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Plants For a Future 2021CE Hardiness Zone 12, Wet, African Origin

pfaf.org

2021

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1 Introduction

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

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

Instructions for food forest design are in separate books. But basic idea is to have thorny plants on the border as a form of fence to keep out predators and animals that want to raid your food forest, with the shortest plants closest to the border, then gradually getting taller plants as you go in. For example starting with thorny 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 your dry season digging swales and vernal pools, that will collect the rain water during the flash floods and keep it in place so that it enters

the ground, then you can grow things downhill of your vernal pools and swales. It is generally more important that they be extensive than deep. You want to ideally catch every drop, so that none of it leaves your property.

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

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

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

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

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

1.1 Pronunciation guide

a /a/, b /b/, c /f/ "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 /q/ "ng", r /r/, s /s/, t /t/, u /u/, v /v/, w /w/, x /x/ /g/ "gh", y /j/, z /z/, 2 /1/ (low tone), 6 /ə/ "uh", 7 /ɪ/ (high tone).

1.2 vocabulary

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

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

hgat /hgat/ drought (tolerant), kyuc /kju/ dry, tcup /tʃup/ damp, hja7n /hʒa 7n/ wet, hś6ś /hś6ś/ puddle, hwic /hwɪ/ water (requirement).

hyis /hjis/ poor (soil), hras /hras/ sandy, jlut /ʒlut/ loamy, nyik /njik/ mud (silt/clay loam), frip /frip/ pottery (heavy clay), hpa7t /hpa 7t/ topsoil.

frus /frus/ corrosive (very acid), flat /flat/ acid, prik /prik/ passive (neutral), lwis /lwis/ alkaline, slip /slip/ slippery (very alkaline), hśom /hśom/ salt (saline), hpa7tmwat /hpa 7tmwat/ topsoil taste.

fyif /fjif/ self (fertile), xre7t /xre 7t/, nyanhjen /njanhʒen/ male-female (dioecious, distinct male and female plants), hjon /hʒon/ sex.

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

12 hmucrotkceec, tcup hmuchwic, 3 ksankcaak, jlut hmuchpa7t, prik hmuchpa7tmwat, 83 xlutkfam.

2 7 tlin

2.0.1 Sorghum hybrids

Perennial Sorghum

7 tlin 12 cyuc 4 keak 3 tcan 1 dwat 3 m hkuc
htut cyutli hgatyuctcup hwicli hrasjlutnyik hpa7tli flatprik-
wis hpa7tmwatli hjonli

drutta Sorghum hybrids is a PERENNIAL growing to 3 m (9ft) by 1 m (3ft 3in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 7. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

pcista The pollen can induce hay fever[269].

kcakta Edible Parts: Seed StemEdible Uses: Carbon Farming Solutions - Staple Crop: balanced carb, 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 Possible but not reported. Sorghum halepense is a good biomass plant. The plant is a potential source of biomass with yields of up to 19 tonnes per hectare[269]. Sorghum bicolor has been used as Biomass, Brooms, and for Weaving. The flowering panicles are used as brushes brooms and whisks etc[1, 2, 4, 46, 57]. Stems are used for weaving fences, mats, wattle houses etc[178]. The plant is an excellent source of biomass[269].

dwatta Possible. For example Sorghum bicolor is Astringent, Demulcent, Diuretic, and Haemostatic. Sorghum halepense is Demulcent and Diuretic.

nrakta Origin: Hypothetical hybrid. Sorghum species range extend to Australia, Africa, Asia, Mesoamerica, and certain islands in the Indian and Pacific Oceans. ksacta Not known in the wild. Under development

propta Seed - sow April in a greenhouse and only just cover the seed. Germination should take place within 2 weeks. Prick out the seedlings into individual pots once they are large enough to handle and plant them out after the last expected frosts. Division in mid spring as the plant comes into new growth. 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 Management: Hay Management: Standard Staple Crop: Balanced carb Staple Crop: Sugar Under DevelopmentClimate: cold temperate to tropical, tropical highlands. Humidity: semi-arid to humid. Sorghum is well suited for dry conditions, areas with uneven rainfall distribution that may adversely affect the growing season of other crops, and high year to year variation in rainfall and water supplies. Carbon Farming Solutions - Cultivation: under development. Management: standard, hay (Describes the non-destructive management systems that are used in cultivation) [1-1]. Sorghum is already weakly perennial in the tropics. It "rattoons", or resprouts for several years. Perennial breeding at the Land Institution focused on crosses with Johnsongrass (Sorghum halepense), while other breeders focus on Ni gao liang (Sorghum propinquum). Perennial sorghum could be bread for grain and sweet syrup. Sorghum is particularly suited to dry regions and some promising hybrids have been trialed [1-1]. For polyculture design as well as the above-ground architecture (form - tree, shrub etc. and size shown above) information on the habit and root pattern is also useful and given here if available. The plant growth habit is a runner spreading indefinitely by rhizomes or stolons [1-2].

3 8 tlin

3.1 bwon

3.1.1 Psophocarpus tetragonolobus

Winged Bean

tfo2n 8 tlin 12 cyuc 3 keak 3 tcan 0 dwat 2 m hkuc

htut cyutli tcup hwicli hrasjlutnyikfrip hpa7tli flatprikwis hpa7tmwatli xre7t hjonli

drutta Psophocarpus tetragonolobus is a PERENNIAL growing to 2 m (6ft 7in). See above for USDA hardiness. It is hardy to UK zone 10 and is frost tender. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil 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 soil.

kcakta Edible Parts: Flowers Leaves Oil Oil Root Seed Seedpod StemEdible Uses: Coffee Colouring Oil OilYoung seedpods - cooked for a few minutes[2, 46, 61, 116]. They tastes like French beans (Phaseolus vulgaris)[183]. The pods are harvested when about 15 - 20 cm long and 2cm wide[200]. They will store for up to 21 days at 10°C with a relative humidity of 90%[200]. The yields of pods average 250 - 500g per m²[200]. Immature seeds are used in soups etc[183]. Mature seeds are eaten cooked[2, 46, 61, 116]. They are very nutritious, being rich in oil (up to 17%)[160], protein, vitamin E and calcium. The seed can also be roasted and eaten like peanuts or fermented and used as tempeh[183]. An edible oil is obtained from the seed[183]. Root - raw or cooked like potatoes[160, 183]. Slightly sweet, it contains 20% or more protein, which is about 12 times that of potatoes[116, 183]. Leaves and young shoots - cooked. They are used like spinach[61, 116, 183]. Flowers and flower buds - raw or cooked[183]. They have a flavour similar to mushrooms when sautéed[161]. The light blue flowers are also used as a colouring in foods[183]. The roasted seed is a coffee substitute[183].

tcanta Green manure Oil Oil Soil reclamationA very good green manure with exceptional nitrogen-fixing properties, producing a greater weight of nodules per plant than any other member of the Leguminosae[200]. It is used for soil improvement and restoration[200].

nrakta Original habitat is obscure, probably Tropical Africa. ksacta Not known in the wild.

propta Pre-soak the seed for 12 hours in warm water and sow in early spring in a warm greenhouse. Place two or three seeds in each pot, thinning to the strongest plant. Plant them out in late spring or early summer, after the last expected frosts and give them the protection of a cloche or cold frame until they are growing away strongly[240].

nwatta Agroforestry Services: Nitrogen Management: Standard Minor Global Crop Staple Crop: Protein-oilPrefers a loamy slightly acidic soil, but there are cultivars suitable for many soil types[200]. Tolerates heavy soils[116] but dislikes wet soils[200]. Dislikes drought[200]. Very widely cultivated as a food plant in the tropics and sub-tropics, there are many named varieties[183]. It is usually treated as an annual. In temperate zones it has to be grown as an annual crop. Most varieties will only flower when daylight hours are around 12 per day[116] but day-neutral varieties are being developed that will flower in the summer in northerly and southerly latitudes[200]. Temperatures in the range of 25 - 30°C are necessary for optimum growth[200]. Plants take 60 - 80 days from sowing to the first harvest of seedpods[200]. Mature tubers can be harvested 120 - 240 days from sowing[200]. The plant is very disease resistant[160]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[200].

3.2 mran

3.2.1 Tacca leontopetaloides

Polynesian Arrowroot, Pia

8 tlin 12 cyuc 4 keak 3 tcan 2 dwat 1 m hkuc
hmimhtut cyutli tcup hwicli hrasjlutnyik hpa7tli frusflatprik hpa7tmwatli hjonli

drutta Tacca leontopetaloides is an evergreen Perennial growing to 1 m (3ft 3in) by 1 m (3ft 3in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 9. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and

and heals wounds, swellings, dermatitis, bruises and other skin problems[299]. The high proportion of unsaponifiable matter, consisting of 60 - 70% triterpene alcohols, gives shea butter creams good penetrative properties[299]. Allantoin, another unsaponifiable compound, is responsible for the anti-inflammatory and healing effect on the skin[299]. The fat is used traditionally to relieve inflammation of the nostrils[299]. Clinical tests with patients suffering from rhinitis, and having moderate to severe nasal congestion, showed that shea butter may relieve nasal congestion better than conventional nasal drops[299]. The leaves are used to treat stomach-ache[299]. They are also added to vapour baths to treat headache and as an eye bath[299]. Ground roots and bark are used to treat diarrhoea, jaundice and stomach-ache[299]. Bark infusions have medicinal and antimicrobial properties, e.g. against dysentery[299]. They are applied as an eyewash to counteract spitting-cobra venom[299]. A bark decoction has been used in baths to facilitate childbirth and stimulate lactation among feeding mothers[299]

nrakta Tropical Africa - Senegal to Sudan, and to western Ethiopia and Uganda. ksacta Open sites and parkland savannah[303]. A characteristic of the West African savannah, though it is also present in the southern Sahel[299].

propta Seed - should not be dried, but sown as soon as possible because their viability is very short. When fresh seed is used, germination is 90 - 97% at 25 - 30°C[299]. Storing seed at 25°C for 70 days and 140 days resulted in 96% and 88% germination, respectively[299]. Seed can be planted directly in the field or in the nursery. Seed-beds are made of a mixture of organic compost and sand[299]. Seeds are planted at 1 - 5 cm depth[299]. After 1 year, seedlings are transplanted in the nursery or planted directly in the field[299]. Those grown in containers are transplanted after 1 - 2 years[299]. Vegetative propagation has only been successful in experiments. Grafting can accelerate the fruiting of the tree. In experiments in Burkina Faso, some grafted seedlings started to bear fruit one year after grafting[299]. Latex exudation interferes with rooting of cuttings and with grafting. A 25% success rate can be achieved in grafting if the scion is soaked in water for a few hours to allow the latex to drain[299]. Marcotting has been tried with some success; growth hormones improved the success rate[299].

nwatta Management: Standard Minor Global Crop Staple Crop: OilShea butter tree is a plant of the drier lowland tropics, usually at elevations up to 600 metres, though it can also be cultivated at elevations up to 1,500 metres[303, 418]. It grows best in areas where annual daytime temperatures are within the range 24 - 38°C, but can tolerate 18 - 43°C[418]. It prefers a mean annual rainfall in the range 500 - 1,000mm, but tolerates 300 - 1,800mm[418]. Grows best in a sunny position, tolerating light shade[418]. Succeeds on a variety of soils such as clay; sandy clay; sand; stony soil and laterites. It prefers colluvial slopes with

moderately moist, deep soils, rich in organic matter[299]. Plants can also succeed in poor, lateritic soils[335]. Prefers a pH in the range 6 - 7, tolerating 5.5 - 8[418]. There are two main forms of the plant:- Ssp. Paradoxa grows at lower elevations, mostly at 100 - 600 metres, though can be found as high as 1,300 metres[299]. The mean annual temperature in its range is 25 - 29°C, with a mean annual rainfall of 600 - 1,400mm and 5 - 8 months dry season where the precipitation is less than 50 mm[299]. Ssp. Nitotica is found at the somewhat higher elevations of 450 - 1,600 metres where the mean annual rainfall is 900 - 1,400 mm and there are only 3 - 5 dry months[299]. Shea butter trees have been protected by farmers for many centuries in the West African savannah, particularly where cattle are scarce. Productive trees are retained when new fields are cleared, leading to areas in Sudan where more than 40% of the trees are Shea butter. Natural regeneration is favoured by fallow of at least 5 years. Shortening the fallow period leads to insufficient regeneration. In areas of cultivation, shea butter tree is found in association with annual crops, such as pearl millet, sorghum, groundnut, cotton, cassava, yams and vegetables[299]. The tree produces a taproot up to 1, occasionally 2 metres long; with shallow lateral roots that are concentrated at a depth of 10 cm and extend up to 20 metres outward from the tree; and secondary lateral roots growing downwards to the same depth as the tap root[299]. The taproot and secondary root system strongly develop during the first few years of growth. This enables the seedling to produce new shoots when the original ones are damaged by drought or fire[299]. Early stem growth is slow; branching occurs after 4 - 7 years. The tree begins flowering at the age of 10 - 25 years. Early flowers may be sterile. Maturity is reached at 20 - 45 years and the total lifespan is around 200 - 300 years[299]. Leaf fall, flowering, flushing and the onset of fruiting occur during the dry season. Leaves drop mostly at the beginning of the dry season. Trees are rarely completely leafless, or only for relatively short periods. Flowering occurs from the beginning to the middle of the dry season. About 25% of the flowers set fruit. Fruits develop in 4 - 6 months; maturation peaks in the rainy season[299]. Productivity of the trees is variable. In a sample taken in Burkina Faso, the best 25% of the trees produced 60% of the yield, while the poorest 30% of trees produced little fruit[299]. A good tree can bear on average 15 - 30 kg fruits per year. In a good year this may be as much as 50 kg, but then only about 15 kg in the next two years[299] Although a clear production cycle is not confirmed, observations show a tendency for trees to give only 1 good harvest every 3 - 4 years[299]. Although the trees are fire tolerant, their growth and fruiting are affected by fire. Therefore, trees must be protected by ring weeding[299]. The tree is an important source of honey. Beehives placed in its branches are assured a good supply of nectar and pollen[299].

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leaf-sap is distilled into the ear for ear-trouble[332]. A leaf decoction is prepared as a vapour-bath for treating feverish stiffness with headache[332].

nrakta Southern and western Tropical Africa - Ghana to the Congo. ksacta Swamp forest[308]. Evergreen forest[332]. A shade-loving species of non-flooded forests in the humid tropical zone[303]. Where there is a well-marked season, it is found only in gallery forest and on swampy ground[303].

propta Seed - it has a short viability, its germination rate drops sharply unless its water content (42% of fresh weight) can be maintained. Unless sown within a week, germination and vigour are greatly reduced[299]. Sow the seed in light shade in a nursery seedbed or in individual containers. Germination starts about 2 weeks after sowing and is epigeal. Early growth is vigorous - the seedlings growing rhythmically, extending by flushes. During a flush, the leaf form changes abruptly from cataphylls (0 - 3 per flush) to normal leaves (with 11 - 19 leaflets). The flush is usually brought to an end by the sudden transition from normal leaves to severely reduced leaves in which only one or two basal pairs of leaflets are extended[299]. Cuttings have proved difficult[299]. Air layering. Up to 80% success has been reported. It takes 4 - 6 months before the layer is ready to remove from the parent, and this should be done when the plant is not in active growth[299].

nwatta Management: Standard Other Systems: Home-garden Other Systems: Multistrata Regional Crop Staple Crop: Protein-oilA plant of the relatively dry tropical savannah, where it is found at elevations up to 1,000 metres. It grows best in areas where annual daytime temperatures are within the range 18 - 28c but can tolerate 14 - 35c[418]. It prefers a mean annual rainfall in the range 1,200 - 3,000mm, but tolerates 1,000 - 5,000mm[418]. The plant can be cultivated in a wide range of areas, since it adapts well to differences in day length, temperature, rainfall, soils and altitude[303]. Seedlings can thrive in quite dense shade, but older trees grow well in partial shade or full sun[418]. Grows in a wide range of soils, even succeeding in leached, infertile ferrallitic soils and swampy soils[299, 303, 418]. Prefers a pH in the range 5 - 6.5, tolerating 4 - 8[418]. Seedling plants can commence fruiting when about 5 - 6 years old[335]. Flowering time and duration depend on latitude and genotype. Some trees flower early, while others flower late and may produce blossoms continuously for several months[303]. Yields of 20 - 50 kilos of fruit can be expected from each tree, with reports of 110 kilos from 20 year old trees[299]. The flowers open in the morning and pollen is shed within 1 - 2 hours, so pollination has to be effected quickly[299]. Trees can be male, female, or hermaphroditic[303]. Male trees may produce a limited number of female flowers, and thus some fruit[303]. Blooms all year. Blooms repeatedly. Carbon Farming - Cultivation: regional crop. Management: standard.

