserves[183]. The fruit is about 6mm in diameter[200]. Leaves - raw or cooked[207]. The leaves are used to make a tea[2, 95, 161, 257]. A mild flavour of wintergreen[183]. Said to be superior to china tea[207].

tcanta A useful fast growing ground cover plant for shady positions.

part of *C. rotundifolia*[204].

5.0.6 *Crataegus laciniata*

5 tlin 9 cyuc 4 kcaak 0 tcan 2 dwat 6 m hkuu
hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfrip hpa7tli
flatprikliwsslip hpa7tmwatli xre7t hjonli

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

ckaakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[2, 105]. A pleasant acid taste[74]. The fruit is about 1.5cm in diameter[200]. A nice taste with a very good flesh to seed ratio, it can be eaten in quantity for dessert[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 WoodWood - heavy, close-grained, hard and tough. Used for tool handles etc[82, 74].

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

nrakta E. Asia. Occasionally self-sows in Britain[17]. ksacta Mountain thickets and rocky slopes[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]. A very hardy species, tolerating temperatures down to at least -18°C[202]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish.

This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

5.0.7 *Typha domingensis*

Southern Cattail

5 tlin 12 cyuc 4 kcaak 3 tcan 3 dwat 3 m hkuu
htut cyutli hja7nhs6s hwicli hrasjlutnyik hpa7tli flatprikliwshom hpa7tmwatli hjonli

drutta *Typha domingensis* is a PERENNIAL growing to 3 m (9ft 10in). See above for USDA hardiness. It is hardy to UK zone 5. 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. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in saline soils. It cannot grow in the shade. It prefers wet soil and can grow in water.

ckaakta Edible Parts: Flowers Leaves Oil Pollen Root Seed StemEdible Uses: OilRhizomes - raw or cooked[145] . A sweet flavour[105 , 277] . Rich in starch, around 30 - 46%, they can be boiled and eaten like potatoes or macerated and then boiled to yield a sweet syrup[172] . The rhizome can also be dried, ground into a powder and then used as a thickener in soups etc or added to cereal flours. Rich in protein, this flour is used to make biscuits, bread, cakes etc[183] . The rhizomes at the base of erect shoots are mostly horizontal, unbranched, up to 70 cm long and 5 - 40mm in diameter. They are starchy, firm and scaly[270] . The root contains a lot of fibre[193] . One way to remove this fibre is to peel lengths of the root that are about 20 - 25cm long, place them by a fire for a short while to dry and then twist and loosen the fibres when the starch of the root can be shaken out[193] . Young shoots in spring - raw or cooked[193] . An asparagus substitute. The inner core is eaten[172] . The young shoots are cut from the underground stems in the spring when they are about 10 - 40cm long[277] . The base of the mature stem - raw or cooked. It is best to remove the outer part of the stem. The base of the stem where it attaches to the rhizome can be boiled or roasted like potatoes[277] . Young flowering stem - raw, cooked or made into a soup. Tastes like sweet corn[172] . Seed - cooked. The seed is rather small and fiddly to utilize, but has a pleasant nutty taste when roasted. Edible oil is obtained from the seed[85] . The seeds contain about 18 - 20% oil, of which 69% is linolenic acid[270] . Due to the small size of the seed, this is probably not a very worthwhile crop. Pollen - raw or cooked. A protein-rich additive to flour used in making bread, porridge etc[105 , 183] . It can also be eaten with the young flowers, which makes it considerably easier to utilize. The pollen is a bright yellow or green colour, and turns pancakes, cookies or biscuits a pretty yellow colour[277] . The pollen can be harvested by placing the flowering stem over a wide but shallow container and then gently tapping the stem and brushing the pollen off with a fine brush[9] . This will help to pollinate the plant and thereby ensure that both pollen and seeds can be harvested[K] .