6.0.2 Vitellaria paradoxa

Shea Butter Tree

11 htin 12 cyuc 4 kcak 4 tcan 5 dwat 15 m hkuc hmimhtut cyutli kyactup hwicli hyhras[utnyik hpa7tli flat-prikliwis hpa7tmwatli fyif hjonli

drutta Vitellaria paradoxa is a deciduous Tree growing to 15 m (49ft) by 15 m (49ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Bees. The plant is self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil.

ksacta Edible Parts: Flowers Fruit Inner bark Oil Sap SeedEdible Uses: Gum OilThe kernel of the seed (often incorrectly called 'nut') contains a vegetable fat known as shea butter[63, 299, 301]. Shea butter from fresh seeds is white, odourless and of high quality, while that from stale seeds is dark, and tastes bitter[299]. High quality shea butter is consumed throughout West Africa as a cooking fat. Refined fat has been marketed as margarine and baking fat. It is used for pastries and confectionery because it makes the dough pliable[63, 299]. It is a useful cocoa butter substitute because it has a similar melting point (32 - 45°C) and high amounts

of di-stearin (30%) and some stearo-palmitine (6.5%) which make it blend with cocoa butter without altering flow properties[299]. In rural areas, seeds are traditionally processed by hot water extraction, usually the job of women. The fruit pulp is first removed for food, or by fermentation or boiling. The seeds are then boiled and later sun- or kiln-dried. Sun-drying may take 5 - 10 days. Seeds are cracked using mortar and pestle, or stones; the kernels are removed by trampling and redried before being crushed, ground and kneaded to form a paste; the paste is put in water, heated or boiled and the boiling mass is churned until a grey, oily fat separates from the emulsion. The fat is skimmed off from the surface and washed to remove impurities. The congealed fat may subsequently undergo further refining before being moulded in to various forms[299]. This traditional method of processing is inefficient and labour intensive. Mechanization of the various operations, in particular the use of hydraulic or continuous screw expellers or application of solvent extraction, will improve oil extraction efficiency considerably. Pre-treatment of the kernel paste with enzymes (e.g. proteases and cellulases) may also result in higher extraction rates[299]. In spite of their slightly laxative properties, mature fresh fruits are considered an important local food[299]. They are commonly eaten in savannah regions because they ripen during the land preparation and planting season[299].The pulp has a sweet flavour[299]. The flowers are also considered an important local foods[299] They are sometimes made into fritters[299]. The reddish latex which exudes from deep cuts in the bark is used as a chewing gum[299].

tcanta Charcoal Cosmetic Fertilizer Filter Fuel Furniture Gum Hair Mulch Oil Soap making Teeth WoodAgro-forestry Uses: The tree regenerates well, and is traditionally favoured and protected by farmers. As a result, it has played a significant role in soil and water conservation and environmental protection in semi-arid West Africa[303]. The husks of the seeds make a good mulch and fertilizer[303]. Studies on the by-products of shea-butter processing have shown that heavy-metal ions can be removed from aqueous solutions, for example waste water, using Vitellaria seed husks[303]. The tree combines well with many cereal crops[303]. Other Uses Shea butter is a vegetable fat obtained from the seed[63, 299]. Many cosmetic products, especially moisturizers, lotions and lipsticks, use it as a base because its high unsaponifiable matter content imparts excellent moisturizing characteristics[299]. The high proportion of unsaponifiable matter, consisting of 60 - 70% triterpene alcohols, gives shea butter creams good penetrative properties that are particularly useful in cosmetics. Allantoin, another unsaponifiable compound, is responsible for the anti-inflammatory and healing effect on the skin. It is used in toothpastes and other oral hygiene products, in shampoos, lipsticks, cosmetic lotions and creams, and other cosmetic and pharmaceutical products[299]. Low-quality shea butter, often mixed with other oils, is a base material for soap[299]. Shea butter is also very suitable for making candles because of its high melting point[299]. As a waterproofing agent, shea butter is used as daubing for earthen walls, doors and windows[299]. The black sticky residue, left after oil extraction, is used to fill cracks in walls and also as a waterproofing material[299]. Waste water from shea butter production has pesticidal properties[299]. The press cake and the husks remaining after oil extraction are potential fertilizers and fuels[299]. The leaves, soaked in water, produce a good lather for washing[299]. The reddish latex (gutta shea or red kano rubber) which exudes from deep cuts in the bark is made into glue, chewing gum and balls for children's games[299]. Musicians use it to repair drums[299]. Only unproductive and unhealthy trees are cut for timber[299]. The wood is moderately heavy and hard. It is liable to crack on drying and needs to be seasoned slowly. It is difficult to work and tends to split on sawing, but it polishes well. It glues, nails and screws well, but pre-boring is recommended to avoid splitting. It is durable and resistant to termites. Both sapwood and heartwood are resistant to impregnation with preservatives[299]. The wood is used for poles, house posts, rafters, flooring, domestic utensils and furniture[299]. It is an excellent fuel wood, burning with great heat, and a source of charcoal[299].

dwatta Antibacterial Antidermatosis Antidiarrhoeal Antiinflammatory Antirheumatic Dysentery Odonatlog Ophthalmic SkinShea butter is a suitable base for topical medicines. Its application relieves rheumatic and joint pains

prefers well-drained soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

pcista The untreated root is considered to be toxic in some areas[398, 451].

ksacta Edible Parts: RootEdible Uses: The root is a rich source of starch. It can be eaten raw or roasted, or the starch can be extracted[301]. The tubers have eyes, a pale-yellow skin and dull-whitish flesh, and are usually bitter and almost inedible when raw[429]. The starch, called Tahiti (or Fiji) arrowroot, is easy to extract and is used in breads or soups, it can be mixed with papayas, bananas and pumpkins, flavoured with vanilla and lemon, and cooked into poi[301, 429]. Good washing is essential because of the presence of the bitter substance (taccalin) which is said to be poisonous[451]. To obtain the starch, the tubers are peeled, grated, and the resultant pulp washed in water several times, finally in a sieve or cloth. The aqueous starch solution is collected and the starch grains allowed to settle out, collected and dried in the sun[429]. In cultivated plants the tuber can be 5 - 10cm long, with unconfirmed reports saying that it may reach the size of a coconut[451].

tcanta Adhesive Broom Fibre Miscellany WeavingOther Uses The leaf stalks and flower scapes make an excellent straw which can be used as a plaiting material for hats and bonnets[454, 459]. The straw is split into narrow strips then cured and dried. It is said to make an excellent, lightweight, glossy, white hat[459]. The leaf stalks are made into brooms[454]. The fresh starch extracted from the roots is used as a starch for clothes and as a glue[459]. Traditionally, it is employed for pasting together the thin layers of beaten bark of the paper mulberry (Broussonetia papyrifera) in making tapa cloth[459].

dwatta Antidiarrhoeal Dysentery Miscellany Skin StingsPolynesian arrowroot is often used in traditional medicine in the Pacific Islands[311]. The inside of the root is squeezed in water and applied as a rinse to injured eyes. The starch from the tubers of the plant was used as a remedy for diarrhoea and dysentery[311]. The root is also used as a thickener in medical preparations[311]. The starch from the root is rubbed onto sores and burns[311]. The crushed leaf stalks of the plant are rubbed onto bee and wasp stings[311]. The stem is roasted and the sap squeezed out and used in the form of ear drops as a remedy for earache[398].

nrakta Widely spread in tropical areas, either as a native plant or naturalized, from Africa, through Asia to Australia and the Pacific.. ksacta Secondary forest and thickets, and many open situations, clearings, grassland, savannah, coconut groves, and beach vegetation (Barringtonia formation), not shunning seasonally dry areas, such as teak and eucalypt woodland[451].

propta Seed - Division of the small, tuberous rhizomes which form at the base of the plant and often remain in the soil when the larger ones are harvested[429]

nwatta A plant of low elevations in the moist tropics, where it is most commonly found near the sea and below elevations of 200 metres[429]. Grows best in a fertile, humus-rich soil in the shade of trees[200]. Plants can set seed three years from being a seedling[451]. The tuber is replaced during the year by a new main tuber which arises from a downward-growing runner-like thick rhizome at a lower level and remains dormant after the yearly death of the aerial parts of the original plant[451]. Tubers are harvested when the aerial parts have died off[451]. It usually takes about 8 months from planting the crop to harvest, but sometimes it can be as much as 10 - 12 months[429]. Most plants produce many starchy tubers, similar in appearance to potatoes, usually 10 - 15 cm in diameter, but they can reach 30 cm on rich soils[429]. They normally weigh from 70 to 340g but can reach 1 kg[429]. Two distinct forms have been reported from the Pacific Islands, one producing a single large tuber, the other with a number of smaller (potato-sized) tubers[429]. Flowering Time: Mid Spring Late Summer/Early Fall Blooms repeatedly. Bloom Color: Dark Purple/Black.

3.2.2 Cuminum cyminum

Cumin - Jeera

8 htin 12 cyuc 4 kcak 2 tcan 3 dwat 0.3 m hkuc htut cyutli hgatkyuctup hwicli hras[utnyik hpa7tli frusflat-prikliwisslip hpa7tmwatli fyifxre7t hjonli

drutta Cuminum cyminum is a ANNUAL growing to 0.3 m (1ft) by 0.2 m (0ft 8in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 9 and is frost tender. It is in leaf from May to October, in flower from June to July, and the seeds ripen from August to September. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. 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 and can grow in very acid and very alkaline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

pcista May cause hypoglycaemia. Caution need for diabetics. Avoid if taking barbiturates [301]

ksacta Edible Parts: SeedEdible Uses: CondimentSeed - cooked as a flavouring. Cumin seed was once widely used as a food flavouring in Europe, the Romans ground it into a powder and used it like pepper[268]. It is little used at present in Western cooking, though it is very commonly employed in India[268]. A hot and aromatic flavour; it is an important ingredient in curries, is used as a seasoning in soups and stews, and is also often used as a flavouring in biscuits, cakes and bread, there are also helps in improving the digestion[1, 4, 14, 21, 27, 46, 132, 171, 244, 418]. The seed is harvested when fully ripe and is then dried and stored in airtight jars[244]. An essential oil from the seed is used as a food flavouring[46, 61, 171]. According to the USDA, one tablespoon of cumin spice contains: 22 kcal (92 kJ) of food energy, 1.34 g (0.047 oz) of fat, 2.63 g (0.093 oz) of carbohydrates, 0.6 g (0.021 oz) of fibre and 1.07 g (0.038 oz) of protein.

tcanta Essential InsecticideThe seed contains about 2.5% essential oil[240]. It is used in perfumery and for flavouring beverages[46, 61, 177, 272].

dwatta Antibacterial Antidiarrhoeal Antirheumatic Antispasmodic Aphrodisiac Carminative Galactagogue Poulitce Stimulant StomachicCumin is an aromatic, astringent herb that benefits the digestive system and acts as a stimulant to the sexual organs[238]. It has been used in the treatment of minor digestive complaints, chest conditions and coughs, as a pain killer and to treat rotten teeth[238, 254]. Cumin is seldom used in Western herbal medicine, having been superseded by caraway which has similar properties but a more pleasant flavour[4]. It is still widely used in India, however[4] where it is said to promote the assimilation of other herbs and to improve liver function[238]. The seed is antispasmodic, carminative, galactagogue, stimulant and stomachic[4, 46, 240, 254]. A general tonic to the whole digestive system, it is used in the treatment of flatulence and bloating, reducing intestinal gas and relaxing the gut as a whole[254]. In India it is also used in the treatment of insomnia, colds and fevers and to improve milk production in nursing mothers[254]. Ground into a powder and mixed into a paste with onion juice, it has been applied to scorpion stings[254]. The herb has been used externally as a poultice to relieve stitch and pains in the side[244]. The essential oil obtained from the seed is antibacterial and larvicidal[238].

nrakta Europe to N. Africa and S.W.Asia? Original habitat is obscure. ksacta Not known in a truly wild condition.

propta Seed - sow early spring in individual pots in a greenhouse. Grow the plants on fast, and plant them out after the last expected frosts[200]. Give the plants some temporary protection such as a cloche for their first few weeks in the open ground to make sure that they keep on growing in the cooler weather of early summer[K].

nwatta An annual plant, it is cultivated from low elevations in the warm temperate to higher elevations in tropical zones. It does not do well in lowland areas of the tropics, but is successful at higher elevations, being grown up to 2,200 metres. It grows best in areas where annual daytime temperatures are within the range 17 - 26°C, but can tolerate 9 - 30°C[418]. The plant is intolerant of frost. It prefers a mean annual rainfall in the range 1,200 - 1,800mm, but tolerates 800 - 2,700mm[418]. Tolerant of most well-drained soils[268], though it prefers a warm fertile well-drained sandy loam in a sheltered sunny position[14, 200]. Prefers a pH in the range 5 - 6.5, tolerating 4.5 - 8.3[418]. The plant can be harvested for its seed about 60 - 110 days after sowing[418]. Seed yields can be 500 - 1,200 kilos per hectare[418]. When bruised, the plant has a pungent aroma[245].

4 9 tlin

4.0.1 Brassica carinata

Abyssinian Cabbage

9 tlin 12 cyuc 4 kcaak 3 tcan 2 dwat 1 m hkuc hmimhtut cyuti tcup hwicli hrasjlutnyik hpa7tli flatprkwliv hpa7tmwatli fyfekre7t hjonli

drutta Brassica carinata is a ANNUAL growing to 1 m (3ft 3in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 9 and is not frost tender. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees. The plant is self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

pcista The oil contained in the seed of this species is rich in erucic acid which is toxic. However, modern cultivars have been selected which are almost free of erucic acid.

kcakta Edible Parts: Flowers Leaves Oil Seed StemEdible Uses: Condiment OilLeaves and young stems - raw or cooked[2, 52, 61, 141]. Used when up to 30cm tall[183]. A mild and pleasant cabbage flavour[K], the young growth can be cut finely and used in mixed salads, whilst older leaves are cooked like cabbage leaves[183]. Immature flowering stems - cooked. Used like broccoli[183], they make a nice vegetable[K]. An edible oil is obtained from the seed[183]. Oil from the wild species is high in erucic acid, which is toxic[141], though there are some cultivars that contain very little erucic acid and can be used as food[K]. The seed can also be crushed and used as a condiment[200].

tcanta OilAn oil that is high in erucic acid can be obtained from the seed[289]. Traditionally, it is used for oiling the baking plates of earthenware 'injera' stoves and also for illumination[299]. The oil finds wide application in the production of water repellents, waxes, polyesters and lubricants[418]. The seed oil is used to produce bio-diesel or special erucic acid derivatives[418]. This plant is also part of a research to develop an aviation biofuel for jet engines. Agroforestry Uses: The plant can be grown as a green manure[418].

dwatta The seed is used in the treatment of stomach aches[299].

nrakta N. Africa - Ethiopia. Occasional in Britain. ksacta An occasional bird-sown alien on waste ground in Britain.

propta Seed - sow in situ in succession from March to early September. The seed can also be sown under cloches in February when it will yield a crop in May.

nwatta Management: Standard Minor Global Crop Staple Crop: Oil Staple Crop: ProteinThis species is very tolerant of a wide range of climatic conditions and can be grown from the temperate to tropical zones. In cool temperate it is only suitable as a leaf crop, but in other areas it can also be grown for its seed. It grows best in areas where annual daytime temperatures are within the range 10 - 25°C, but can tolerate 5 - 35°C[418]

]. It prefers a mean annual rainfall in the range 1,000 - 1,500mm, but tolerates 800 - 1,700mm[418]

]. Succeeds in full sun in a well-drained fertile preferably alkaline soil[200]

]. Succeeds in any reasonable soil[52]

]. Prefers a pH in the range 5.5 - 8, tolerating 5 - 8.5[418]

]. Plants develop an extensive root system, larger than in other Brassica species[299]

]. There is a difference in first flowering date between oil types and vegetable types; oil types start flowering about 10 weeks after germination, vegetable cultivars after about 12 weeks, depending on cultivar and growing conditions. Flowering of vegetable cultivars is delayed by regular harvesting of the leaves or young shoots[299]

]. Plants grown in dry regions flower earlier and produce ripe seeds within 4 months from sowing[299]

]. Vegetable crops grown with adequate moisture produce seeds in 5 - 6 months[299]

]. An average leaf and shoot yield of 35 tonnes per hectare can be expected, but at research stations leaf yields of 50 - 55 tonnes have been reported[299]

]. In India and Canada farmers may get seed yields of 1,200 - 1,800 kg per hectare in a good year[299]

]. Some tall cultivars, when grown with adequate moisture, may develop new shoots after removal of the infructescences and become perennial, normally for one further season, but plants of up to 4 years old have been recorded[299]

]. Most Brassica species are cross-pollinating, which contributes to the great diversity within species. Brassica carinata is an exception as it sets seed very efficiently through self-pollination without insects acting as pollinators[299]

]. The plant does not need low temperatures for flower initiation, and seed production is therefore much easier in Africa than for most Brassica oleracea leaf cabbages except for Portuguese kale[299]

]. There are some named varieties. 'Texsel' is especially good for temperate climates, it is fast growing even at relatively low temperatures[141]

, 200

]. Research has produced a collection of lines with characteristics suitable for modern agriculture. Varieties are available, including different oil types, such as low erucic (0%) and very high erucic (+ 50%) content[289]

]. This plant is unknown in the wild. It arose as a natural amphidiploid hybrid of female *B. nigra* and male *B. oleracea*[289]

].

4.0.2 Raphia farinifera

Raffia Palm

9 tlin 12 cyuc 3 kcaak 4 tcan 0 dwat 25 m hkuc htut cyuti tcuphja7n hwicli hrasjlutnyik hpa7tli flatprkwliv hpa7tmwatli hjonli

drutta Raphia farinifera is an evergreen Tree growing to 25 m (82ft) by 18 m (59ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils. 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: Fruit Oil Sap Seed StemEdible Uses: Drink Oil SweetenerThe sap from the trunk is fermented to make palm wine[297, 317]. It is also used to make a sweet beverage[301]. The sap can be obtained either by cutting down the trunk and allowing the sap to drain out, or by boring a hole in the trunk near the apex[297]. An edible starch is obtained from the stem[301, 317]. Fruit - boiled and eaten[297, 317]. An oil is obtained from the fruit[297]. The boiled fruit pulp yields a yellow fat known as raphia butter - it has a good taste when fresh[301]. The fruits are crushed, water is added and the mixture boiled then left to cool. The floating oil is then skimmed off and used in cooking[398]. The seed is edible[301, 317].

tcanta Basketry Broom Buttons Containers Fibre Furniture Lighting Oil Raffia Soap making String Thatching Weaving WoodRaffia, which is widely used in weaving to make baskets, mats etc, is obtained from the leaflets of this plant[297]. The large midribs of the leaves, and the leaf stalks, are widely used by native people to construct the framework of houses, as poles for various uses and for making into furniture[297]. They can be split into strips for weaving into mats, baskets etc[297]. The leaves are used for thatching and weaving baskets, mats and hats[364]. The fibres obtained from the leaves are used as tying material and for weaving mats, hoods, bags, curtains etc[317]. The tough fibre (known as piassava) obtained from the leaf sheaths, is used for making brooms[297]. A tough rope can also be made from this fibre[297]. The fibre is derived from the cuticle of the leaves, which are harvested before fully expanded and peeled upon both sides. The thin strips of fibrous material thus obtained are afterwards divided into narrower strips by a kind of comb, according to the purpose for which they are to be used. It appears as flat, straw-coloured strips, about 12 - 18mm wide and from 90 - 120cm long. It is capable of being divided into fine threads. It can be used for delicately plaited goods, hats, mats for covering floors, and for wrapping up goods. The loose strips are extensively used in place of Russian bast or tie bands by gardeners and nurserymen. More recently it has been woven into superior matting, tastefully coloured, and used instead of tapestry for covering walls in London houses[454]. The preparation of raffia is one of the most extensive industries in Madagascar. The men cut the palm leaves in the forests and bring them home for the

drying oil[132]. Apart from being edible, it is also used in soap making, lighting, as a lubricant and a source of pharmaceutical drugs etc[21, 46, 61, 238]. When added to the insecticide pyrethrum it acts as a synergist, a 10% content of oil doubling the potency of the pyrethrum[57, 174]. The oil can also be used in barrier creams to protect the skin from harmful UV light radiation[201].

dwatta Antiasthmatic Antidiarrhoeal Antihæmorrhoidal Antitussive Astringent Cholera Diuretic Dysentery Emollient Galactagogue Kidney Laxative Lenitive Nutritive Skin TonicThe leaves and seed are astringent[174, 201, 257]. The leaves are rich in a gummy matter and when mixed with water they form a rich bland mucilage that is used in the treatment of infant cholera, diarrhoea, dysentery, catarrh and bladder troubles[4, 238]. The seed is diuretic, emollient, galactagogue, lenitive and tonic[218], and acts as a tonic for the liver and kidneys[238]. It is taken internally in the treatment of premature hair loss and greying, convalescence, chronic dry constipation, dental caries, osteoporosis, stiff joints, dry cough etc[238]. It has a marked ability to increase milk production in nursing mothers[254]. Externally it is used to treat hæmorrhoids and ulcers[238, 240]. The seed is very high in calories and so should be used with caution by people who are overweight[238]. The oil is laxative and also promotes menstruation[4]. It is used to treat dry constipation in the elderly[238]. Mixed with lime water, the oil is used externally to treat burns, boils and ulcers[238]. A decoction of the root is used in various traditions to treat asthma and coughs[254].

nrakta Not known but possibly northeast Africa or India. ksacta Not known in a truly wild situation.

propta Seed - sow early spring in a greenhouse. Prick out the seedlings into individual pots when they are large enough to handle and plant them out after the last expected frosts. Give them the protection of a cloche until they are growing away well[K]. In warm temperate zones, where frosts are very rare and light, or non-existent, the seed can be sown in situ in the spring or the autumn[238].

nwatta Sesame can be grown from the warm temperate zone to the tropics, so long as there is a growing season of at least 5 months. In the tropics, it can be grown at elevations up to 1,500 metres. It grows best in areas where annual daytime temperatures are within the range of 20 - 30°C, but can tolerate 10 - 40°C[418]

]. It prefers a mean annual rainfall in the range 500 - 1,000mm, but tolerates 300 - 1,500mm[418]

]. High relative humidity or heavy rains may increase the incidence of fungal diseases[418]

]. Requires a well-drained porous soil and a warm sunny sheltered position[1

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]. Succeeds in most well-drained soils of moderate fertility[18

]. Prefers a pH in the range 5.5 - 7.5, tolerating 4.5 - 8[418]

]. A sheltered position is preferred, sesame is susceptible to wind damage after the main stem has elongated[418]

]. Depending upon variety, a crop of sesame can be produced within 40 - 180 days from sowing the seed[418]

]. The average yield of sesame seed in the world is about 350 kilos per hectare, but yields can be up to 3 tonnes[418]

]. There are many named varieties[183

]. Sesame grows well with sweet corn but it grows badly with sorghum[201

]. The British climate is probably too cool in the summer to successfully grow this crop, though some people have reported success[206]. Early sowing in the greenhouse and some protection when first planting it out will help. Sesame grows well with sweet corn but it grows badly with sorghum[201].