tcanta Biomass Compost Fibre Filter Fuel Insulation Miscellany Oil Paper Roofing Soil stabilization String Stuffing Thatching Tinder Waterproofing WeavingAgroforestry Uses: The plant's extensive root system makes it very good for stabilizing wet banks of rivers, lakes etc[200 , 418] . It can be grown in reed beds and other water purification systems in order to remove various kinds of pollutants from the water and soil. The top growth is removed once or twice during the growing season - it can either be used as a fuel or the materials recovered from it[270] . Other Uses: The stems and leaves have many uses, they make a good thatch, being used on roofs, to make walls and floor coverings[13 , 46 , 57 , 61 , 94 , 145 , 257 , 270] . They can be used in weaving to make items such as mats, chairs, hats and other handicrafts[13 , 46 , 57 , 61 , 94 , 270] . They can be used as a caulking material for barrels, boats etc[270] . A fibre obtained from the leaves and stems can be used in making paper[13 , 46 , 57 , 61 , 94] . A fibre obtained from the roots can be used for making string[193] . The plant produces large amounts of biomass, comparable to the most productive agricultural crops. This is a potential source of energy - it can, for exam-

shelter from strong winds[200]. Plants are hardy to about -25°C[184]. This species is often cultivated for its edible fruit[3]. Plants are self-sterile, at least two different varieties must be grown if seed is required[11]. Dislikes root disturbance, plants are best grown in pots until being planted out in their permanent positions[200]. Closely related to *V. corymbosum*[11, 182]. Plants in this genus are notably resistant to honey fungus[200].

4.0.32 *Scirpus lacustris*

Bulrush

4 tlin 8 cyuc 3 kcaak 0 tcan 1 dwat 2.5 m hkuu
hmimhtut cyutli tcuphja7nhs6s hwicli hrasjlutnyik hpa7tli
flatprikliwss hpa7tmwatli xre7t hjonli

drutta *Scirpus lacustris* is a PERENNIAL growing to 2.5 m (8ft 2in). See above for USDA hardiness. It is hardy to UK zone 4. 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. 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 grow in water.

ckaakta Edible Parts: Leaves Pollen Root Seed StemEdible Uses: Root - raw or cooked[2, 85, 95, 183]. Rich in starch, it can be dried and ground into a powder or made into a syrup[13, 85, 95, 183]. The buds at the end of the rhizomes are crisp and sweet, making excellent eating raw[183]. Young shoots - raw or cooked[85, 183]. Used in spring. Seed - ground up into a powder and mixed with flour for use in making cakes etc[85, 183]. The seed is small and rather fiddly to harvest and utilize. Base of mature stems - raw or cooked. Somewhat tough[85]. Pollen - raw or cooked. Rich in pollen, it is mixed with flour and used in making cakes etc[85, 183].

tcanta Paper Thatching WeavingThe stems are frequently used for making matting, chair bottoms etc and thatching[1, 4, 23, 85, 100, 115]. They were at one time imported in large quantities for this purpose[4]. The pith of the stems is used in paper making[100].

dwatta Astringent Cancer DiureticThe roots are astringent and diuretic[240]. They were formerly employed medicinally but have fallen into disuse[4]. This plant is a traditional medicine for cancer[218].

nrakta Europe, incl Britain, south and east from Lapland to Africa and Asia. N. and C. America, Polynesia. ksacta Bogs, shallow pond margins, rivers and lakes, usually where there is abundant silt, in acid or calcareous conditions[1, 17].

propta Seed - sow in a cold frame as soon as it is ripe in a pot standing in 3cm of water. Only just cover the seed with soil[200]. The seed usually germinates fairly quickly. Prick out the plants when large enough to handle and plant out in their permanent positions in early summer. Division in spring. Very easy, 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 any wet to moisture retentive soil, pond margins and shallow water in full sun or shade[1, 200]. Plants can succeed in fairly deep water. Hardy to about -25°C[187]. Some named forms have been selected for their ornamental value[187].

4.0.33 *Acorus calamus*

Sweet Flag - Calamus

4 tlin 11 cyuc 3 kcaak 0 tcan 4 dwat 1 m hkuu
htut cyutli hja7nhs6s hwicli hrasjlutnyik hpa7tli flatprikliwss
hpa7tmwatli xre7t hjonli

drutta *Acorus calamus* 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 3 and is not frost tender. It is in flower from May 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. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils.

It cannot grow in the shade. It prefers wet soil and can grow in water.

pcista The fresh root can be poisonous[7]. When using the plant medicinally, the isolated essential oil should not be used[165]. The essential oil in the roots of some populations of this plant contains the compound asarone. This has tranquillising and antibiotic activity, but is also potentially toxic and carcinogenic[218, 238]. It seems that these compounds are found in the triploid form of the species (found in Asia) whilst the diploid form (found in N. America and Siberia) is free of the compounds[218, 238]. However, the root (but not the isolated essential oil) has been used in India for thousands of years without reports of cancer which suggests that using the whole herb is completely safe, though more research is needed[254]. Only roots free from or with a low content of beta asarone should be used in human herb therapy. Should be avoided in patients taking monoamine oxidase inhibitor antidepressants as possible side-effects [301].

ckaakta Edible Parts: Leaves Root StemEdible Uses: CondimentThe rhizome is candied and made into a sweetmeat[2, 4, 13, 55, 62, 115, 183]. It can be peeled and washed to remove the bitterness and then eaten raw like a fruit[106, 179]. It makes a palatable vegetable when roasted[192] and can also be used as a flavouring[61]. Rich in starch, the root contains about 1% of an essential oil that is used as a food flavouring[1, 13, 57]. The root also contains a bitter glycoside[179]. Some caution is advised, see the notes above on toxicity. The dried and powdered rhizome has a spicy flavour and is used as a substitute for ginger, cinnamon and nutmeg[4, 55, 142, 177, 183]. A pinch of the powdered rhizome is used as a flavouring in tea[272]. The young and tender inflorescence is often eaten by children for its sweetness[4]. Young leaves - cooked[55]. The fresh leaves contain 0.078% oxalic acid[240]. The leaves can be used to flavour custards in the same way as vanilla pods[244]. The inner portion of young stems is eaten raw[62]. It makes a very palatable salad[183].

tcanta Basketry Incense Insecticide Repellent Strewing Thatching WeavingThe leaves are used in basket making or woven into mats[169]. They have also been used as a thatch for roofs[4]. An essential oil from the rhizome is used in perfumery and as a food flavouring[1, 13, 57]. The oil is contained mainly in the outer skin of the root[245], it has a fragrance reminiscent of patchouli oil[192]. The fresh roots yield about 1.5 - 3.5% essential oil, dried roots about 0.8%[4, 240]. Some plants from Japan have yielded 5% essential oil[4]. The essential oil is also an insect repellent and insecticide[218, 272]. It is effective against houseflies[240]. When added to rice being stored in granaries it has significantly reduced loss caused by insect damage because the oil in the root has sterilized the male rice weevils[244]. An essential oil obtained from the leaves is used in perfumery and for making aromatic vinegars[245]. The leaves and the root have a refreshing scent of cinnamon[245]. All parts of plant can be dried and used to repel insects or to scent linen cupboards[8, 14, 61]. They can also be burnt as an incense[14], whilst the whole plant was formerly used as a strewing herb[4, 14, 115, 238]. The growing plant is said to repel mosquitoes[20, 201].

dwatta Abortifacient Anodyne Antirheumatic Aphrodisiac Aromatic Carminative Diaphoretic Emmenagogue Epilepsy Febrifuge Hallucinogenic Homeopath Odontalgic Sedative Stimulant Stomachic Tonic VermifugeSweet flag has a very long history of medicinal use in many herbal traditions. It is widely employed in modern herbal medicine as an aromatic stimulant and mild tonic[4]. In Ayurveda it is highly valued as a rejuvenator for the brain and nervous system and as a remedy for digestive disorders[254]. However, some care should be taken in its use since some forms of the plant might be carcinogenic - see the notes above on toxicity for more information. The root is anodyne, aphrodisiac, aromatic, carminative, diaphoretic, emmenagogue, expectorant, febrifuge, hallucinogenic, hypotensive, sedative, stimulant, stomachic, mildly tonic and vermifuge[4, 7, 9, 21, 147, 165, 213, 240, 279]. It is used internally in the treatment of digestive complaints, bronchitis, sinusitis etc[238]. It is said to have wonderfully tonic powers of stimulating and normalizing the appetite. In small doses it reduces stomach acidity whilst larger doses increase stomach secretions[254] and it is, therefore, recommended in the treatment of anorexia nervosa[244]. However if the dose is too large it will cause nausea and vomiting[K]. Sweet flag is also used externally to treat skin eruptions, rheumatic pains and neuralgia[238]. An

infusion of the root can bring about an abortion[213] whilst chewing the root alleviates toothache[213]. It is a folk remedy for arthritis, cancer, convulsions, diarrhoea, dyspepsia, epilepsy etc. Chewing the root is said to kill the taste for tobacco[218]. Roots 2 - 3 years old are used since older roots tend to become tough and hollow[4]. They are harvested in late autumn or early spring and are dried for later use[4]. The dry root loses 70% of its weight, but has an improved smell and taste[244]. It does, however, deteriorate if stored for too long[244]. Caution is advised on the use of this root, especially in the form of the distilled essential oil, since large doses can cause mild hallucinations[192]. See also the notes above on toxicity. A homeopathic remedy is made from the roots[9]. It is used in the treatment of flatulence, dyspepsia, anorexia and disorders of the gall bladder[9]. Bath oils containing calamus have caused redness of the skin (erythema) and dermatitis, particularly in hypersensitive individuals [301].