6 11 tlin

6.0.1 Dacryodes edulis

Bush Butter Tree, Butterfruit, African Plum, bush pear, bush plum, safou
11 tlin 12 cyuc 5 kcaak 3 tcan 2 dwat 20 m hkuc

hmimhtut cyuti tcuphja7n hwicli hyishrasjlutnyik hpa7tli frusflatprkwliv hpa7tmwatli dyat hjonli

drutta Dacryodes edulis is an evergreen Tree growing to 20 m (65ft) by 20 m (65ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Bees, Insects. The plant is not self-fertile. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in nutritionally poor soil. Suitable pH: 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.

kcakta Edible Parts: Fruit OilEdible Uses: OilFruit - raw or cooked[301]. A pleasant, subacid flavour[335]. The leathery shelled stone is surrounded by a pulpy, butyrous pericarp about 5 mm thick which is the portion eaten, either raw, or cooked to form a sort of 'butter'[332]. When placed in hot water it softens and swells and all the flesh then slides easily off the seed[301]. The fruit flesh is softened by cell-wall-degrading enzymes. At temperatures of 60 - 85c this is accomplished in a matter of minutes; at room temperature, it takes 7 - 10 days, with bruising and microbes reducing this period to 3 days[299]. Boiling inactivates the enzymes so that the pulp hardens[299]. The fruit is usually salted and tastes like a warmed ripe avocado with a slightly sour flavour[301]. It has a mild smell of turpentine and is oily with palmitic acid 36.5%, oleic acid 33.9 %, linoleic acid 24.0% and stearic acid 5.5%[332]. The fruit contains 7% protein, which is very high for a fruit[301]. The fruit is up to 70mm long and 30mm wide[332]. The seed kernel is also rich in oil of the same fatty acids and approximately in similar amounts[332]. Carbon Farming - Staple Crop: protein-oil.

tcanta Adhesive Biomass Cosmetic Dye Essential Fuel Lighting Oil Resin Soil conditioner Waterproofing WoodAgroforestry Uses: The leaves and the remains of the fruits can provide considerable quantities of biomass to improve soil fertility. Research carried out in the forest humid lowland of south Cameroon, showed that the peasant farmers use the tree as a good indicator of soils fertility[303]. The plant's canopy can allow its integration into the traditional farming systems involving food crops, mainly shade tolerant species such as Xanthosoma sagittifolium, Colocasia esculenta etc[303]. Other Uses: The bark is aromatic and on injury yields a resin[46, 332]. This is used in various ways - in perfumery; as an adhesive for mending broken earthenware; as a waterproofing the inner surface of calabashes; it can also be burnt as a primitive lamp-oil or bush-candle[332]. The resin, under steam distillation, has been reported to yield a peppery essential oil rich in sabinene, -phellandrene and limonene, and a non-volatile fraction of crystalline canaric acid, a keto acid and the corresponding hydroxy acid[332]. The fruit contains about 1.5% essential oil. Its main constituents are: myrcene (45%), alpha-pinene (9%), alpha-terpineol (8%) and germacrene-D (4%); minor compounds include: E-alpha-cadinol, sigma-cadinol and beta-udesmol[299]. The wood contains an oil that on petrol-ether extraction has been found to be composed of fatty acids and their esters[303]. The fresh pulp is rich in lipids (35-65%) with a considerable amount of palmitic and linoleic acid. The tree can produce 7 - 8 t/ha of oil[303]. The leaves are the source of a dye[332]. The heartwood is greyish white to pinkish; it is not clearly demarcated from the sapwood. The wood is moderately heavy and elastic, the texture moderately coarse[299, 303, 332]. It is somewhat difficult to work due to the presence of silica, rapidly blunting tools during sawing; planing may be problematic due to the interlocked grain; staining, polishing and gluing properties are good, it can be peeled satisfactorily. It is used for axe-handles, occasionally for mortars, and is suitable for carpentry, etc[299, 332]. The wood is used mainly for fuel[299]. Other Systems: homegarden, multistrata.

dwatta Antiemetic Dysentery Emmenagogue MouthwashThe resin from the bark is used to treat parasitic skin diseases, jiggers etc[46, 332]. A bark-decoction is taken powdered with maleguetta pepper as an anti-dysenteric, and for anaemia, spitting blood and as an emmenagogue[303]. The decoction is also used for making gargles and mouthwashes, for treating tonsillitis[332]. The pulped-up bark is used as a wound cicatrizant[332]. Combined with palm-oil, it is applied topically to relieve general pains and stiffness and to treat cutaneous conditions[332]. The leaves are eaten raw with kola nut as an antiemetic[332]. The

nrakta East tropical Africa - Sudan, Eritrea, Ethiopia, Somalia, Uganda, Kenya, Rwanda; through Arabia to the Indian subcontinent and western China. ksacta Not known

propta Seed - although it can be propagated by seed, seed production is usually low, viability is seldom above 50% and seed remains viable for 6 months only[310]. Cuttings 12 - 20cm long should be taken from terminal shoots; treatment with a root stimulator increases the strike rate[310]. Cuttings taken from shoot tips have given better results than semi-ripe cuttings. They are usually treated with a fungicide, placed in prepared planting holes and watered[310]. Layering in the field is done with one-year-old shoots; a slanting cut is made approximately half-way through the shoot some 50cm from the end; the cut is buried about 10 - 15cm deep with the top remaining above ground. After about 4 - 6 months the rooted layers can be separated from the parent plant and transplanted[310]. In warm temperate areas the plant is grafted on 2 - 3-year-old rootstocks of *Jasminum officinale* to give protection against frost. In warmer regions grafting is not needed[310].

nwatta *Jasminum grandiflorum* can be grown from the warm temperate to the tropical zones. When grown commercially, plantations are usually below elevations of 500 metres[310]. The plant is day-neutral, and floral initiation is promoted by high day and low night temperatures. Some cultivars can resist at least some frost[310]. Grows best in a sunny position, growth and flowering being depressed by shade[310]. Preferring warm sunny conditions with adequate soil moisture, the plant can withstand short periods of very high temperatures[310]. Growth and flowering are depressed by low daytime temperatures and cool wet conditions[310]. Some cultivars are fairly drought tolerant, although flowering is strongly reduced by moisture stress[310]. Almost any well-drained soil is suitable, but sandy clays or loams with a pH between 6 - 8 are preferred[310]. Marshy, waterlogged or very stony soils should be avoided, as should saline soils[310]. The plant grows slowly for the first 2 years after planting, but first flowering starts at the age of 6 months. In the 3rd and following years flowering is profuse[310]. Mature plants flower for 7 - 9 months per year in warm regions, 4 - 6 months in temperate regions[310]. Seed set is usually very low and pollen sterility frequently above 75%[310]. Flowers open early in the morning and oil content decreases considerably after 10 a.m. In Europe, flowers contain substantially more essential oil in August and September than in July and October[310]. Jasmine plantations usually remain productive for 10 - 15 years but perhaps much longer if well-managed[310]. *Jasminum grandiflorum* is a complex species with wild and cultivated populations[310]. Jasmine flowers are picked manually between dawn and 10 a.m., during the hot season in India even between 3 - 8 a.m. Preferably only half-opened and fresh fully opened flowers must be picked, not buds or old (yellowish) flowers, as these will depress the quality of the essential oil. Although rain makes the flowers almost useless, picking flowers in the rain should continue, to promote further flowering[310]. An experienced picker can harvest 0.5 kg flowers per hour, but the pickers are usually young women and children, who achieve 2 kg in 5 hours[310]. Annual flower yield of jasmine varies from 5.5 - 12.5 t/ha, on average 5 - 8 t/ha. Modern commercial plantations average 8 - 10 t/ha. In Java, production is highest during the rainy season (30 kg/ha per day), and lowest during the dry season (4 kg/ha per day). Concrete yield is about 0.1%; up to 0.3% is reported from India. As an approximate guide, 1000 kg flowers yield 1 kg concrete when solvent extracted, half of this as absolute[310]. Jasmine flowers must be quickly processed, since delay substantially reduces essential oil content. Flowers should be kept shaded and cool between picking and processing and the processing facility should be close to the plantation. Freshly picked flowers can be stored in polythene bags at 15°C without loss of yield, quality or odour[310]. Jasmine oil can be obtained from flowers by steam distillation but the yield is very low. Jasmine concrete is obtained from flowers, formerly by enflourage, currently by solvent extraction. In solvent extraction, flowers are washed up to 3 times with petroleum ether or, preferably, with hydrocarbon-free food-grade hexane; the extract is then distilled to remove the solvent, resulting in the concrete. Concrete is usually produced at the plantation, but absolute is produced where convenient, often in another country[310].

5.2.63 Stipagrostis pungens

Drinn

10 tlin 12 cyuc 3 ckaak 2 tcan 1 dwat 1 m hkuc
htut cyutli hgaktyucup hwicli hyshrasjltu hpa7tli flatprikliwis hpa7tmwatli hjonli

drutta *Stipagrostis pungens* is an evergreen Perennial growing to 1 m (3ft 3in) by 0.2 m (0ft 8in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

ksakta Edible Parts: SeedEdible Uses: Edible Portion: Seeds, Cereal. A traditional food plant in Africa, this grain has potential to improve nutrition, boost food security, foster rural development, and support sustainable landcare. It is used in kreb a grain mixture eaten in Chad. Carbon Farming Solutions - Staple Crop: balanced carb (The term staple crop typically refers to a food that is eaten routinely and accounts for a dominant part of people's diets in a particular region of the world) [1-1].

tcanta Paper and Fibre mats: The chemical composition of *S. pungens* has showed that it contains quite high amount of extractives, lignin (around 12%) and polysaccharides (71%). The a-cellulose amounts are acceptable (44%).

dwatta A traditional medicinal annual plant growing in Tunisia.

nrakta Africa Europe, Asia ksacta Common throughout the Sahara. Adapted to sandy habitats, represented by deep sandy clusters (dunes, ergs).

propta Seed. rhizomes.

nwatta Management: Coppice Management: Standard Staple Crop: Balanced carb Wild Staple CropClimate: tropical. Humidity: arid to semi-arid. Extremely drought-resistant, drinn grows in areas with as little as 70 mm of rainfall per year. Perennial, robust (50 cm to 1 m), long rhizomatous plant, recognizable by inflorescences composed of spikelets, in loose and ventilated panicles. Common throughout the Sahara, the drinn is perfectly adapted to sandy habitats, represented by deep sandy clusters (dunes, ergs). The steppe in drinn is an essential pasture for camels. Carbon Farming Solutions - Cultivation: wild staple. Management: standard, coppice (Describes the non-destructive management systems that are used in cultivation) [1-1]. .

5.2.64 Sesamum indicum

Sesame

10 tlin 12 cyuc 3 ckaak 4 tcan 3 dwat 1 m hkuc
htut cyutli tcup hwicli hrasjltunyk hpa7tli flatprikliwis hpa7tmwatli xre7t hjonli

drutta *Sesamum indicum* is an ANNUAL growing to 1 m (3ft 3in) by 0.5 m (1ft 8in). See above for USDA hardiness. It is hardy to UK zone 10 and is frost tender. It is in flower in July. The species is hermaphrodite (has both male and female organs). Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist soil.

ksakta Edible Parts: Leaves Oil Oil SeedEdible Uses: Condiment Oil OilSeed - cooked[1, 2, 4, 34, 46]. Usually roasted or stewed, it can also be ground into a powder and used as a flour, added to breads, vegetables etc, used to make sweetmeats, or crushed and used as a butter or as 'tahini'[14, 21, 183, 238]. It can also be fermented into 'tempéh', ground into a powder and mixed with a sweetener to make 'halva', or made into a paste and used as the spread 'tahini'[183, 238]. The seeds can also be sprouted and used in salads[183]. The seed contains about 21.5% protein, 60.8% fat, 8.9% carbohydrate, 3.4% ash[179]. It is a rich source of unsaturated fatty acids, calcium and vitamins A, B and E[201, 238]. The calcium is absorbed well by the body, making sesame an excellent dietary source[238]. An edible oil is obtained from the seed[2, 34, 46, 57]. It is used for cooking or in margarines etc[14, 183]. The oil is very stable and will keep for years without turning rancid[61, 117, 201]. Leaves - raw or cooked as a potherb or added to soups[105, 117, 183].

tcanta Hair Insecticide Lighting Oil Oil Soap making Weather protectionThe seed contains up to 55% of a semi-

women to complete the work. The fibre is cured the same day it is stripped[454] Among its native uses may be mentioned cordage and fishing nets[454]. Raphia wax, which is derived from the lower surface of the leaves, is used as a polish for boats and floors or is utilized for the production of candles[317]. The oil extracted from the boiled fruit pulp and the kernels of the fruits is used for the production of soap and stearin[317]. The shells of the fruits are made into snuff-boxes or buttons[317]. Wood - used for construction[297]. The wood can be used after the sap has been allowed to drain[297].

nrakta Tropical Africa - Senegal to Cameroon; Uganda, Kenya, Tanzania, Angola, Zambia, Malawi, Zimbabwe, Mozambique, Madagascar. ksacta Moist, swampy ground[200]. Riverine and groundwater forest[364]. Gallery forests, freshwater swamp forest, along river banks and in the western shoreline forests of Lake Victoria, at elevations from sea level to 2,500 metres[398].

propta Seed - pre-soak for 24 hours in warm water and sow in containers. The seed requires several months to germinate[297].

nwatta Industrial Crop: Fiber Industrial Crop: Wax Management: Standard Regional Crop Staple Crop: Oil Staple Crop: SugarA plant of the tropics, it is able to succeed in subtropical areas. Plants succeed in moist tropical climates where temperatures never fall below 10°C, the average annual rainfall is 1,500mm or more and the driest month has 25mm or more rain[297]. Requires a sunny position in a wet soil[314]. A monocarpic plant - growing for several years without flowering, then producing a massive inflorescence and dying after setting seed[200]. Flowering Time: Early spring, Late spring, Mid spring. Bloom Color: White. Spacing: 20-30 ft. (6-9 m) 30-40 ft. (9-12 m) over 40 ft. (12 m).

4.0.3 Bauhinia petersiana

White bauhinia, Zambezi coffee

9 tlin 12 cyuc 3 ckaak 2 tcan 2 dwat 7 m hkuc
htut cyutli kyucup hwicli hrasjltu hpa7tli flatprikliwis hpa7tmwatli hjonli

drutta *Bauhinia petersiana* is a deciduous Tree growing to 7 m (23ft) by 7 m (23ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 9. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil.

ksakta Edible Parts: Oil Root Seed SeedpodEdible Uses: Coffee Drink OilSeed - cooked. Roasted and eaten like nuts, when they are considered a delicacy[299]. The seeds can be harvested whilst immature - the whole green pod is briefly roasted and then the seeds removed and eaten[775]. A meal made from the pounded seeds is eaten[299]. The seeds can be eaten green, but ripe seeds are usually roasted, peeled, and pounded into a pleasant-tasting, coarse meal[322]. The mature seeds are roasted and ground into a powder then used as a substitute for coffee[299, 775]. Immature seed-pods - cooked[299]. They can be roasted or boiled[299]. Root - roasted[775]. The core of the root is rejected and only the outer portion eaten[775]. Mainly a famine food, it is seldom eaten at other times[775]. An oil is obtained from the seed[299]. The principal fatty acids in the seed oil are linoleic acid (45%), oleic acid (26%), palmitic acid (16%) and stearic acid (7%)[299].

tcanta Dye Fibre Oil String TanninThe bark fibres are used to make rope[299]. A dye is obtained from the roots[299].

dwatta Antidiarrhoeal Antitussive SkinThe leaves are boiled, the steam inhaled and the cooled-down liquid drunk to cure common cough[299]. The pounded leaves, mixed with salt, are boiled and the warm liquid is sprinkled on wounds to promote healing[299]. An infusion of the roots is used to treat dysmenorrhoea and female infertility[299]. A decoction of the macerated roots is drunk as a remedy for diarrhoea[299]. The roots and leaves contain tannins[299].

nrakta Africa - southern DR Congo, Tanzania, southern Angola, Zambia, Malawi, Namibia, Botswana, Zimbabwe, Mozambique, S. Africa. ksacta Open grassland, wooded grassland and woodland, at elevations from 150 - 1,850 metres in east Africa[299].

propta Seed - Cuttings Layering
nwatta Management: Standard Staple Crop: Protein-oil Wild Staple CropBauhinia petersiana is a plant of moist to arid areas in the tropics, where it can be found at elevations up to 1,850 metres[299]. The plant can tolerate some frost and can be found in areas experiencing as little as 350mm of rain in a year[299]. Requires a sunny position in a well-drained, preferably light, soil. Although many species within the family Fabaceae have a symbiotic relationship with soil bacteria, this species is said to be devoid of such a relationship and therefore does not fix atmospheric nitrogen[299].

4.0.4 Hibiscus sabdariffa

Roselle

9 tlin 12 cyuc 3 ckaak 2 tcan 3 dwat 3 m hkuc
htut cyutli tcup hwicli hrasjltunyk hpa7tli flatprikliwis hpa7tmwatli xre7t hjonli

drutta *Hibiscus sabdariffa* is a ANNUAL/PERENNIAL growing to 3 m (9ft) by 2 m (6ft). See above for USDA hardiness. It is hardy to UK zone 10 and is frost tender. It is in flower from August to October, and the seeds ripen from October to November. The species is hermaphrodite (has both male and female organs) and is pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist soil.

ksakta Edible Parts: Flowers Leaves Oil Oil Root SeedEdible Uses: Coffee Condiment Drink Oil Oil Pectin TeaThe fresh calyx (the outer whorl of the flower) is eaten raw in salads, is cooked and used as a flavouring in cakes etc and is also used in making jellies, soups, sauces, pickles, puddings etc[74, 171, 183, 269]. The calyx is rich in citric acid and pectin and so is useful for making jams, jellies etc[240, 269]. It is also used to add a red colour and to flavour to herb teas[238, 269], and can be roasted and used as a coffee substitute[183]. A refreshing and very popular beverage can be made by boiling the calyx, sweetening it with sugar and adding ginger[183]. Tender young leaves and stems - raw or cooked[177, 269, 272]. Used in salads, as a potherb and as a seasoning in curries, they have an acid, rubarbar-like flavour[183, 238, 269]. Seed - roasted and ground into a powder then used in oily soups and sauces[177, 183]. The roasted seeds have been used as a coffee substitute that is said to have aphrodisiac properties[269]. Root - it is edible but very fibrous[144]. Mucilaginous, without very much flavour[144]. The seed yields 20% oil[74]. (This is probably edible[K]).

tcanta Dye Fibre Oil Oil Pectin StringA strong fibre obtained from the stem (called rosella hemp) is used for various household purposes including making sackcloth, twine and cord[74, 171, 238, 272]. A yellow dye is obtained from the petals[240]. It is used in medicines etc[74]. The seed yields 20% oil[74].

dwatta Antibilious Antiscorbutic Antiseptic Aphrodisiac Appetizer Aromatic Astringent Chologogue Demulcent Digestive Diuretic Emollient Febrifuge Hypotensive Poultrice Purgative Refrigerant Resolvent Sedative Stomachic TonicRoselle is an aromatic, astringent, cooling herb that is much used in the Tropics. It is said to have diuretic effects, to help lower fevers and is antiscorbutic[74, 238]. The leaves are antiscorbutic, emollient, diuretic, refrigerant, and sedative[269]. The leaves are very mucilaginous and are used as an emollient and as a soothing cough remedy. They are used externally as a poultice on abscesses[269]. The fruits are antiscorbutic[269]. The flowers contain gossypetin, anthocyanin, and the glycoside hibiscin[269]. These may have diuretic and choleric effects, decreasing the viscosity of the blood, reducing blood pressure and stimulating intestinal peristalsis[269]. The leaves and flowers are used internally as a tonic tea for digestive and kidney functions[74, 238]. Experimentally, an infusion decreases the viscosity of the blood, reduces blood pressure and stimulates intestinal peristalsis[240]. The ripe calyces are diuretic and antiscorbutic[269]. The succulent calyx, boiled in water, is used as a drink in the treatment of bilious attacks[269]. The seeds are diuretic, laxative and tonic[269]. They are used in the treatment of debility[269]. The bitter root is aperitif and tonic[269]. The plant is also reported to be antiseptic, aphrodisiac, astringent, chologogue, demulcent, digestive, purga-

tive and resolvent[269]. It is used as a folk remedy in the treatment of abscesses, bilious conditions, cancer, cough, debility, dyspepsia, dysuria, fever, hangover, heart ailments, hypertension, neurosis, scurvy, and strangury[269]. One report says that the plant has been shown to be of value in the treatment of arteriosclerosis and as an intestinal antiseptic, though it does not say which part of the plant is used[269]. Simulated ingestion of the plant extract decreased the rate of absorption of alcohol, lessening the intensity of alcohol effects in chickens[269].

nrakta Tropics - probably tropical central or western Africa. ksacta Disturbed ground[238].

propta Seed - sow early spring in a warm greenhouse. Germination is usually fairly rapid. Prick out the seedlings into individual pots when they are large enough to handle. If growing them as annuals, plant them out into their permanent positions in early summer and protect them with a frame or cloche until they are growing away well. If hoping to grow them as perennials, then it is better to grow them out in the greenhouse for their first year and to plant them out in early summer of the following year. Cuttings of half-ripe wood, July/August in a frame. Overwinter them in a warm greenhouse and plant out after the last expected frosts.

nwatta Prefers a well-drained humus rich fertile soil in full sun[200]. Roselle requires a permeable soil, a friable sandy loam with humus being preferable; however, it will adapt to a variety of soils[269]. It is not shade tolerant and must be kept weed-free[269]. It will tolerate floods, heavy winds or stagnant water[269]. Roselle is reported to tolerate an annual precipitation of 64 to 429cm, an annual temperature in the range of 12.5 to 27.5°C and a pH of 4.5 to 8.0[269]. This species is not hardy in Britain, but it can be grown as a half-hardy annual, flowering in its first year from seed[200]. Plants are sensitive to the length of daylight and do not flower if there are more than 13 hours of light in the day[169]. Roselle is widely cultivated in the Tropical and Sub-tropical zones for its fibre and edible calyx, there are some named varieties[183]. Roselle is best suited to tropical climates with a well-distributed rainfall of 1500 - 2000 mm yearly, from sea-level to about 600 m altitude[269]. It tolerates a warmer and more humid climate than kenaf (*Hibiscus cannabinus*), but is more susceptible to damage from frost and fog[269]. Plants exhibit marked photoperiodism, not flowering at shortening days of 13.5 hours, but flowering at 11 hours. In the United States plants do not flower until short days of late fall or early winter. Since flowering is not necessary for fibre production, long light days for 3 - 4 months is the critical factor[269]. There are two main forms of the plant:- var. *sabdariffa* has red or pale yellow inflated edible calyces but a poor quality fibre; var. *altissima* is grown for its fibre but has inedible calyces[269]. Plants have a deep penetrating taproot[269].

4.0.5 Gossypium herbaceum

Levant cotton
9 11in 12 cyuc 3 kcak 4 tcan 3 dwat 1.2 m hkuc
hmmihtut cyutli tcup hwicli hrasjlut hpa7tli flatprikliwshom hpa7tmwatli hjonli

drutta Gossypium herbaceum is a SHRUB growing to 1.2 m (4ft) by 1.2 m (4ft in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in saline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil. The plant is not wind tolerant.

pcasta The plant, and especially the oil from the seed, contains gossypol. It is believed that this substance, when ingested, causes reduced sperm levels and infertility in men[238 , 254].

kcakta Edible Parts: Leaves Oil SeedEdible Uses: OilEdible portion: Seeds, Leaves, Oil. Seed - roasted[301]. The roasted seed can be used as a coffee substitute[301]. An oil is obtained from the seed[301]. Used in salads or as a cooking oil[301]. The oil is also used in the manufacture of margarines, vegetable shortenings, lard substitutes etc[46]. The oil contains a substance called gossypol which is believed to lower male fertility and cause infertility[238]. The gossypol is usually removed before the oil is used for edible

purposes[238]. Leaves[301]. Carbon Farming - Staple Crop: oil.

tcanta OilOther Uses: The floss contained in the seed-pod is used to make fibre for clothing and many other applications[238]. Cotton fibres have a wide range of used including making clothes; rubber-tyre fabrics; stuffing material for pillows, cushions etc; surgical dressings; making twine and ropes; carpets etc[46]. The plant stems can be used for making paper[46]. A semi-drying oil obtained from the seeds is used for making soap[46 , 238]. The oil cake residue can be used as a fertilizer[46]. Yellow and brown dyes can be obtained from the petals[46]. Carbon Farming - Industrial Crop: fiber.

dwatta DysenteryCotton is an astringent, slightly acidic, aromatic herb that causes uterine contractions, depresses sperm production, lowers fever, reduces inflammation and soothes irritated tissue[238]. It also has antiviral and anti-bacterial actions[238]. The root bark contains gossypol and flavonoids[254]. It is seldom used in modern herbalism, but has been used as a milder and safer alternative to ergot (*Claviceps purpurea*) for inducing uterine contractions in order to speed a difficult labour[254]. It can induce an abortion or the onset of a period, and reduces total menstrual flow[254]. It has also been taken internally in the treatment of painful menstruation[238]. The root bark also encourages an increased milk flow in nursing mothers and blood clotting[254]. The roots are harvested at the end of the growing season, peeled and dried[238]. The seeds are taken internally in the treatment of dysentery, intermittent fever and fibroids[238]. Externally, the seeds are used to treat herpes, scabies, wounds and orchitis[238]. The oil obtained from the seed contains a substance known as gossypol. This has the effect of lowering sperm production and possibly causing infertility in males[238]. Research has been carried out into its potential use as a male contraceptive[238]. It can be used to reduce heavy menstrual flow and in the treatment of endometriosis[254]. The leaves are taken internally in the treatment of gastroenteritis[238]. Externally, the leaves are used to treat thrush, scalds, bruises and sores[238]. The leaves are harvested as required during the growing season[238].

nrakta Probably originating in S. Africa, it is only known in cultivation. ksacta Not known in the wild

propta From herbaceous stem cuttings From seed; sow indoors before last frost Seed Collecting: Allow seedheads to dry on plants; remove and collect seeds Properly cleaned, seed can be successfully stored

nwatta Industrial Crop: Fiber Management: Cop-pice Management: Standard Regional Crop Staple Crop: OilShort-staple American cotton can be grown in the dry to moist tropics and subtropics, where it is found at elevations up to 2,200 metres. For commercial production it requires a climate that has a long, hot growing season with abundant moisture, followed by a drier period for harvesting the seed floss[200]. It grows best in areas where annual daytime temperatures are within the range 26 - 36c, but can tolerate 18 - 38c[418]. It prefers a mean annual rainfall in the range 750 - 1,250mm, but tolerates 200 - 1,500mm[418]. Prefers a very sunny position in a light, fertile soil[200]. Plants can tolerate a range of well-drained soils, including moderate levels of salt[418]. Prefers a pH in the range 6 - 7.2, tolerating 5.3 - 8.5[418]. Requires a position sheltered from strong winds[418]. Flowering Time: Late Spring/Early Summer Mid Summer Late Summer/Early Fall. Bloom Color: Bright Yellow. Spacing: 9-12 in. (22-30 cm). Carbon Farming - Cultivation: regional crop. Management: standard, coppice. Perennial cotton has longer fibres and is considered superior to annual cottons. Perennial cottons are suited to arid and humid conditions while annual cottons were bred for colder climates and for mechanical harvesting. Perennial cottons are cultivated in the tropics on a smaller scale and include *Gossypium arboreum burmanicum*, *Gossypium arboreum indicum*, *Gossypium arboreum sudanense*, *Gossypium barbadense brazilense*, *Gossypium barbadense darwinii*, *Gossypium herbaceum acerifolium*, *Gossypium herbaceum africanum*, *Gossypium hirsutum marie-galante*, *Gossypium hirsutum punctatum*, *Gossypium hirsutum taitense*. Currently perennial cottons are harvested by hand. Researching perennial cottons varieties and production methods would help develop them as good carbon farming plants and help to alleviate the terrible problems caused by annual cottons.

rapidly form clones by means of rhizomes in their first season, flower the second season, and often form very large, persistent, often monospecific stands[270]. 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. It will often form an almost complete monoculture in boggy soil. The dense growth provides excellent cover for water fowl[1]. Carbon Farming - Cultivation: regional crop. Management: hay.

5.2.61 Citrullus colocynthis

Perennial egusi, Bitter-apple

10 11in 12 cyuc 3 kcak 3 tcan 2 dwat 3 m hkuc
htut cyutli hgatkuytcup hwicli hyishrasjlut hpa7tli flatprikli-wis hpa7tmwatli hjonli

drutta *Citrullus colocynthis* is an evergreen Perennial growing to 3 m (9ft) by 0.3 m (1ft in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

pcasta The plant contains a number of potentially toxic compounds and can be harmful if used in quantity. These compounds include elateridine, glycosides, resin, dihydric alcohol, heltaicontane, citrullin and citrullinic acid. Taken in excess they can cause gastrointestinal pain, diarrhoea, vomiting, hypothermia, cardiac disorders, cerebral congestion and necrosis of liver and renal cells[1314].

kcakta Edible Parts: Fruit Oil SeedEdible Uses: OilFruit - cooked [301]. They are first boiled in several changes of water to remove a bitter principle, and then made into pickles and preserves[301]. The fruit is 5 - 8cm in diameter [284]. Seed - cooked[301]. Eaten roasted or ground into a meal and used to make chapattis [301]. The desert Bedouin are said to make a type of bread from the ground seeds. Some confusion exists between this species and the closely related watermelon (*Citrullus lanatus* (Thunb)), whose seeds may be used in much the same way. In particular, the name "egusi" may refer to either or both plants (or more generically to other cucurbits) in their capacity as seed crops, or for a soup made from these seeds and popular in West Africa. The seed flour is rich in micronutrients, and could therefore be used in food formulations especially in regions with low milk consumption, such as West Africa. An edible oil is obtained from the seed[301]. The seeds yield is about 6.7-10 t/ha, which means that for an oil profit of 31-47%, oil yields may reach up to 3 t/ha. Carbon Farming Solutions - Staple Crop: protein-oil (The term staple crop typically refers to a food that is eaten routinely and accounts for a dominant part of people's diets in a particular region of the world) [1-1].

tcanta OilThe seeds contain 30 - 34% of a pale yellow oil, which contains an alkaloid, a glucoside and a saponin[284]. Carbon Farming Solutions - Other Systems: strip intercrop (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].

dwatta UrinaryThe dried, unripe fruit pulp constitutes the drug "colocynth", which is a very strong laxative[200 , 284]. It is also used as an antirheumatic, antelmintic, hy-drogogue, and as a remedy for skin infections[46 , 310]. The fruits and seeds are used in the treatment of diabetes[1314]. The roots have purgative properties and are used in the treatment of jaundice, rheumatism and urinary diseases[284]. Some caution should be employed in the use of this remedy, see the notes above on toxicity.

nrakta Northern Africa through Arabia to Afghanistan and Pakistan. ksacta Open woodlands, grasslands, river beds and banks, flood plains, on bare areas and road verges and in disturbed and undisturbed natural vegetation.

propta Seed
nwatta Management: Standard Other Systems: Strip intercrop Regional Crop Staple Crop: Protein-oilClimate: subtropical to tropical. Humidity: arid to semi-arid. A plant found mainly in the drier areas the tropics and subtropics, though it can tolerate high levels of rainfall when cultivated. It grows best in areas where annual daytime temperatures are within the range 23 - 32°C, but can tolerate 14 - 40°C

[418]. Mature growth can be killed by temperatures of -5°C or lower, but young growth is severely damaged at 0°C [418]. It prefers a mean annual rainfall in the range 300 - 500mm, but tolerates 250 - 4,300mm [418]. Prefers a well-drained, light soil and a position in full sun [200]. Plants are very drought hardy [284 , 418]. Prefers a pH in the range 4.5 - 7.5, tolerating 4 - 8[418]. Productivity is enhanced during dry, sunny periods and reduced during periods of excessive rainfall and high humidity[418]. Carbon Farming Solutions - Cultivation: regional crop only. Management: standard (Describes the non-destructive management systems that are used in cultivation) [1-1]. .

5.2.62 Jasminum grandiflorum

Jasmin

10 11in 12 cyuc 3 kcak 4 tcan 3 dwat 2.5 m hkuc
hmmihtut cyutli hgattcup hwicli hrasjlutnyik hpa7tli flatprikli-wis hpa7tmwatli hjonli

drutta *Jasminum grandiflorum* is an evergreen Climber growing to 2.5 m (8ft) by 0.5 m (1ft 8in) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought.

kcakta Edible Parts: Flowers OilEdible Uses: OilJasmine absolute (the essential oil) and concrete (the waxy solid containing the essential oil) are used as additives in food and tobacco[310]. Jasmine flowers are a popular flavouring in tea in countries such as China and India[310].

tcanta OilAgroforestry Uses: Jasmine requires support, ranging from individual stakes and trellises to the post and wire systems used in vineyards. To lower plantation establishment costs it is common to intercrop in the first 2 years, as is done in India. In southern Italy intercropping is done in bergamot orange plantations which start producing after 10 - 15 years[310]. Other Uses Jasmine concrete, the major jasmine product traded, is obtained by solvent extraction (using petroleum ether, hexane or liquid carbon dioxide) of the fresh flowers. It is normally a yellowish to reddish orange-brown waxy solid, only partially soluble in 95% alcohol with an odour like jasmine absolute[310]. Jasmine absolute (the essential oil), is a dark orange-brown viscous liquid, darkening with age to red-brown or even deep red. Its odour is intense floral, warm, rich, highly diffusive, with a peculiar waxy-herbaceous oily-fruity and tea-like undertone. Light may reduce the quality of the absolute, especially degrading the benzyl acetate and benzyl benzoate it contains. The major components from jasmine absolute (Egyptian samples) include: benzyl acetate, benzyl benzoate, isophytol, phytol, phytol acetate, linalool and methyl jamonate. Composition varies due to many factors, including the cultivar extracted; time of day the flowers were plucked; flower age; weather conditions; season of plucking; time between plucking and extraction; extraction method and extraction solvent. Jasmine absolute is the major product of the flowers. It has a powerful and tenacious odour and is common in all kinds of perfumes[310]. Attar of jasmine, or East Indian jasmine oil, is prepared by water distillation of the flowers and collecting the distillate in a base oil such as Sandalwood oil[310]. Perfumed oils are produced by extracting from the flowers with hot sesame or groundnut oil or by mixing the flowers with boiled sesame seed and subsequently expressing the seed oil[310]. The wax, which is the residue of the concrete after extraction of the essential oil,) can be used in soaps and is an excellent perfume fixative[310].

dwatta Jasmine oil or essence is used medicinally. It is said to stimulate the reproductive system as an aphrodisiac and as a muscle relaxant, by warming and softening nerves and tendons[310]. An infusion of the flowers is used to relieve coughs[348]. The flowers are also used to treat headaches (external application)[K]) weak eyes and scorpion stings[240]. Applied externally, an infusion of the flowers is used to treat skin diseases[240]. The leaves are chewed as a remedy for ulcers or eruptions in the mouth[240]. The fresh juice of the plant is applied to corns[240]. Mixed with oil, it is poured into the ears as a treatment for otorrhoea[240].