nrakta Europe, Asia and N. America. Naturalized in Britain[17]. ksacta Found in moist soils and shallow water in ditches, marshes, river edges and ponds[1, 100, 187, 244].

propta Seed - best sown in a cold frame as soon as it is ripe. Stand the pot in about 3cm of water. Pot up young seedlings as soon as they are large enough to handle, keep them wet by standing the pots in shallow water and overwinter for the first year in a greenhouse or cold frame. Seed is rarely produced in Britain[4, 17]. Division in spring just before growth starts[1]. Very easy, it can be carried out successfully at any time in the growing season and can be planted direct into its permanent positions[K].

nwatta Landscape Uses:Container, Ground cover, Massing, Rock garden, Seashore. Prefers growing in shallow water or in a very moist loamy soil[200]. Requires a sunny position[200]. Prefers a pH in the range 5.5 to 7.5. Plants are hardy to about -25°C[187]. The sweet flag has a long history of use as a medicinal and culinary plant. It has been cultivated for this purpose but was more commonly allowed to naturalize and was then harvested from the wild. The plant seldom flowers or sets seed in Britain and never does so unless it is growing in water[4]. It can spread quite freely at the roots however and soon becomes established. Special Features: Attractive foliage, North American native, Edible, Fragrant foliage, Naturalizing, Wetlands plant, Inconspicuous flowers or blooms.

4.0.34 Butomus umbellatus

Flowering Rush
4 tin 8 cyuc 3 kcak 1 tcan 0 dwat 1 m hkuc
htut cyutli hja7nhs6s hwicli hrasjlutnyik hpa7tli flatprikwis hpa7tmwatli xre7t hjonli

drutta Butomus umbellatus is a PERENNIAL growing to 1 m (3ft 3in) by 0.5 m (1ft 8in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 5. It is in flower from July to September, and the seeds ripen from August to September. 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. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers wet soil and can grow in water.

kcakta Edible Parts: Root SeedEdible Uses: Tuber - cooked[5, 46, 61, 100, 177]. It should be peeled and the rootlets removed[179]. The root can also be dried and ground into a powder[179], it can then be used as a thickener in soups etc, or be added to cereal flours when making bread[2]. It contains more than 50% starch[13]. Seed[1, 2, 5, 177]. No more details are given, but the seed is very small and fiddly to use[K].

tcanta Butomus umbellatus is cultivated as an ornamental waterside plant.

nrakta Most of Europe, including Britain, and temperate Asia. ksacta Pond margins, ditches and canals, avoiding shade[13, 17].

propta Seed - best surface-sown in a cold frame as soon as it is ripe, it usually germinates in the spring. The seed quickly loses its vitality if it is not kept moist[200]. When large enough to handle, prick the seedlings out into individual pots and grow them on in a tray of water in the cold frame, planting them out into their permanent positions in early summer. Division in spring[188]. Very easy, larger

clumps can be planted direct into their permanent positions. It is best to pot up smaller clumps and grow them on in a cold frame until they are well rooted before planting them out in the summer.

nwatta Requires a sunny position[200]. A plant of wet habitats, it succeeds in wet soils and in water up to 30cm deep[24, 56]. A very ornamental plant[2]. The flowers have a scent of bitter almonds[245].

4.0.35 Crataegus monogyna

Hawthorn, Oneseed hawthorn
4 tin 8 cyuc 3 kcak 3 tcan 5 dwat m hkuc
hmmihtut cyutli hgattcuphja7n hwicli hyishrasjlutnyikfrip hpa7tli frusflatpriklwissip hpa7tmwatli xre7t hjonli
drutta Crataegus monogyna is a deciduous Shrub growing to 6 m (19ft) by 6 m (19ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from May to June, and the seeds ripen from September to November. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay and nutritionally poor soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid and very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist or wet soil and can tolerate drought. The plant can tolerate maritime exposure. It can tolerate atmospheric pollution.