]. The plant is antidote, astringent, diuretic, emetic, hypoglycaemic, purgative, refrigerant, stomachic and tonic[304]. It is used particularly to reduce sugar levels in the blood and urine[304]. The leaves are used in the treatment of fevers and coughs[299]. The powdered leaf is considered to help curb cravings for sweets and to have lipid lowering effects, it is added to food additives as a weight loss remedy[299]. The powder also helps in preventing caries[299]. Applied externally the leaves are combined with castor oil and used as a poultice to treat swollen glands[304]. The roots are considered to be a useful antidote to snakebite - they are applied to the wound as a powder, made into a paste with water or given internally as a decoction[299 , 304]. The pounded and cooked roots are added to food and eaten as a treatment for epilepsys[299]. The pounded cooked root or root powder is applied externally to treat boils[299].

nrakta Africa - Mauritania to Ethiopia, south to S. Africa; through Arabia to India, Sri Lanka, China, Japan, Thailand, Vietnam, Malaysia, Indonesia. ksacta Secondary forest, riverine forest and dry shrub savannah, usually on sandy or loamy soils. It occurs scattered and is locally abundant and common[299].

propta Seed - it has a short period of viability and so should be sown as soon as it is ripe[299].

nwatta Gymnema sylvestre thrives in subtropical and tropical climates. The plant grows best in areas with a well-distributed rainfall of 600 - 1,000mm annually[299].

5.2.60 Typha elephantina

Bora. Elephant grass, Indian reed-mace.

10 thin 12 cyuc 3 kcaak 3 tcan 3 dwat 3 m hkuc hmimhtut cyutli tcuphja7nh6s hwicli hrasjlutnyik hpa7tli frusflatprikwisliphso hpa7tmwatti hjonli

drutta Typha elephantina is an evergreen Perennial growing to 3 m (9ft) by 0.2 m (0ft 8in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are 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, 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.

kcakta Edible Parts: Flowers Leaves Oil Pollen Root Shoots StemEdible Uses: OilEdible Portion: Rhizome, Leaves, Flowers, Pollen, Stems, Roots, Vegetable. This species has the same properties as other Typha species, but it is particularly suitable for exploitation owing to its enormous size[74]. The report does not give any other information, but the general uses of other large Typha species are as follows:- Rhizomes - 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]. Base of 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. An 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 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 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: This species has the same properties as other Typha species, but it is particularly suitable for exploitation owing to its enormous size[74]. The report does not give any other information, but the general uses of other large Typha species are as follows:- 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 example, 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 VulneraryThis species has the same properties as other Typha species, but it is particularly suitable for exploitation owing to its enormous size[74]. The report does not give any other information, but the general uses of other large Typha species are as follows:- The 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 Asia - Tajikistan, Turkmenistan, Uzbekistan, Afghanistan, Pakistan, India, China (Yunnan), Myanmar; Africa - Algeria to Egypt, Niger, Chad, Ethiopia ksacta A tropical plant. Riverside thickets[74]. Swamps and riversides[266]. It grows on the Deccan in India. It grows on the edge of water. It grows in the Sahara and the Sahel. It can grow in salty soils. It can grow in arid places.

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 Regional CropClimate: subtropical to tropical. Humidity: aquatic. Succeeds in sun or part shade[200]. Grows in boggy pond margins or shallow water to 15cm deep[1 , 200]. Requires a rich wet soil if it is to well[200]. Tolerates moderate levels of salt[418]. Prefers a pH in the range 6.5 - 7.5, tolerating 6 - 8[418]. The rhizomes of the vigorous species of Typha contain around 30% - 46% starch. The core of these rhizomes can be ground into a flour. One hectare of plants would yield about 7 tonnes of flour per year. This flour would probably contain about 80 % carbohydrates and around 6% - 8% protein. Since these species occur around the world, the plants are a potential source of food for the world's population[277]. Seedlings

5 10 tlin

5.1 bwon

5.1.1 Tamarindus indica

Tamarind

tfot2n 10 tlin 12 cyuc 4 kcaak 3 tcan 3 dwat 20 m hkuc htutli cyutli hgatkycutcup hwicli hrasjlutnyik hpa7tli frusflatprikwishosom hpa7tmwatti hjonli

drutta Tamarindus indica is an evergreen Tree growing to 20 m (65ft) by 20 m (65ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Insects. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid and saline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate maritime exposure.

kcakta Edible Parts: Flowers Leaves Seed SeedpodEdible Uses: Seedpod - raw or cooked. An acid flavour[398]. Harvested when fully grown but still green and tender, they are used as a seasoning and also to make juices and paste[296]. The immature pods are used in a variety of ways, being eaten fresh mixed with spices, pickled like green mango, or added whole to soups, stews and sauces[301]. The pods are 5 - 15cm long[302]. When fully mature, the pods contain a sticky paste which can be eaten raw , used to make drinks, jellies, syrups etc, and, mixed with salt, is a favourite flavouring in the curries of India[296 , 301 , 303]. This paste is usually quite sour due to its content of tartaric, acetic and citric acids[307], though sweet forms can also be found[298]. The sweet-fruited forms are considered a delicacy and are eaten raw[301]. Mixed with water, the pulp makes a pleasant lemonade-like drink[298]. Mature seeds - dried then toasted or boiled and the shell is removed[298]. The seed can be ground into a flour[298]. The roasted seed is also used as a coffee substitute[301]. Young leaves - raw or cooked. An agreeably sour flavour, they go well cooked with other blander leaves[298]. Young leaves can be added to salads[298 , 301]. Seedlings, when about 30cm tall, are used as a vegetable[301]. Flowers - raw in salads or cooked[298 , 301].

tcanta FodderSeaside. Large shade tree. Street tree. Public open space. Bonsai. Xerophytic. Agroforestry Uses: Tamarind is not very compatible with other plants because of its dense shade, broad spreading crown and allelopathic effects. It has been tested as an agroforestry species in India but although the reduction in crop yield is less than that with species such as teak, the spreading crown makes it little compatible with other species[303 , 325]. The dense shade makes it more suitable for firebreaks as no grass will grow under the trees[303 , 325]. The deep roots make it very resistant to storms and suitable for windbreaks[325]. Other Uses The pulp of the fruit, sometimes mixed with sea-salt, is used to polish silver, copper and brass[303]. It is normally used when the pulp is over-ripe[307]. The seed contains pectin that can be used for sizing textiles[303]. Ground, boiled, and mixed with gum, the seeds produce a strong wood cement[303]. An amber coloured seed oil - which resembles linseed oil - is suitable for making paints and varnishes and for burning in lamps[303]. Both leaves and bark are rich in tannin. The bark tannins can be used in ink or for fixing dyes[303]. The leaves yield a red dye, which is used to give a yellow tint to cloth previously dyed with indigo[303]. Sapwood is light yellow, heartwood is dark purplish brown; very hard, durable and strong (specific gravity 0.8-0.9g/cubic m), and takes a fine polish. It is used for general carpentry, sugar mills, wheels, hubs, wooden utensils, agricultural tools, mortars, boat planks, toys, panels and furniture. In North America, tamarind wood has been traded under the name of 'Madeira mahogany'[303]. Provides a good firewood with the calorific value of 4 850 kcal/kg, it also produces an excellent charcoal[303 , 598].

dwatta Dysentery Malaria UrinaryThe bark is astringent and tonic and its ash may be given internally as a digestive. Incorporated into lotions or poultices, the bark may be used to relieve sores, ulcers, boils and rashes. It may also be administered as a decoction against asthma and amenorrhoea and as a febrifuge[303]. Leaf extracts exhibit anti-oxidant

activity in the liver, and are a common ingredient in cardiac and blood sugar reducing medicines[303]. Young leaves may be used in fomentation for rheumatism, applied to sores and wounds, or administered as a poultice for inflammation of joints to reduce swelling and relieve pain[303]. A sweetened decoction of the leaves is good against throat infection, cough, fever, and even intestinal worms[303]. The filtered hot juice of young leaves, and a poultice of the flowers, is used for conjunctivitis[303]. The leaves are warmed and tied to affected areas in order to relieve swellings and pains, particularly sprains[348]. They are also used for bathing sores or to bathe persons suffering from measles or allergies[348]. The leaves and flowers are used to make a sweetened tea that is drunk by children as a remedy for measles[348]. They were also used in a preparation which was drunk in early Guyana as a malaria remedy[348]. A decoction of the flower buds is used as a remedy for children's bedwetting and urinary complaints[348]. The fruit is aperient and laxative[348]. A syrup made from the ripe fruit is drunk in order to keep the digestive organs in good condition, and also as a remedy for coughs and chest colds[348]. The flesh of the fruit is eaten to cure fevers and control gastric acid[348]. The fruit pulp may be used as a massage to treat rheumatism, as an acid refrigerant, a mild laxative and also to treat scurvy[303]. Powdered seeds may be given to cure dysentery and diarrhoea[303]. The plant contains pyrazines and thiazoles[348]. The seed contains polyoses[348]. The bark yields bromthocyanidin and hordenine[348].

nrakta Probably originating in tropical Africa, it is now widespread through the tropics and subtropics. ksacta Low-altitude woodland, savannah and bush, often associated with termite mounds. Prefers semi-arid areas and wooded grassland, and can also be found growing along stream and riverbanks[303].

propta Seed - when dried, it retains viability for several years at ambient temperatures[325]. Pre-soak the seed for 24 hours in warm water and sow in a nursery seedbed or containers at 21°C[200]. About 90% germination is achieved in 40 - 50 days[303]. Germination is best when seeds are covered by 1.5 cm loose, sandy loam or by a mixture of loam and sand[303]. The seedlings quickly develop a taproot and so should not be allowed to grow in a nursery seedbed for more than 4 months before being transplanted into containers[325]. Seedlings should attain at least 80 cm before being transplanted to their final location at the beginning of the rainy season[303]. They can be planted out when 30cm tall[325]. Cuttings of greenwood Air layering Grafting.

nwatta Agroforestry Services: Crop shade Agroforestry Services: Living trellis Agroforestry Services: Wind-break Fodder: Bank Management: Standard Minor Global CropTamarind grows best in drier areas of the tropics, though it can also do well in much wetter, monsoon areas so long as there is a distinct dry season. It is found at elevations up to 1,500 metres[298 , 325 , 418 , 774]. It grows best in areas where annual daytime temperatures are within the range 20 - 35°C, but can tolerate 12 - 45°C[418]. When dormant, the plant can survive temperatures down to about -3°C, but young growth can be severely damaged at -1°C[418]. The plant is very sensitive to frost[325]. It prefers a mean annual rainfall in the range 800 - 3,000mm, but tolerates 300 - 4,500mm[418]. In India, it is not grown commercially in areas receiving more than 1,900mm of rain a year and in the wet tropics, with over 4,000 mm of rain, flowering and fruit setting is significantly reduced[325]. Regardless of total annual rainfall, a long, well-marked dry season is necessary for fruiting[303]. Plants succeed in a range of soils, though they prefer a well-drained, fertile soil in a sunny position[302 , 307]. Often found near the coast and in sandy soils, which suggests it is tolerant of saline conditions[298]. Prefers a pH in the range 5.5 - 6.5, tolerating 4.5 - 8.5[418]. Plants have an extensive root system, which makes them very tolerant of windy conditions (including salt-laden winds) and drought[200 , 303 , 307]. Growth is generally slow; seedling height increasing by about 60cm annually[303]. Trees commence bearing fruit at 7 - 10 years of age, with maximum yields being obtained from about 15 years onwards[303]. Trees can continue yielding for 200 years[325 , 774]. Yields of 200 kilos per tree have been recorded[200]. There are many named forms[298]. The trees respond to coppicing and pollarding[303]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this ni-

trogen is utilized by the growing plant but some can also be used by other plants growing nearby[200]. Flowering Time: Mid Winter. Bloom Color: Rose/Mauve Pale Yellow. Spacing: 4-6 ft. (1.2-1.8 m).

5.1.2 Parkia biglobosa

African Locust Bean
tfo2n 10 thin 12 cyuc 4 kca4 4 tcan 2 dwat 15 m hkuc
htut cyutli hqattcup hwicli hrasljutnyik hpa7tli frusflatprik
hpa7tmwatli hjonli

drutta Parkia biglobosa is a deciduous Tree growing to 15 m (49ft) by 15 m (49ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Bats, Bees, Insects. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It cannot grow in the shade. It prefers moist soil and can tolerate drought.

pista The bark and pods contain substances toxic to fish - the alkaloid parkine that occurs in the pods and bark may be responsible[303].

kcakta Edible Parts: Flowers Leaves Seed SeedpodEdible Uses: DrinkThe pods contain a sweet, yellow, farinaceous pulp surrounding the seeds[46, 301]. This pulp can be eaten fresh or made into sweetmeats and drinks[299, 301, 303]. It contains up to 29% crude protein and up to 60% saccharose, is rich in vitamin C and high in oil content[303, 317]. The pulp also yields a flour that is much used in parts of Africa[301, 317]. The pink brown to dark brown pods are about 45cm long and 2cm wide[418]. Seeds are fermented to make dawadawa, a black, strong-smelling, tasty food high in protein. Dried fermented seeds keep for more than a year in traditional earthenware pots without refrigeration, and small amounts are crumbled during cooking into traditional soups and stews that are usually eaten with sorghum- or millet-based dumplings and porridges. Because of the savoury taste and the high protein and fat values of the seed, it is sometimes described as a meat or cheese substitute, but it is not usually eaten in large amounts. Dawadawa is rich in protein, lipids and vitamin B2. Parinari curatellifolia is deficient in the amino acids methionine, cystine and tryptophan, but fermented beans are rich in lysine. The fat in the beans is nutritionally useful (approximately 60% is unsaturated)[299, 303]. The seeds contain antinutritional factors and have to be processed before use as food. Boiled and fermented seeds contain 35% proteins, 29% lipids, 16% carbohydrates and have good organoleptic properties and a positive effect on intestinal flora[299]. A coffee substitute is prepared from the parched seeds[299, 301, 303]. The seeds are roasted and ground into a powder for use as a coffee substitute[317]. Young pods are sometimes roasted on embers and eaten[303]. Leaves are edible but not commonly eaten[303]. They are sometimes eaten as a vegetable, usually after boiling and then mixed with other foods such as cereal flour[299]. Young flower buds are added to mixed salads[299].

tcanta Containers Dye Fibre Fodder Fuel Furniture Insecticide Mordant Musical Potash Shelterbelt Soap making Soil conditioner Tannin Teeth WoodAgroforestry Uses: A useful windbreak and shade tree[303]. Soils under the tree are improved by its leaf fall[299, 303]. It is common practice to grow several crops such as maize, cassava, yams, sorghum and millet under the canopy[303]. Other Uses Pods and roots contain fibres and are used as sponges and as strings for musical instruments[299, 303]. Twigs are used to clean the teeth. The bark stains the mouth red and also contains saponins that clean the teeth[303]. A mucilage obtained from part of the fruit is made into a fluid and used for hardening earth floors and to give a black glaze in pottery[303]. The fruit pods are used to produce an insecticide powder, which is added to water and sprayed on crops[325]. The husks of pods, mixed with indigo, improve the lustre of dye products[303]. The boiled pods are used to dye pottery black[299]. The ash is applied as a mordant[299]. The seeds and bark are a source of tannins[303, 317]. The wood ashes are used as a source of potash in making soap and indigo dye[317]. Wood is whitish, moderately heavy, 580-640 kg/cubic m when air seasoned, relatively hard and solid; it smells unpleasant when newly felled, but seasoning does not take long and only occasionally causes shape distortion; easily worked by hand or power tools; nails, glues,

varnishes and paints well; mainly useful as a light structural timber, for example, for vehicle bodies, agricultural implements, boxes, crates and barrels, furniture, mortars and pestles, bowls, planks and carvings[299, 303]. The branches are sometimes lopped for firewood[299, 303].

dwatta Analgesic Anticoagulant Antidiarrhoeal Antidote Antihaemorrhoidal Antinflammatory Antiseptic Diuretic Febrifuge Hypotensive Leprosy Malaria Mouthwash Ophthalmic Purgative Skin Vitamin CThe bark is used as a mouthwash, vapour inhalant for toothache, or for ear complaints. It is macerated in baths for leprosy and used for bronchitis, pneumonia, skin infections, sores, ulcers, bilharzia, washes for fever, malaria, diarrhoea, violent colic and vomiting, sterility, venereal diseases, guinea worm, oedema and rickets, and as a poison antidote[303]. Leaves are used in lotions for sore eyes, burns, haemorrhoids and toothache[303]. Seed is taken for tension, and pulp for fevers, as a diuretic and as a mild purgative[303]. Roots are used in a lotion for sore eyes[303]. An alcoholic extract of crude seeds showed anti-hypertensive activity and contractile effect on smooth muscles of the intestine, and increased the tonus and mobility of the uterus[299]. Ichthyotoxic and molluscicidal activities have been recorded for the seeds due to the presence of saponins[299]. The bark, leaves and pod husks are rich in tannins, which in general have anti-diarrhoeal activities[299]. Analgesic and anti-inflammatory activities have been demonstrated for the bark extracts[299]. The aglycone flavonoids in the leaves have spasmodic activity on smooth muscles, and also vasodilatory and antiseptic effects[299]. Coumarin derivatives in leaf extracts have anticoagulant activity[299].

nrakta Western central and northeastern tropical Africa. ksacta Particularly found on areas such as farm woodland which are subject to semi-permanent cultivation, also open woodlands on savannahs, rocky slopes, stony ridges etc[303].

propta Seed - it has a hard seedcoat and benefits from scarification before sowing in order to speed up and improve germination. This can usually be done by pouring a small amount of nearly boiling water on the seeds (being careful not to cook them!) and then soaking them for 12 - 24 hours in warm water. By this time they should have imbibed moisture and swollen - if they have not, then carefully make a nick in the seedcoat (being careful not to damage the embryo) and soak for a further 12 hours before sowing. The plant forms two different types of seed in each pod, reddish-dark ones and black ones[303]. The reddish dark have thinner seed coats and germinate more easily and quickly, even without scarification[303]. Young plants quickly form a deep taproot so it is best to sow the seed in individual, deep containers. Usually about 75% of all the seeds will germinate[303]. Seedlings can be ready to plant in their permanent positions when they are 10 - 14 weeks old[774]. Cuttings of mature wood[303]. Grafting.

nwatta Agroforestry Services: Nitrogen Fodder: Pod Management: Standard Other Systems: Parkland Regional Crop Staple Crop: Protein-oilAdapted to a wide ecological range, African locust bean is found naturally in the drier lowland tropics at elevations below 600 metres[325]. It grows best in areas where annual daytime temperatures are within the range 28 - 40°C, but can tolerate 8 - 44°C[418]. It prefers a mean annual rainfall in the range mm, but tolerates mm[418]. It prefers a strongly seasonal climate with a dry season of 4 - 8 months[303, 325]. Grows best in a sunny position[418]. Prefers well-drained, deep, sandy to loamy cultivated soils, but it is also found on shallow, skeletal soils and thick laterites[303, 418]. Prefers a pH in the range 4.5 - 5.5, tolerating 4 - 6[418]. The plant has a deep taproot system and an ability to restrict transpiration, this gives it the capacity to withstand drought conditions once it is established[303]. Young trees have a slow rate of growth[774]. Growth is comparatively fast: seedlings may reach a height of 1 metre within the first year, and young trees of superior provenances can reach 7 metres tall in 6-year-old plantations[299]. Trees start flowering at 5 - 7 years while still comparatively small. They reach their maximum height after 30 - 50 years, and can reach an age of 100 years[299]. Trees in some areas have two flowering periods each year[299]. The tree produces root suckers[774]. There are conflicting reports on whether or not this tree has a symbiotic relationship with certain soil bacteria, so it is unclear as to whether this tree fixes atmospheric nitrogen[755

is not advisable to eat large quantities of food that contain saponins. Saponins are much more toxic to some creatures, such as fish, and hunting tribes have traditionally put large quantities of them in streams, lakes etc in order to stupefy or kill the fish[K].

kcakta Edible Parts: Flowers Fruit Leaves Oil Seed Shoots StemEdible Uses: Drink OilThe fleshy pulp of both unripe and ripe fruit is edible and can be eaten dried or fresh[46, 303]. It has a slightly astringent taste and can be purgative in larger quantities[774]. The fruit is processed into a drink and sweetmeats in Ghana, an alcoholic liquor in Nigeria, a soup ingredient in Sudan[303]. The ellipsoid fruit is up to 4cm long[303]. Brown or pale brown when fully ripe, with a brittle coat enclosing a brown or brown-green sticky pulp and a hard stone seed[303]. Young leaves and tender shoots are used as a vegetable[46, 303]. They are prepared by boiling and pounding, and are then fried or mixed with fat[303]. The flowers are a supplementary food in West Africa and a flavouring in Nigeria[303]. They are sucked in order to obtain their nectar[303]. A greenish-yellow to orange-red resin is produced from the stems. It is sucked and chewed when fresh[303]. The kernels produce an edible oil used for cooking[303]. The oil remains stable when heated and has a high smoking point, and therefore its free fatty acid content is low[303]. Its scent and taste are acceptable[303]. The seed contains up to 50% oil[774].

tcanta Adhesive Beads Biomass Charcoal Fencing Fibre Fodder Fuel Hedge Oil Resin Shelterbelt Soap making WoodAgroforestry Uses: The usually evergreen behaviour potentially makes this plant an attractive element to introduce into shelterbelts, although because of its slow growth, it is not suitable as a principal species[303]. Its thorny habit makes this tree a useful plant for fencing and hedging[303, 317]. Other Uses An oil obtained from the seed has been recommended for the manufacture of soap[46]. A strong fibre is obtained from the bark[46, 303]. A greenish-yellow to orange-red resin is produced from the stems. It is used as a glue for sticking feathers onto arrow shafts and spearheads and in the repair of handle cracks and arrows[303]. The fruit and bark contain saponins[303]. An emulsion made from them is lethal to the freshwater snails that are the host of miracidia and cercaria stages of bilharzia and to a water flea that acts as a host to the guinea worm[303]. The seeds are used for rosary beads and necklaces[303]. The pale yellow or yellowish-brown wood is fine-grained, compact, hard, durable and easily worked[46, 303]. The heartwood and sapwood are not clearly differentiated[303]. It shows no serious seasoning defects and no tendency towards surface checking or splitting[303]. The wood saws cleanly and easily, planes without difficulty to a smooth finish and is easy to chisel. It glues firmly and takes a clear varnish[303]. The timber has traditionally been a minor product, it is made into yokes, wooden spoons, pestles, mortars, handles, stools and combs[303]. The usually small log size and the prevalence of stem fluting makes sawmill processing difficult[303]. The wood is good firewood; it produces considerable heat and very little smoke, making it particularly suitable for indoor use[303]. It produces high-quality charcoal, and it has been suggested that the nutshell is suitable for industrial activated charcoal[303]. The calorific value is estimated at 4600 kcal/kg[303].

dwatta Antiasthmatic Antidiarrhoeal Antiperiodic Dysentery Emetic Epilepsy Febrifuge Malaria Purgative Stomachic Vermifugelt is traditionally used in treatment of various ailments including jaundice, intestinal worm infection, wounds, malaria, syphilis, epilepsy, dysentery, constipation, diarrhoea, hemorrhoid, stomach aches, asthma, and fever. It contains protein, lipid, carbohydrate, alkaloid, saponin, flavonoid, and organic acid. The roots are purgative and vermifuge[46]. A decoction of the root is used to treat malaria[303]. The roots are boiled in a soup to be used in the treatment of oedema and stomach pains[303]. They are also used as an emetic[303]. The bark is purgative and vermifuge[46]. An infusion of the bark is used to treat heartburn[303]. The bark is used to deworm cattle in Rajasthan[303]. Wood gum, mixed with maize meal porridge, is used to treat chest pains[303]. The plant is a potential source of steroidal saponinins (diosgenin) for the hemisynthesis of corticosteroids[317].

nrakta Africa - most of the drier areas except the far south, extending to Arabia. ksacta Found in a variety of habitats, growing best in low-lying, level alluvial sites with deep

sandy loam and uninterrupted access to water such as valley floors, riverbanks or the foot of rocky slopes[303].

propta Seeds may be collected from fruit that is being processed for other purposes, from dung, and directly from the trees. Soaking in water for some hours and then stirring vigorously separates the stones from the pulp. Seed germination can be improved by immersing the seeds in boiling water for 7 - 10 minutes then cooling then slowly. The effect that passage through an animal's intestinal tract has on germination is unclear. However, seeds are said to germinate readily, although with some difference associated with date of collection[303]. Seed storage behaviour is orthodox; viability can be maintained for 2 years in air-dry storage at cool temperatures or for several years in hermetic storage at 3°C with 6 - 10% mc[303]. Root suckers. Produced abundantly[303].

nwatta Fodder: Bank Industrial Crop: Biomass Manage Coppice Management: Standard Other Systems: Parkland Regional Crop Staple Crop: Protein-oilA plant of the arid and sub-arid tropics and subtropics, where it is found at elevations up to 2,300 metres. It grows best in areas where annual daytime temperatures are within the range 20 - 35c, but can tolerate 15 - 41c[418]. It prefers a mean annual rainfall in the range 300 - 800mm, but tolerates 200 - 1,700mm[418]. Dislikes humid climates[335]. Grows best in deep sands, sandy clay loams, sandy loams or clays[303]. Plants are intolerant of shade after they pass the seedling stage[303]. Prefers a pH in the range 7 - 8, tolerating 6.5 - 8.5[418]. The plant can become a weed[418]. A slow-growing tree, reaching a height of 1 - 3 metres after 3 years; 2 - 5 metres after 8 years[418]. Fruiting commences when plants are about 5 - 8 years old, the yield increasing until they are around 25 years old[303]. The fruit apparently takes at least 1 year to mature and ripen[303]. Desert date coppics and pollards well, and can regenerate after lopping and heavy browsing. The fruit is in high demand as a food, which gives it high economic value; therefore, little fruit and thus few seeds are left for natural regeneration of the species[303]. Fruiting and foliage production usually occur at the height of the dry season, though this can vary[303]. The tree withstands grass fires[418].

5.2.59 Gymnema sylvestere

Gurmar, Gymnema
10 thin 12 cyuc 3 kca4 0 tcan 4 dwat 3 m hkuc
htut cyutli tcup hwicli hrasljutnyik hpa7tli flatprikliwis
hpa7tmwatli hjonli

drutta Gymnema sylvestere is an evergreen Climber growing to 3 m (9ft) by 0.3 m (1ft in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist soil.

kcakta Edible Parts: Fruit LeavesEdible Uses: Leaves - raw or cooked[299]. Eaten as a vegetable or added to soups[299]. The leaves, for a short while after being eaten, have the ability to make even bitter foods taste sweet[46]. In India and China the bitter leaves are known as 'sugar destroyer', as the taste for sweetness is blocked for some time[299]. Fruit - cooked[299]. It is roasted then peeled and eaten, after discarding the seeds. The taste is similar to that of potatoes[299].

dwatta Antidote Astringent Diuretic Emetic Epilepsy Febrifuge Hypoglycaemic Poullice Purgative Refrigerant Skin Stomachic TonicGurmar is an important, bitter-tasting Ayurvedic herb that is used especially to reduce blood sugar levels in diabetics[304]. Both roots and leaves can be used[304]. The plant contains a group of oleanane type triterpenoid saponins known as gymnemic acids, a complex mixture of at least 9 closely related acidic glycosides, which have taste-modifying activity; and gurmarin, which is a sweet taste-suppressing polypeptide. When the leaf is chewed, the ability to taste sweetness is lost temporarily[299]. Studies have demonstrated that the leaf powder may exert an antidiabetic effect via a number of pathways, including decreasing the uptake of glucose from the small intestine; improvements in glycogen synthesis, glycolysis, gluconeogenesis, and hepatic and muscle glucose uptake; as well as the reversal of haemoglobin and plasma protein glycosylation[299

sometimes with peanut butter, and eaten as a vegetable[299]. The dried powdered leaves are added to food as a condiment[299]. The vanilla-like odour may have potential as a novel African fragrance or spice[299]. The fruits are considered edible in some parts of Africa, although in southern Africa the seeds are used as an arrow poison[299]. The roots are used to flavour food and tea[299]. They are also used to make an energizing drink for wedding parties and a ginger-like beer[299].

tcanta Essential Fencing Fibre Parasiticide String TeethAgroforestry Uses: The plant is grown to reinforce enclosures[299]. Other Uses A fibre obtained from the stem yields a strong rope and a fine thread[299]. The woody parts of the root are used as chewing sticks[299].

dwatta Antidepressant Antiemetic Antiinflammatory Antitussive Aphrodisiac Appetizer Carminative Digestive Diuretic Expectorant Laxative Malaria Parasiticide Purgative Restorative Stomachic Tonic UrinaryThe plant is widely used medicinally throughout its range, the root especially being valued. Relatively little research on the active compounds in the plant has been effected. The roots contain 1 - 1.2% of an essential oil, 2.8% of a fixed oil, 20% glucose, 0.7% resin and 0.045% of a glycoside[299]. The essential oil causes inflammation and reddening of the skin, irritation of the mucous membranes and relaxes mammalian intestinal smooth muscles[299]. Hexane, methanol and water extracts of the leaves and roots did not show any antibacterial activity against a range of human pathogens. The hexane and methanol extracts showed significant anti-inflammatory activity[299]. An aqueous root extract showed moderate activity against *Schistosoma haematobium*[299]. An aqueous root bark extract at 400 mg/kg/day given orally during 8 days increased testosterone production and fertility of male rats[299]. An aqueous root extract administered to human spermatozoa in vitro was found to enhance total motility as well as progressive motility in a time-dependent manner[299]. Both the roots and the root bark have a pronounced vanilla-like odour and taste like a mixture of liquorice and ginger[299]. They are anodyne, aphrodisiac, appetizer, carminative, diuretic, expectorant, purgative, restorative, stomachic, tonic and uterine stimulant[299]. The root is especially highly valued throughout Africa as an aphrodisiac - the fresh or dried roots are chewed to treat sexual weakness, prevent premature ejaculation and to increase sperm production[299]. A decoction or infusion is widely taken to treat digestive troubles including gastro-intestinal problems, stomach-ache, indigestion, constipation, anorexia, and as a restorative and appetite stimulant[299]. The decoction is also used to treat a wide range of other conditions, including urinary infections, gonorrhoea, jaundice, coughs, bronchitis, chest complaints, headache, paralysis and epileptic attacks, depression, to relieve body pains and to treat fits in children[299]. The root is pulverized and added to porridge in order to treat schistosomiasis[299]. A plant extract is taken to treat malaria[299]. The leaves are squeezed in water and the filtrate is drunk to stop heavy post partum bleeding[299]. T A leaf decoction is drunk to stop vomiting[299].

nrakta Tropical Africa - Senegal to Sudan and Kenya, south to Namibia, Zambia, Zimbabwe and Mozambique. ksacta Found in a variety of habitats, ranging from humid forest, riverine forest, swamp forest and forest margins to humid or semi-dry savannah, sometimes along river banks, at elevations from sea-level up to 2,000 metres[299].

propta Seed - Stem cuttings. Root cuttings. nwatta The flowers have a slightly fruity, unpleasant odour, which becomes stronger in the afternoons. They remain open for between 3 and 4 days and are probably pollinated by flies[299]. Bloom Color: Red Cream/Tan. Spacing: 24-36 in. (60-90 cm).

5.2.57 Raphia vinifera

Wine Raffia Palm. Wine Palm

10 tin 12 cyuc 3 kcak 3 tcan 0 dwat 6 m hkc hut cyutli tcup hwicli hrasjltuntyik hpa7tli flatprikliws hpa7tmwatli hjonli

drutta Raphia vinifera is an evergreen Tree growing to 6 m (19ft) by 4 m (13ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic

(mildly alkaline) soils. It cannot grow in the shade. It prefers moist soil.

kcaakta Edible Parts: Apical bud Fruit Oil Sap SeedEdible Uses: OilThe oil, extracted from the mesocarp of the fruits by cooking, is used as food (raphia butter)[431 , 970]. The kernels of the fruits are eaten roasted[317]. The fruit is edible, but somewhat bitter[301]. The terminal bud of the palm is eaten as palm cabbage[317]. An intoxicating beverage called Bourdon is obtained by tapping the trunk and fermenting the sap obtained[454]. The sweet sap is extracted by removing the immature inflorescence and collecting the sap that runs out of the portion of cut stem remaining on the tree. In contrast to *Raphia hookeri*, the sap is not much used for wine making[317]. The sap is also concentrated to make a sweet syrup[301]. When the stems are harvested to be used as poles, they are allowed to lie on the ground for several days whilst the sap was drained. The drink obtained by this method is less sweet and more alcoholic that the drink obtained from the genuine wine palm (*Elaeis spp*)[970].

tcanta OilThe leaves are mainly exploited as a source of fibres (piassava, raffia, Lagos-bast, African bast)[317]. Hats, clothes and cordage are traditionally made from the leaves[454]. The leaves are considered as one of the best local thatching materials, being more durable than other materials[970]. Bound with lines, they are used as a thatching material[454]. The vascular bundle fibres, obtained from the leaf sheaths, are made into brooms and brushes[317]. The fibres are about 90 - 120cm long[454]. The bast fibres serve the weaving of mats, baskets, belts, hammocks, fishing lines, and as tying material, used in the horticulture[317]. The oil, extracted from the mesocarp of the fruits by cooking, is used as food (raphia butter) or utilized as fuel oil, lubricant, or pomade[327]. The leaf stems are about 2 metres long[454]. They are used as a building material in a similar manner to bamboo for making the framework of native dwellings[317 , 454]. The mid-ribs are stout but light. They have a wide range of uses including as poles, paddles, material for house building, furniture making etc[970]. When split, they provide material for weaving floor mats[970]. The main stems of the plant are used as house posts[970]. Industrial Crop: Fibre.

nrakta Tropical west Africa - Ghana to DR Congo. ksacta Borders of rivers[454]. Swamps and creeks[970].

propta *Raphia* palms are generally propagated by seed. In nurseries, a spacing of 30 cm × 30 cm is recommended. Seedlings may be collected from the wild and raised in a nursery before being planted out in the field. *Raphia vinifera* is also propagated by suckers. Propagation by tissue culture techniques may offer potential for *Raphia*.

nwatta Industrial Crop: Fiber Management: Standard Regional CropHumid tropics. A monocarpic plant - growing for several years without flowering, then producing a massive inflorescence and dying after setting seed[200]. Fruit rot, caused by *Thielaviopsis paradoxa* (synonym: *Chalara paradoxa*) affects *Raphia vinifera* in Nigeria, causing dark brown rot of the mesocarp. It is a weak pathogen entering fruit via wounds, sometimes killing the embryo, and leading to loss of planting material. The aphid *Cerataphis palmae* may cause considerable damage to *Raphia vinifera*, e.g. in Nigeria.