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

tcanta Fuel Hedge Hedge WoodA good hedge plant, it is very tolerant of being cut and of neglect and is able to regenerate if cut back severely, it makes a good thorny stock-proof barrier[186] and resists very strong winds. It is often used in layered hedges[11, 29]. The cultivar ‘Stricta’ has made a very good hedge 3.5 metres tall in an exposed maritime position at Rosewarne in N. Cornwall[1K]. Wood - very hard and tough, difficult to work. Used for tool handles etc. Valued in turning[7, 46, 61]. A good fuel, giving out a lot of heat[4].

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

nrakta Europe, including Britain, absent from Iceland, south and west the the Mediterranean and Afghanistan ks-

It is in flower in June. The species is hermaphrodite (has both male and female organs) and is pollinated by Midges. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very 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 tolerates strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked in pies, preserves etc[1, 2, 3, 11, 34, 183]. The fruit can be used fresh or dried for later use. A pleasant acid taste[89]. In warm temperate areas the fruit develops more fruit sugars and has a fragrant sugary pulp with a slightly acid flavour[183]. It can be eaten out of hand. In cooler zones, however, the fruit does not develop so well and is best cooked or used in preserves[183]. The fruit is very variable in size and colour, it is up to 25mm in diameter[200]. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

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

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

nrakta S. Europe to W. Asia. ksacta Dry hillsides and mountains in woods and hedges[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]. The azarole has long been cultivated for its edible fruit in S. Europe, though it is now going out of favour[3, 11]. There are some named varieties[46]. 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]. Hawthorns in general hybridize freely with other members of the genus[200]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11].

5.0.5 Crataegus champlainensis

Quebec hawthorn
5 tin 9 cyuc 4 kcak 0 tcan 2 dwat 6 m hkuc
hmmihtut cyutli hgattcuphja7n hwicli hrasjlutnyikfrip hpa7tli flatprikwis hpa7tmwatli xre7t hjonli

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

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked. A nice sweet flavour, the fruit is about 1.5cm in diameter[K]. The fruit can be used in making pies, preserves, etc, and can also be dried for later use. There are up to five fairly large seeds in the centre of the fruit, these often stick together and so the effect is of eating a cherry-like fruit with a single seed[K].

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

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

nrakta Northern N. America - Quebec to New York and Ontario. ksacta Thickets, streambanks and hillsides[204]. Limestone ridges[82].

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

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. Hybridizes freely with other members of this genus[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. Closely related to C. submollis[200], and included in that species by some botanists[82]. This species is possibly no more than a

to 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].

5.0.3 *Crataegus schraderana*

Blue hawthorn

5 tlin 9 cyuc 5 kcaak 0 tcan 2 dwat 6 m hkuc hmimhtut cyutli hgattcuphja7n hwicli hrasljutnykfrip hpa7tli flatprikwlisslip 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 can tolerate strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcaakta 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].

5.0.4 *Crataegus azarolus*

Azarole

5 tlin 9 cyuc 4 kcaak 0 tcan 2 dwat 10 m hkuc hmimhtut cyutli hgattcuphja7n hwicli hrasljutnykfrip hpa7tli flatprikwlisslip hpa7tmwatli xre7t hjonli

drutta *Crataegus azarolus* is a deciduous Tree growing to 10 m (32ft 10in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 6 and is not frost tender.

acta Woods, hedges, thickets etc, on most soils except wet peat and poor acid sands[9, 17].

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

nwatta A very easily grown plant, it prefers a well-drained moisture retentive loamy soil but is not at all fussy[11, 200]. Succeeds in all but the very poorest acid soils[186]. Once established, it succeeds in excessively moist soils and also tolerates drought[200]. It grows well on a chalk soil and also in heavy clay soils[200]. A position in full sun is best when plants are being grown for their fruit, they also succeed in semi-shade though fruit yields and quality will be lower in such a position[11, 200]. Most members of this genus succeed in exposed positions, they also tolerate atmospheric pollution[200]. A very hardy plant, tolerating temperatures down to at least -18°C[202]. Hybridizes freely with other members of this genus and with *C. laevigata* in the wild[186, 200]. There are many named forms selected for their ornamental value[200]. Seedling trees take from 5 - 8 years before they start bearing fruit, though grafted trees will often flower heavily in their third year[K]. The flowers have a foetid smell somewhat like decaying fish. This attracts midges which are the main means of fertilization. When freshly open, the flowers have more pleasant scent with balsamic undertones[245]. Seedlings should not be left in a seedbed for more than 2 years without being transplanted[11]. In heavier shade they quickly become drawn and leggy, eventually dying[186]. An important food plant for the caterpillars of many lepidoptera species[30], there are 149 insect species associated with this tree[24]. Plants are susceptible to fireblight[200]. In garden design, as well as the above-ground architecture of a plant, root structure considerations help in choosing plants that work together for their optimal soil requirements including nutrients and water. The root pattern is branching: a heart root, dividing from the crown into several primary roots going down and out [2-1].