5.2.58 Balanites aegyptiaca

Desert Date. Desert date, Soapberry tree 10 tin 12 cyuc 3 kcak 3 tcan 2 dwat 6 m hkc htut cyutli tcuphja7n hwicli hrasjltuntyik hpa7tli flatprikliws hpa7tmwatli hjonli

drutta *Balanites aegyptiaca* is an evergreen Tree growing to 6 m (19ft) by 4 m (13ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 10. 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 The plant contains saponins[303]. Although poisonous, saponins are poorly absorbed by the human body and so most pass through without harm. Saponins are quite bitter and can be found in many common foods such as some beans. They can be removed by carefully leaching in running water. Thorough cooking, and perhaps changing the cooking water once, will also normally remove most of them. However, it

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5.1.3 Vitex doniana

Black Plum tfo2n 10 tin 12 cyuc 4 keak 4 tcan 3 dwat 15 m hkc hmimhtut cyutli tcup hwicli hyishrasjltuntyik hpa7tli frusflatprik hpa7tmwatli hjonli

drutta *Vitex doniana* is a deciduous Tree growing to 15 m (49ft) by 15 m (49ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Bees, Sunbirds. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

pcista The sawdust from the leaves has been known to cause dermatitis[299].

kcaakta Edible Parts: Fruit Leaves Seed ShootsEdible Uses: Coffee Condiment Drink Sweetener TeaFruit - raw, cooked, candied etc[299 , 335]. A sweet flavour with a mealy texture, it tastes a bit like prunes[303 , 323 , 335]. It contains vitamins A and B and can be made into a jam[303]. The jam is of good quality, somewhat like plum jam but better for spreading[299]. A syrup made from the fruit pulp can be used instead of other syrups as a nutritive sweetener[299]. The black fruit is about 2cm long[335]. The fruit can be made into a wine[303]. Wine obtained from controlled fermentation had 10.5% alcohol content, and wine obtained from spontaneous fermentation 5%[299]. Young twigs and leaves are an esteemed vegetable[299 , 317]. The leaves are often used as a herb for cooking[303]. The pounded leaves can be added to warm filtered grain beer and then drunk[303]. It is said to make them stronger[299]. Seeds[299]. The seeds are roasted and used to make a coffee-like drink[323]. The leaves can be used as a tea substitute[301].

tcanta Charcoal Dye Friction sticks Fuel Furniture Ink Mulch Pioneer Resin Soil conditioner Teeth WoodAgroforestry Uses: The heavy rounded crown provides good shade[303]. The tree has nitrogen-fixing roots and this, combined with the leaf fall, contributes to the improvement of soil fertility[299 , 303]. The leaves can be used for mulch[303]. The tree has some potential for use as a pioneer species - in Central Africa it is often the first species to establish when gallery forests evolve in low-lying areas in the savannah[299]. Other Uses An ink is produced from the dried fruits, young leaves and bark[317]. The blackish extract obtained by boiling the leaves, bark, roots and/or fruits is used as ink and as a dye for clothes[299 , 303]. The twigs are used as chewing sticks for teeth cleaning[299]. An aqueous extract of the chewing sticks has been shown to exhibit strong activity against a wide spectrum of bacteria including medically and dentally relevant bacteria, although the extracts of chewing sticks from *Garcinia kola* and *Anogeissus leiocarpa* had broader and generally stronger effects. This supports the traditional use of these chewing sticks with reported anticaries effect[299]. The dried seeds yield about 30% oil[299]. The oil has high iodine and low saponification values and can be used for skin cream, resin and paint production[299]. The wood is said to be used as friction sticks to start a fire[323]. The heartwood is creamy white to pale brown, yellowish brown or greyish brown; it is indistinctly demarcated from the 25 - 60mm wide sapwood[299]. The grain is straight to wavy or interlocked; texture moderately fine to moderately coarse. The wood resembles teak; it is medium-weight and soft; usually not durable, although good durability has also been reported, especially resistance against termites[299 , 303]. It is easy to saw and work with hand and machine tools; it often planes to a silky or furry surface due to the presence of interlocked grain; it nails well with little splitting, but it does not always hold nails well. Veneer of good quality can be produced, but the logs are often too irregular to be suitable for rotary peeling. The wood is often too soft for turnery[299]. It is suitable for light building material, furniture, carvings and boats[303]. The wood makes a good fuel and is also used to bake charcoal[303 , 323].

dwatta Anodyne Antidiarrhoeal Dysentery Refriferug Galactogogue Hypotensive Leprosy Odontalgic Ophthalmic Skin TonicThe plant is often used in traditional medicine. Modern research has shown that the plant has a range of

actions upon the body. Consumption of large amounts of the fruits has been shown to cause a transient reduction in reproductive functioning in female olive baboons. The presence of progestogen-like compounds in the fruit has been suggested as the probable cause[299]. An aqueous extract of the stem bark has been shown to produce a dose-dependant hypotensive effect and to also be hepato-protective[299]. Stem bark extracts can inhibit the growth of clinical isolates of *Salmonella typhi*, *Shigella dysenteriae* and *Escherichia coli*, suggesting that they may be valuable in the treatment of dysentery and other gastroenteric infections[299]. The fruit is used to improve fertility and to treat anaemia, jaundice, leprosy and dysentery[303]. Both the dried and the fresh fruits are eaten as a treatment against diarrhoea[299]. The root is anodyne[299]. A decoction is used to treat gonorrhoea, ankylostomiasis, rickets, gastro-intestinal disorders and jaundice[299 , 303]. A decoction of the root is drunk by women to treat backaches[303]. The leaves are anodyne, febrifuge, galactagogue and tonic[299]. A decoction is taken internally as a tonic and to treat fevers and respiratory diseases[299]. It is applied externally to increase milk flow and as a treatment for headache, stiffness, measles, rash, fever, chickenpox and hemiplegia[299]. The young tender leaves are pounded and the juice squeezed into the eyes to treat conjunctivitis and other eye troubles[299 , 303]. A paste made from the pounded leaves and bark is applied to wounds and burns[299]. The powdered bark is added to water and then taken to treat colic[299]. A bark extract is used to treat stomach complaints, kidney troubles, leprosy, liver diseases, and to control bleeding after childbirth[299].

nrakta Tropical Africa - Senegal to the Sudan, south to Angola, Zambia and Mozambique. ksacta Dense forest, wooded savannah, coastal savannah, galleried soudanian and riverine thickets[332]. A deciduous forest tree of coastal woodland, riverine and lowland forests and deciduous woodland, extending as high as upland grassland[303].

propta Seed - The seed has a hard coat, which slows down germination. Any pre-treatment would be to soften or abrade this seed coat and allow the ingress of water[303]. This can either be done by soaking the seed in hot water that is allowed to cool - if the seed has not shown signs of swelling within 12 - 24 hours then remove from the water and abrade the seedcoat, being careful not to damage the seed below[K]. It is thought forest fires help in inducing germination because they help break the hard seedcoat[303]. The treated seed is said to germinate easily - it can be raised in a nursery and transplanted, or can be sown in situ[323]. Root suckers[323]. Cuttings[323].

nwatta Black plum is a plant of hot, tropical climates where it is found at elevations from near sea level to 1,850 metres[303]. It grows best in areas where annual daytime temperatures are within the range 14 - 28°c, but can tolerate 10 - 36°c[418]. It prefers a mean annual rainfall in the range 750 - 2,000mm, but tolerates 600 - 2,500mm[418]. Grows best in a sunny position[418]. Occurs on a variety of well-drained soils of varying origins, usually alluvial soils[303]. Prefers a pH in the range 5.5 - 7, tolerating 5 - 7.5[418]. The growth rate is moderate. In plantations in northern Cote d'Ivoire, seedlings were on average 70 - 90cm tall after 3 years, the tallest ones reaching 170cm[299]. On good soils in southern Burkina Faso early growth is a bit faster[299]. Trees respond well to coppicing and also produce root suckers[303 , 323]. The fruit falls from the trees when it is ripe. It is not damaged by this fall so people generally harvest from under the tree rather than picking it from the tree[323]. The flowers are extremely attractive to bees[323]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[200].

5.1.4 Pentaclethra macrophylla

African Oil Bean. Oil Bean Tree, Owala Oil

tfo2n 10 tin 12 cyuc 3 kcak 3 tcan 2 dwat m hkc hmimhtut cyutli tcup hwicli jltuntyik hpa7tli frusflatprik hpa7tmwatli hjonli

drutta *Pentaclethra macrophylla* is an evergreen Tree growing to 30 m (98ft) by 30 m (98ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Bees. It can fix Nitrogen. Suitable

for: medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

pista The seeds contain a toxic alkaloid[317]. They are pulverized and used as a component of an arrow poison, they are also used as fish poison and as mild drug (snuff)[317].

kcakta Edible Parts: Oil Seed Seedpod**Edible Uses:** Oil SaltSeeds - boiled or roasted[46 , 299 , 418]. They can be ground into a flour and used in making bread[46]. The pods are 40 - 50cm long and 5 - 10cm wide, containing 6 - 10 flat, glossy brown seeds up to 7cm long[414 , 418]. The seeds are fermented to produce 'ugba'[299]. They are boiled for 3 - 12 hours; then the seedcoat is removed. When the cotyledons are cooled to room temperature they are sliced into small pieces of 4 - 5 cm × 1 - 2 mm and washed with water. The slices are boiled for 1 - 2 hours, cooled and soaked in water for 10 hours[299]. Then the slices are drained in a basket lined with banana leaves[299]. The drained slices are wrapped in blanched leaves of banana or Mallotus oppositifolius and incubated at ambient temperature for 4 - 6 days when prepared for use as a snack or sidedish, or for 7 - 10 days when prepared as a condiment for soups[299]. The fermentation is proteolytic and proceeds under alkaline conditions. It is caused mainly by *Bacillus subtilis*, but other *Bacillus* spp. are also involved, while other bacteria may be present as contaminants[299]. The seeds contain 30 - 36% of an edible oil[317]. They are used for the production of 'owala-oil', or 'owala-butter' which is used in food[317]. The ash of the seedpods is used as a salt substitute[414].

tcanta Beads Charcoal Fencing Fuel Lighting Mordant Mulch Oil Soap making Soil conditioner WoodAgroforestry Uses: Farmers protect this species on farms because of its open crown form that allows substantial light and does not inhibit crop plants grown under its canopy[418]. This accounts for the trees use in combination with food crops on farms and particularly in home gardens in south east Nigeria[418]. The tree produces a heavy leaf fall and these are used as a mulch[414]. **Other Uses:** The seeds contain 30 - 36% oil[317]. They are used for the production of 'owala-oil', or 'owala-butter' which is used in soap and candle production[317]. The dried pods are used as fuel[418]. The ashes of burnt pods are used as a mordant[303 , 414]. The seeds are decorative and are used as beads in necklaces and rosaries[303]. The heartwood is reddish brown and not always distinctly demarcated from the whitish or grey sapwood[299]. The wood is hard, the grain interlocked and difficult to work[46 , 299]. Wood of suitable size can be difficult to find but, when available, it is used for turnery, wheelwright's work, fencing, railway sleepers and general carpentry[46 , 299]. Traditionally, it is used to make pestles and mortars[299]. The wood is used as firewood and charcoal[418]. Pentacthra macrophylla nodulates and fixes atmospheric nitrogen.

dwatta Abortifacient Analgesic Anthelmintic Antidiarrhoeal Antiinflammatory Dysentery Laxative SkinExtracts of the leaf, stembark, seed and fruit pulp have anti-inflammatory and anthelmintic activity, and are used to treat gonorrhoea and convulsions, and also used as analgesic[299]. The crushed seeds are taken to acquire an abortion[418]. Leaf and stem decoctions are taken against diarrhoea[418]. A lotion made from the bark is used as a wash on sores[46]. The ripe fruits are applied externally to heal wounds[299]. The root bark is used as a laxative, as an emema against dysentery and as a liniment against itch[299]. An infusion of the bark is used as an abortifacient[299].

nrakta West tropical Africa - Senegal to Central African Republic, south to Angola and the Congo. **ksacta** Mainly in lowland rainforest, but also sometimes in the high forest zone[303]. Often occurs near streams and on the edges of damp depressions, and is frequently seen as a small tree of untidy habit and large crown on roadsides and farms[303].

propta Seed - best sown as soon as it is ripe because it has a short viability[414]. Storage at 15°C can extend longevity for about three months[414]. Scarifying the seed and then soaking for 24 hours in warm water prior to sowing increases the germination rate and reduces the time taken to germinate[414]. About 87% of treated seed germinates within 14 - 16 days[303]. Adult trees can be air layered[414]. Cuttings of juvenile plants can be rooted, but usually require rooting hormone[414].

nwatta Agroforestry Services: Nitrogen Management: Standard Regional Crop Staple Crop: Protein-oilA plant of

the humid and subhumid tropics[418]. It grows best in areas where the mean annual temperature is within the range 24 - 30°C, but can tolerate 18 - 34°C[418]. It prefers a mean annual rainfall in the range 1,800 - 2,200mm, tolerating 1,000 - 2,700mm[418]. Succeeds in full sun and in light shade[418]. Prefers a deep, moderately fertile medium soil[418]. Tolerant of some water-logging[414]. Prefers a pH in the range 4.5 - 5.5, but tolerates 4 - 6.5[418]. Seedling trees can reach a height of 1.5 metres by the end of their first year[414]. The trees start to produce beans from their tenth year and will continue to bear regularly[418]. After about 2-years growth in the forest, the trees become relatively fire resistant and resprout readily when lopped[414]. Trees coppice well and often produce watershoots around their base[299]. There are conflicting reports on whether or not this tree has a symbiotic relationship with certain soil bacteria, so it is unclear as to whether this tree fixes atmospheric nitrogen[755].

5.1.5 Canavalia gladiata

Sword Bean

tfo2n 10 tlin 12 cyuc 3 kcaak 3 tcan 2 dwat 10 m hkuc hmimhtut cyuti hqtatcup hwicli hrasjlutnyik hpa7tli flatprikli-wihsum hpa7tmwatli fyif hjonli

drutta Canavalia gladiata is a ANNUAL/PERENNIAL growing to 10 m (32ft) by 0.3 m (1ft in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by insects. The plant is self-fertile. 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 saline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought.

pista The mature seeds contain toxic alkaloids. These can be destroyed by thoroughly boiling the seeds twice in salt water[300].

kcakta Edible Parts: Seed Seedpod**Edible Uses:** Young seedpods - raw or more commonly cooked and used as a vegetable[300 , 418]. The pod is 20 - 30cm long and 2cm wide[300]. Seeds - cooked[300]. Thorough boiling is necessary in order to destroy a toxic alkaloid[300]. The seedcoats are often removed, then the seeds are cooked in two or three changes of water[299 , 418]. Large pods, 30-45cm long, are produced towards the end of summer and the seed gradually swell for several weeks (they fatten much more slowly than peas). It requires practice to identify when they're fully matured, otherwise you don't get much food from a pod. A haricot bean alternative!

tcanta Green manure Soap makingThe plant is sometimes grown as a green manure crop or as a temporary ground cover[418]. **Other Uses:** As an ornamental climber on fences and houses (but short lived). It is believed to repel snakes. The seed is used as feed for cattle and chicken, but if eaten in considerable quantity dry seeds may cause poisoning (Bosch, 2004).

dwatta Antiasthmatic Antihemorrhoidal Antiinflammatory Antitussive Cancer Dysentery Epilepsy Skin StomachicUrease is extracted from the seed; it is used in clinical laboratories for the in-vitro determination of urea in human blood[299]. In Korea it is used in the treatment of vomiting, abdominal dropsy, kidney-related lumbago, asthma, obesity, stomach-ache, dysentery, coughs, headache, intercostal neuralgia, epilepsy, schizophrenia, inflammatory diseases and swellings[299]. A soap is marketed there which is based on extracts of sword bean; it is used for the treatment of athlete's foot and acne[299]. In Japan it is effective in treating ozena, haemorrhoids, pyorrhoea, otitis media, boils and cancers, all kinds of inflammatory diseases and atopic dermatitis[299].

nrakta Tropical Asia and Africa. **ksacta** Not known in the wild.

propta Seed - sow in situ, placing the seeds 2 - 3cm deep in the soil[300]. The seed germinates in about 72 hours[300].

nwatta Management: Standard Regional Crop Staple Crop: ProteinGrows well in lowland tropical areas, succeeding at elevations up to 1,500 metres[300]. It grows best in areas where annual daytime temperatures are within the range15 - 30c, but can tolerate 12 - 36c[418]. The foliage

for various uses and for making into furniture, ladders etc[46 , 297 , 299]. They can be split into strips for maing screens, weaving into mats, baskets etc[297 , 299]. The leaves, split lengthwise, are used for thatching, though they last only 1 year[299]. They are also used to make mats, baskets and other articles of wickerwork, and are used for hut-walls and fences[299]. Wood - used for construction[297]. The stem can be used in house-building, both for the framework and roof-poles and also for furniture frames; the outer splints are used for heavy mat screens, hut partitions and ceilings[418]. The wood can be used after the sap has been allowed to drain[297].

dwatta Laxative StomachicThe oily mesocarp of the fruit is used in traditional medicine for its laxative and stomachic properties and as a liniment for pains[299].

nrakta Western tropical Africa - Sierra Leone to Central African Republic and Zaire, south to Angola. **ksacta** Lowland coastal freshwater swamps, where it can grow in water up to 1 metre deep, and river banks. The soils of Nigerian freshwater swamps are light textured and generally acidic[299 , 314 , 418].

propta Seed - pre-soak for 24 hours in warm water and sow in containers. The seed requires several months to germinate[297]. The germination period may range from 1 - 24 months, and the germination rate from 30 - 60%. Young plants are easily transplanted[299]. It has been claimed that seeds should be sown ventral side upwards, because the embryo is located on this side, but research has shown that seed orientation does not influence germination or seedling growth[299].

nwatta Industrial Crop: Fiber Management: Standard Regional Crop Staple Crop: Oil Staple Crop: SugarA plant of the wet, lowland tropics, where it is found at elevations up to 200 metres. It grows best in areas where annual daytime temperatures are within the range 24 - 30°C, but can tolerate 14 - 36°C[418]. It prefers a mean annual rainfall in the range 3,000 - 4,000mm, but tolerates 2,000 - 5,000mm[418]. Requires a hot, sunny position in a moist soil[314]. Prefers a pH in the range 5 - 6, tolerating 4.5 - 6.5[418]. Dislikes saline soils[299]. Plants can tolerate being in flooded ground[314]. A monocarpic plant - growing for several years without flowering, then producing a massive inflorescence and dying after setting seed[200]. Inflorescences are produced more or less simultaneously in the axils of the most distal leaves. Tapping for wine may damage the developing inflorescence, making flowering impossible and accelerating death[299]. The time from planting to flowering in *Raphia hookeri* is 3 - 7 years[299]. Managed stands are mostly left to rejuvenate naturally by seed. In Nigeria, selected trees are left untapped for this purpose[299].