4.0.36 *Stachys palustris*

Marsh Woundwort, Marsh hedgenettle

4 tlin 8 cyuc 3 kcaak 1 tcan 2 dwat 1 m hkuc hmimhtut cyutli tcuphja7n hwicli hrasljutnyk hpa7tli flatprikwlis hpa7tmwatli xre7t hjonli

drutta *Stachys palustris* is a PERENNIAL growing to 1 m (3ft 3in) by 0.4 m (1ft 4in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from July to September, and the seeds ripen from August to October. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. It is noted for attracting wildlife. Suitable for: light (sandy), 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 or wet soil.

pcista Avoid during pregnancy and breast feeding [301]. kcaakta Edible Parts: Leaves Root SeedEdible Uses: Tubers - raw or cooked[K]. A wholesome and nutritious food[4], they have a pleasant mild nutty flavour[K]. The tubers can be dried and ground into a powder that is used in making

bread etc[2, 4, 12, 115, 183]. The tubers are formed in the autumn[17]. Although quite small, they are fairly smooth and produced in a reasonable quantity so are not too fiddly to utilize[K]. Young shoots - cooked. Used as an asparagus substitute[183]. A pleasant taste but the smell is disagreeable[4]. Seed[257]. No further details are given[257].

tcanta DyeA yellow dye is obtained from the plant[207]. dwatta Antiseptic Antispasmodic Emetic Emmenagogue Expectorant Haemostatic Nervine Sedative Tonic Vulnerary-The plant is antiseptic, antispasmodic, emetic, emmenagogue, expectorant, haemostatic, nervine, sedative, tonic, vulnerary[4, 61, 218]. The plant has been highly valued for its wound-healing activity, being effective against both internal and external bleeding, and is also used in the treatment of gout, cramps and pains in the joints[4]. The herb is harvested in the summer when just coming into flower and can be dried for later use[4].

nrakta Europe, including Britain, south and east from Norway to Portugal and temperate Asia to Japan. ksacta By streams and ditches, also in swamps and fens. Occasionally found on arable land[17].

propta Seed - sow spring in a cold frame. Prick out the seedlings into individual pots once they are large enough to handle and plant them out in the 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 Requires a moist soil for good root production[2, 24]. A good bee plant[24]. All parts of the plant emit an unpleasant smell when bruised[245]. 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].

4.0.37 *Cardamine pratensis*

Cuckoo Flower

4 tlin 8 cyuc 3 kcaak 2 tcan 2 dwat 0.5 m hkuc hmimhtut cyutli tcuphja7n hwicli hrasljutnyk hpa7tli flatprikwlis hpa7tmwatli fyifxre7t hjonli

drutta *Cardamine pratensis* is a PERENNIAL growing to 0.5 m (1ft 8in) by 0.3 m (1ft). See above for USDA hardiness. It is hardy to UK zone 4 and is not frost tender. It is in flower from April 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, 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. 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.

kcaakta Edible Parts: Flowers LeavesEdible Uses: Leaves and young shoots - raw or cooked[2, 5, 12, 52, 115]. Rich in vitamins and minerals[268], especially vitamin C[238], but with a bitter and pungent flavour[27]. The leaves and young shoots are harvested in the spring and taste rather like water cress[9]. The leaves can be available early in the year[K] and when used in small quantities make a very acceptable addition to salads[183, K]. Flowers and flower buds - raw. A pungent cress-like flavour[183, K]. The white flowers are very attractive, they make a pleasant nibble and also add a delicious flavour to salads[K].

tcanta Attracts wildlife.

dwatta Antirheumatic Antiscorbatic Antispasmodic Carmative Digestive Diuretic Stimulant Vitamin CCuckoo flower is seldom used in herbalism, though an infusion of the leaves has been used to treat indigestion and promote appetite[268]. The leaves and the flowering plant are antirheumatic, antiscorbatic, antispasmodic, carminative, digestive, diuretic, stimulant[9, 146, 172, 238, 240]. They are used internally in the treatment of chronic skin complaints, asthma and hysteria[238]. The plant is harvested in spring and early summer and is best used when fresh[9, 238].

nrakta Most of Europe, including Britain, N. Asia and N. America. ksacta Moist, slightly shady places in meadows and by streams[13, 31, 187], usually in acid soils[9].

propta Seed - sow outdoors in a seedbed in a shady position in April. Plant out in autumn or spring. Division in spring or autumn[238]. The plant produces young plants at the base of its leaflets. When large enough, these can be easily separated from the main plant and grown on as individual plants[K].

nwatta Succeeds in most soils[1, 111] so long as they are moist or wet[187, 188]. Prefers a cool damp soil[111]. Succeeds in full sun or partial shade[238]. Cuckoo flower was at one time much used as a spring salad plant and was often sold in local markets. It has, however, fallen out of favour and is scarcely used at present[268]. A polymorphic species[17]. A very ornamental plant, non-invasive and well suited to the wild garden though it may require protection from wood pigeons who eat out the young buds in spring[187]. It grows well in the spring meadow[24]. A food plant for the orange tip butterfly[24]. There is at least one named variety, selected for its ornamental value. ‘Flore Pleno’ is a double flowered form[187]. The plant is heat tolerant in zones 8 through 5. (Plant Hardiness Zones show how well plants withstand cold winter temperatures. Plant Heat Zones show when plants would start suffering from the heat. The Plant Heat Zone map is based on the number of “heat days” experienced in a given area where the temperature climbs to over 86 degrees F (30°C). At this temperature, many plants begin to suffer physiological damage. Heat Zones range from 1 (no heat days) to 12 (210 or more heat days). For example Heat Zone. 11-1 indicates that the plant is heat tolerant in zones 11 through 1.) For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a clumper with limited spread [1-2]. The root pattern is rhizomatous with underground stems sending roots and shoots along their length [1-2].

4.0.38 Peltandra virginica

Green Arrow Arum

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

htut cyutli hja7nhs6s hwicli hrasjlutnyik hpa7tli flatprik hpa7tmwatli hjonli

drutta Peltandra virginica is a PERENNIAL growing to 0.3 m (1ft). See above for USDA hardiness. It is hardy to UK zone 5. It is in flower in June. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant). Suitable for: light (sandy), medium (loamy) and heavy (clay) soils. Suitable pH: mildly acid and neutral soils. It cannot grow in the shade. It prefers wet soil and can grow in water.

pcista The plant is rich in calcium oxylate, this is toxic and if consumed makes the mouth and digestive tract feel as though hundreds of tiny needles are being stuck into it. However, calcium oxylate is easily destroyed by thoroughly cooking or drying the plant[95].

kcakta Edible Parts: Flowers Root SeedEdible Uses: Seed - cooked. A slightly sweetish flavour, resembling parched corn[183]. A bread can be made from the dried and powdered seeds, it tastes like corncake with a strong flavour of cocoa[183]. Spadix (the flowering stem) and berries - cooked[2, 46, 61, 105]. A great delicacy, but they must be very well cooked otherwise they are poisonous[207]. The Indians would boil them for 9 hours[207]. Root - must be well cooked in order to destroy an acrimonious principle, see the notes above on toxicity[95]. The root is rich in starch[2, 46, 57, 61, 105] and can weigh up to 2.7 kilos[95]. It is highly astringent and has an unpleasant flavour[159]. The root can be dried and ground into a powder for use when making bread, soups etc[207].

nrakta Eastern N. America - Maine to Ontario, Michigan, Florida, Louisiana and Missouri. ksacta Swamps, borders of ponds and slow streams[1, 43].

propta Seed - best sown as soon as it is ripe in late summer in pots of soil that are submerged to their rims in water[200]. When they are large enough to handle, prick the seedlings out into individual pots and grow them on in trays of water in the greenhouse for their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. Division in spring[200]. 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. Stem cuttings rooted in wet mud in the summer[200].

nwatta Requires a wet lime-free humus-rich soil in the side of water or in shallow still or slowly flowing water in a sunny position[200]. Plants are best grown in clumps[1].

4.0.39 Lycopus uniflorus

Bugleweed, Northern bugleweed

4 tlin 8 cyuc 3 kcak 0 tcan 1 dwat 0.3 m hkuc hmimhtut cyutli tcuphja7n hwicli hrasjlutnyik hpa7tli flatprikwis hpa7tmwatli xre7t hjonli

drutta Lycopus uniflorus is a PERENNIAL growing to 0.3 m (1ft). 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 Bees, flies. 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 or wet soil.

kcakta Edible Parts: RootEdible Uses: Root - raw or cooked[55, 61, 62, 105, 161]. The roots were a staple food for some native North American Indian tribes[257]. The crisp white tubers can be eaten raw in salads or cooked in soups etc[183]. When boiled for a short time they are said to make an agreeable vegetable, somewhat like Chinese artichokes (Stachys affinis)[183].

dwatta Antitussive SedativeThe whole plant is antitussive and sedative[61].

nrakta N. America - Newfoundland to British Columbia, North Carolina, Nebraska and Oregon ksacta Low, wet or boggy ground in the north of its range, wet woodland in the south[43].

propta Seed - sow spring or autumn in a cold frame[238]. 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 them out into their permanent positions in early summer. Division in spring or autumn[238]. 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 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 the country. This species might be no more than a synonym for L. virginicus, a species known to be hardy in Britain. The following notes are based on the general needs of the genus. Tolerates most soil types so long as they are wet. Succeeds in damp meadows or in wet places by ponds or streams[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 stoloniferous rooting from creeping stems above the ground [1-2]. The root pattern is tuberous with swollen potato-like roots [1-2].

4.0.40 Glyceria fluitans

Floating Manna Grass, Water mannagrass

4 tlin 8 cyuc 3 kcak 0 tcan 0 dwat 0.5 m hkuc

htut cyutli hja7nhs6s hwicli hrasjlutnyik hpa7tli frusflatprik-wisslip hpa7tmwatli xre7t hjonli

drutta Glyceria fluitans is a PERENNIAL growing to 0.5 m (1ft 8in) by 0.5 m (1ft 8in). See above for USDA hardiness. It is hardy to UK zone 5 and is not frost tender. It is in flower from May to August. 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) soils and can grow in very acid and very alkaline soils. It cannot grow in the shade. It prefers wet soil and can grow in water.

kcakta Edible Parts: SeedEdible Uses: Seed - raw or cooked[43, 57, 100]. A sweetish taste, the seed was considered a delicacy in some parts of Europe and was an article of

commerce until well into the 20th century[183]. A flour from the seed is said to make a bread little inferior to wheat bread, the flour can also be used as a thickener in soups etc when it imparts a sweet delicate flavour[183]. Unfortunately, the seed is very small and therefore the plant is relatively unproductive[K].

tcanta IncenseThe leaves have been burnt as an incense[257].

nrakta Europe, including Britain, temperate Asia the Caucasus and N. America. ksacta Shallow water, either stagnant or slow flowing, or in wet soils whether acid or calcareous[17].

propta Seed - sow spring in a greenhouse in a pot standing in 3 - 5cm of water. Surface sow the seed, or only just cover it. Germination should take place within 3 weeks. When they are large enough to handle, prick the seedlings out into individual pots and plant them out in early summer. If you have sufficient seed then it can be sown outdoors in situ in mid to late spring. Division in spring. Very easy, larger clumps can be replanted direct into their permanent positions, though it is best to pot up smaller clumps and grow them on in a cold frame until they are rooting well. Plant them out in the spring.

nwatta Historic Staple Management: Standard Staple Crop: Balanced carbSucceeds in most soils, so long as they are wet, and in shallow water[115]. Dislikes shade. This plant is occasionally cultivated for its edible seed[115], it is not very large and is somewhat fiddly to harvest but is considered to be an epicure’s food[183].

5 5 tlin

5.0.1 Crataegus pennsylvanica

5 tlin 9 cyuc 5 kcak 0 tcan 2 dwat 9 m hkuc

hmimhtut cyutli hgattcuphja7n hwicli hrasjlutnyikfrip hpa7tli flatprikwisslip 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 tolerates 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 fertile 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].

5.0.2 Crataegus arnoldiana

Arnold Hawthorn

5 tlin 9 cyuc 5 kcak 0 tcan 2 dwat 7 m hkuc

hmimhtut cyutli hgaktyucuphja7n hwicli hrasjlutnyikfrip hpa7tli flatprikwisslip 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 tolerates strong winds but not maritime exposure. It can tolerate atmospheric pollution.

kcakta Edible Parts: FruitEdible 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 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