5.2.55 Lagenaria siceraria

Bottle Gourd

10 tlin 12 cyuc 3 kcaak 5 tcan 2 dwat 9 m hkuc htut cyuti tcup hwicli hrasjlutnyik hpa7tli flatprikliwis hpa7tmwatli hjonli

drutta Lagenaria siceraria is a ANNUAL CLIMBER growing to 9 m (29ft 6in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10 and is frost tender. It is in flower from August to September. The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist soil.

kcakta Edible Parts: Fruit Leaves Oil Seed Shoots**Edible Uses:** Condiment OilImmature fruit - cooked and used as a vegetable[2, 27, 200]. They can be boiled, steamed, fried, used in curries or made into fritters[183]. Of variable quality, but some of the selected cultivars from India and China are of very good quality, equivalent to good summer squashes[183]. The pulp around the seed is purgative and should not be eaten[46]. The fruit can be dried for later use[86]. Leaves and young shoots - cooked and used as a potherb[178, 183]. Seed - cooked. Rich in oil, it is added to soups etc[183]. A vegetable curd, similar to tofu, can be made from the seed[183]. An edible oil is obtained from the seed. It is used for cooking[177, 183]. Yields of up to 45% have been obtained[240].

tcanta Bottles Containers Musical OilThe shell of well-ripened fruits is very hard and can be used for many purposes such as bottles, bowls, musical instruments etc. There are many different shapes of fruits from the various different varieties[1, 27, 46, 61, 86, 97].

dwatta Antibiotic Antidote Diuretic Emetic Febrifuge Lithontripic Odontalgic Odontalgic Poulitce Purgative Refrigerant Skin Stomachic VermifugeThe pulp around the seed is emetic and purgative[46, 178, 272]. A poultice of the crushed leaves has been applied to the head to treat headaches[257]. The flowers are an antidote to poison[218]. The stem bark and the rind of the fruit are diuretic[218]. The fruit is antilithic, diuretic, emetic and refrigerant[178, 218]. The juice of the fruit is used in the treatment of stomach acidity, indigestion and ulcers[272]. The seed is vermifuge[218]. A poultice of the boiled seeds has been used in the treatment of boils[257]. Taken with *Achyranthes* spp the seed is used to treat aching teeth and gums, boils etc[218]. Extracts of the plant have shown antibiotic activity[218]. In many parts of China 3 grams per day of this species (the report does not say what part of the plant) has been used as a single treatment for diabetes mellitus[218].

nrakta A widely cultivated plant, its original habitat is obscure, though it is probably Asia or Africa. **ksacta** Not known in the wild.

propta Seed - sow spring in a greenhouse in a rich soil, putting 2 - 3 seeds in a pot and thinning to the strongest plant. Grow on fast and plant out as soon as possible after the last expected frosts, giving some protection until the plants are established and growing well. The seed germinates best at 25°C[86]. Soaking the seeds for 12 hours in warm water prior to sowing can hasten germination[86]. Discard any seeds that have not germinated after 10 days, the plants they produce will not be vigorous enough to succeed outdoors in Britain[86].

nwatta Prefers a well-drained moist good rich circum-neutral soil[1, 27, 86, 200]. Requires plenty of moisture in the growing season[1]. Prefers a warm sunny position sheltered from the wind[86]. The bottle gourd is widely cultivated in the tropics and sub-tropics for its edible fruit and for the hard wooden shell of the fruit that can be used as containers, musical instruments etc[206], there are many named varieties with different shaped and sized fruits[86, 183, 206]. The variety 'Cougourda' is said to be the best for eating[132]. Forms with wooden shells tend not to have an edible flesh[206]. The plants are frost-tender annuals, they grow very rapidly and their stems can reach a length of 9 metres in the summer[86]. A warm summer is required for good production of the fruit[86]. British summers are often too cool for this species and obtaining a crop from outdoor-grown plants in this country is somewhat problematical. The best chance is by starting the plants off early in a warm greenhouse, growing them on fast and then planting them out as soon as possible but making sure that they are not checked by cold weather. Hand pollination of the fruits can increase fruit set[206]. A climbing plant, attaching itself to supports by means of tendrils that grow out of the leaf axils[206]. It can be used as a fast-growing summer screen. The leaves have a strong musky scent that some people find repulsive[206]. The plant is remarkably disease and pest-free, this might be connected to the smell of the leaves[206].

5.2.56 Mondia whitei

Mondia, White's Ginger

10 tlin 12 cyuc 3 kcaak 2 tcan 4 dwat 8 m hkuc hmimhtut cyuti tcup hwicli hrasjlutnyik hpa7tli flatprikliwis hpa7tmwatli hjonli

drutta *Mondia whitei* is an evergreen Climber growing to 8 m (26ft) by 2 m (6ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Flies. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

pista The seeds are used as a substitute for Strophanthus seeds in the preparation of arrow poison[299]. The latex is also added to Strophanthus arrow poison[299].

kcakta Edible Parts: Fruit Leaves Root**Edible Uses:** Condiment Drink TeaThe fresh or dried leaves are cooked,

emerge[299]. The seed remains viable for 2 years if stored at 10°c[325]. Truncleons root readily and are used for propagation[299].

nwatta Management: Standard Staple Crop: Protein-oil Wild Staple CropMongongo nut is a plant of arid to moist tropical and subtropical areas where it is found at elevations ranging from 50 - 1,500 metres, more commonly at the higher end of the range[325 , 418]. It grows best in areas where annual daytime temperatures are within the range 18 - 30°c, but can tolerate 10 - 40°c[418]. When dormant, the plant can survive temperatures down to about -7°c, but young growth can be severely damaged at -1°c[418]. It prefers a mean annual rainfall in the range 500 - 800mm, but tolerates 400 - 1,000mm[418]. It can tolerate mean rainfall as low as 150mm[325]. Grows best in a sunny position[418]. Requires a well-drained soil, and is not found on compacted clay soils or areas subject to flooding[325]. Prefers a pH in the range 6.5 - 8, tolerating 6 - 8.5[418]. Established plants are drought tolerant[325]. Strong winds often cause immature fruits to drop[299]. The growth from seedling to sapling stage depends very much on the fire regime prevailing in the area. Fires reduce young saplings back to ground level as long as their bark is too thin to protect them[299]. Plants coppice well when young[299]. Trees may start flowering and fruiting when about 20 years old, and can live up to 100 years[299]. Fruit production is very closely linked to the amount of rain of the previous season, with crop yields higher in years following heavy rains[299]. High rainfall after flowering has been found to damage the developing fruits, as do fires late in the dry season[299]. Limited data are available on yields, although some estimates indicate yields of 200 - 1000 kilos per hectare in northern Namibia, and about 300 kilos in Angola[299]. A dioecious plant, both male and female forms must be grown if fruit and seed are required[308]. Cultivated as a wild staple.

5.2.53 Nauclea latifolia

African Peach

10 tlin 12 cyuc 3 kcaak 2 tcan 4 dwat 10 m hkuc htut cyutli hgaktyuctup hwicli hrasjlutnyik hpa7tli flatprik-wis hpa7tmwatli hjonli

drutta Nauclea latifolia is a deciduous Tree growing to 10 m (32ft) by 10 m (32ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Bees, Butterflies. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

kcakta Edible Parts: Flowers FruitEdible Uses: Fruit - raw[301]. The pulp is deep red, watery, sweet with a taste of ripe apple[307]. The fruit is said to resemble a strawberry in taste and texture[301]. The globose fruit is about 8cm in diameter[307]. Flower heads - cooked and eaten as a vegetable[46 , 301].

tcanta Agroforestry Uses: A suitable species for planting schemes for conservation and soil stabilization[303]. The tree offers shade and acts as a windbreak[303]. It is used as a live stake to provide barriers in farms[303]. The leaves are used as a mulch[303]. Other Uses Small twigs are used as chewing sticks[307]. The bark is a source of tannins[303]. A yellow dye is obtained from the roots[46]. The heartwood is dark red-brown, hard and moderately heavy[307]. The wood is resistant to termites[303]. It is used for inlay work[307]. The wood is used for fuel[303].

dwatta Used in the treatment of diabetes[303 , 307]. The root is febrifuge and tonic[46]. It is used in the treatment of fevers, indigestion[46]. The fruit is eaten as a cure for coughs[303]. The alkaloid stricosamine is obtained from the roots, leaves and stem bark[303]. Researchers have reported that Tramadol (an opioid pain medication) was found in relatively high concentrations (1%+) in the roots of the Nauclea latifolia. This is now reported to be the result of Tramadol being administered to cattle by farmers. Radiocarbon analysis has confirmed that tramadol could not be plant-derived and was of synthetic origin (wikipedia.org/wiki/Tramadol).

nrakta West tropical Africa - Ghana to Gabon and DR Congo. ksacta Dry savannah and thickets[307]. A savannah shrub sometimes found in undisturbed fringing forest

and closed savannah woodland[303].

propta Seed - usually sown in situ[303]. The seed is said to germinate more quickly and reliably if it first passes through the gut of a baboon[303 , 307]. Cuttings of green-wood. Layering.

nwatta Plants grow in hot tropical climates, where they are found at elevations from sea level to around 200 metres[303 , 335]. They grow best in areas where the mean annual temperature is around 27°c[303]. They succeed in a range of moisture conditions from fairly dry savannah to moist forest[335], preferring a mean annual rainfall around 2,700mm[303]. Plants are tolerant of a range of soils, preferring a position in full sun[307]. Established plants are very drought tolerant[307]. Seedlings commence fruiting when about 5 - 6 years old[335]. The flowers are extremely fragrant[307]. Plants respond well to coppicing[303].

5.2.54 Raphia hookeri

Ivory Coast Raffia Palm

10 tlin 12 cyuc 3 kcaak 4 tcan 2 dwat 10 m hkuc htut cyutli tcuphja7n hwicli hrasjlutnyik hpa7tli frusflatprik hpa7tmwatli hjonli

drutta Raphia hookeri is an evergreen Tree growing to 10 m (32ft) by 7 m (23ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It cannot grow in the shade. It prefers moist or wet soil.

pcista The raw fruit is poisonous and is crushed for use as fish poison[299].

kcakta Edible Parts: Apical bud Flowers Fruit Oil Sap StemEdible Uses: Drink Oil SweetenerThe sap from the trunk is fermented to make palm wine, which is a very popular drink in west Africa[297 , 299]. When fresh, the sap tastes like ginger beer. The alcohol content of the sap increases from less than 2% to about 5% during the first 8 days of tapping, remaining constant thereafter[299]. It is obtained from the inflorescence[301]. It is tapped from the stem when the tree nears the flowering stage[299]. The sap can be obtained either by cutting down the trunk and allowing the sap to drain out, or by boring a hole in the trunk near the apex[297]. Palm wine is obtained by piercing the base of the terminal bud, which leads eventually to the death of the palm[418]. The wine is distilled into a strong alcoholic liquor and can also be used as bakers' yeast[299]. Fruit - boiled and eaten[297 , 299]. Poisonous raw[299]. The apical bud is cooked and used like cabbage[299 , 301]. Harvesting this bud will eventually cause the death of the trunk because it is unable to make side branches[K]. An edible starch is obtained from the stem[301]. An oil is obtained from the fruit[297].

tcanta Basketry Broom Charcoal Fencing Fibre Furniture Oil Paper Plant support Roofing String Thatching Weaving WoodAgroforestry Uses: In Nigeria, the plant sometimes serves as support for yams[299]. In Benin, tomatoes, cassava, sugar cane, red pepper and other crops are sometimes grown on earth ridges in Raphia hookeri swamps[299]. Other Uses Raffia, a soft but strong fibre, is obtained by pulling off ribbon-like strips from the upper surface of the leaflets of young unfolding leaves. It is used to make mats, hats, baskets, bags, ropes, hammocks, ceremonial costumes, etc[297 , 299]. It may be woven into cloth[299]. In Europe it is used as tying material for horticulture and handicrafts[299]. Raffia fibre has been considered as a potential source of pulp for paper production[299]. The tough fibre (known as piassava) obtained from the petioles and leaf sheaths, is used for making brooms[46 , 297]. It is used for the roller brushes employed in sweeping streets; for making mats, bags, hammocks, ropes, etc[418]. A tough, weather-resistant, coarse rope can also be made from this fibre[297 , 299]. Piassava fibre is also used to make exceptionally strong paper[299]. A very fine-textured charcoal, much favoured for the manufacture of home-made gunpowder, can be made from the fibre[299]. Piassava fibre is water resistant, hard-wearing, and has the right balance between stiffness and elasticity to give a firm stroke to a broom and sufficient spring action to make the broom self-cleaning. Mature leaves yield higher quality piassava fibre than younger leaves[299]. The large midribs of the leaves, and the leaf stalks, are widely used by native people to construct the framework of houses, as poles

can not tolerate frost, but any mature beans remain unaffected[418]. It prefers a mean annual rainfall in the range 800 - 1,800mm, but tolerates 600 - 2,600mm[418]. An easily grown plant, it is not fussy about soil type or fertility, though it prefers a soil rich in organic matter[300]. Tolerates some salinity in the soil[299]. Plants are shade tolerant[300]. A deep rooted plant, it is drought resistant when established and can also tolerate some waterlogging[299 , 300]. Prefers a pH in the range 5 - 6, tolerating 4.3 - 7.5[418]. Young pods can be harvested about 3 - 5 months after sowing, the mature seeds in 6 - 10 months[300]. Average yields of dry seed are about 0.7 - 1.5 tonnes/ha, while the optimum is 4.6 tonnes/ha[300 , 418]. 40- 50 tonnes/ha of green manure/green vegetation can be obtained[418]. A short day plant, often developing a bushy habit, but more commonly a climbing plant[300]. 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]. When removing plant remains at the end of the growing season, it is best to only remove the aerial parts of the plant, leaving the roots in the ground to decay and release their nitrogen.

5.1.6 Senegalia senegal

Gum Arabic

tofn2n 10 tlin 12 cyuc 3 kcaak 4 tcan 2 dwat 6 m hkuc htut cyutli hgaktyuctup hwicli hyishrasjlutnyik hpa7tli frusflatprik hpa7tmwatli hjonli

drutta Senegalia senegal is a deciduous Shrub growing to 6 m (19ft) by 6 m (19ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Bees, Insects. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

kcakta Edible Parts: Oil Seed StemEdible Uses: Gum Oil StabilizerThe gum obtained from the trunk is important in the food industry, where it is used as an emulsifier, stabilizer and flavour fixative[238]. It is also used as an additive (E414) that retards the crystallization of sugar[238]. It is found especially in products such as chewing gum and confectionery[238]. The gum is harvested after the rainy season by scraping it off the trunk and branches from which it oozes[238]. Unhealthy trees tend to give higher yields and incisions are sometimes made into the bark in order to increase yields[238]. Seed[396]. The dried seed is cooked as a protein source[325]. The dried seed is the main component of panchkut, a delicacy in Jodhpur, India, also containing fruits of Capparis decidua, Cucumis sativa and Prosopis cinerearia[303].

tcanta Charcoal Dye Fencing Fibre Fodder Fuel Gum Oil Pioneer Soap making Soil conditioner Soil stabilization String Tannin WoodAgroforestry Uses: The plant is sometimes used in soil improvement and dune stabilization schemes[396]. It is used as a pioneer species to re-establish woodland in dry areas[325]. Intercrops well with plants such as sorghum and millet[396]. It is highly suitable for use in agroforestry systems in combination with watermelon, millet, forage grasses etc[325]. In Sudan it is grown in 'gum gardens' for gum production as well as to restore soil fertility[295]. Other Uses: The gum obtained from the trunk has a variety of uses, including adding lustre to crape and silk, thickening colours, calico printing, manufacturing ink and as a mucilage[46]. Careful 'wounding' of the trunk is required for sustainable gum production[396]. The cut should be only just deep enough for the gum to exude[396]. Cordage is made from the roots, either directly or after beating to extract the fibres; its strength makes it suitable for well ropes and fishing nets[299 , 303]. An oil obtained from the seed is used for making soap[299 , 303]. A dye is obtained from the seeds[396]. The heartwood is almost black and takes polish well[303]. The wood is used for posts, poles, tool handles, sugar cane crushers etc[303 , 396]. The dense wood is an excellent fuel and is also made into charcoal[396]. The calorific value is estimated at 3,000 kcal/kg[303].

dwatta Antidiarrhoeal Antitussive Astringent Dysentery Leprosy Ophthalmic SkinThe gum obtained from the trunk

has soothing properties and forms a protective coating over inflamed tissue, reducing irritation and encouraging healing[238]. It is taken internally, often in the form of pastilles, to treat sore throats, coughs and catarrh[238]. It is also often added to proprietary mixtures used in the treatment of dysentery and diarrhoea[238]. Externally, it is used in the treatment of sores, burns and leprosy[238]. The bark, leaves and gum contain tannins and are used as an astringent to treat colds, ophthalmia, diarrhoea and haemorrhages[299]. The roots are used to treat dysentery, gonorrhoea and nodular leprosy[303]. The seeds contain fat (khakhan), which is used in medicine[303].

nrakta Drier regions of Africa - Senegal to Ethiopia and Somalia, south to Natal; Arabian Peninsula; Indian subcontinent. ksacta Hot, dry regions[238]. Dry scrub and wooded grassland at elevations of 500 - 1,650 metres[396].

propta Seed - unlike other acacias, the seed coat is not impermeable to water even after storage, and scarification is normally not necessary[325]. Germination is improved, however, if the seed is pre-soaked for 24 hours in warm water prior to sowing[238 , 325]. The seed can be sown in individual pots, preferably deep pots to allow the taproot to develop[325]. It usually germinates quickly and freely, sprouting best at a temperature around 21°c[238]. Plants make a deep taproot and resent root disturbance, they should be planted out into their permanent positions as soon as possible[238]. Semi-ripe cuttings of lateral shoots[238].

nwatta Agroforestry Services: Nitrogen Fodder: Bank Fodder: Pod Industrial Crop: Biomass Industrial Crop: Gum Industrial Crop: Tannin Management: Coppice Regional CropA plant for the drier tropical areas, where it can be found at elevations from 100 - 1,700 metres[325]. Tolerates a minimum temperature of about 15°c[238]. Plants can tolerate high daily temperatures, but are sensitive to frost[325 , 396]. Prefers areas where the mean annual rainfall is 300 - 400mm, but can survive with as little as 100mm and a dry period of 8 - 11 months[325]. Grows best in a moist, well-drained, neutral to acid soil[238 , 396]. Gum production is best when the plant grows in a poor soil[396]. Prefers a pH in the range 5 - 8[774]. Established plants are very drought tolerant[325 , 396]. Plants can be coppiced and pollarded[396]. Wood yields of 120 - 190 cubic metres per hectare, with annual increments of 0.5 - 1.0 cubic metres per hectare have been recorded[303]. The gum exudes from ducts in the inner bark; it is tapped in the hot season when the trees are stressed. Tapping begins when trees are 4 - 5 years old, commencing after leaf fall and ceasing during the colder months of the dry season. Gum nodules form in 3 - 8 weeks, exuding from the former broken abscission scars[303]. Care should be taken to keep the gum clean[303]. Annual yields stand at 188 - 2,856g for young trees and 379 - 6,754g for older trees (7-15 years). Gum production is excellent on poor soils and higher in stressed trees[303]. This species has a symbiotic relationship with certain soil bacteria, these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby[200].

5.1.7 Bauhinia thonningii

Camel's foot tree, monkey bread

tfozn 10 tlin 12 cyuc 3 kcaak 3 tcan 2 dwat 5 m hkuc htut cyutli kyuctup hwicli hyishrasjlutnyikfrip hpa7tli flatprikwis hpa7tmwatli dyat hjonli

drutta Bauhinia thonningii is an evergreen Tree growing to 5 m (16ft) by 4 m (13ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Bees. The plant is not self-fertile. It can fix Nitrogen. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay and nutritionally poor soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil.

kcakta Edible Parts: Fruit Leaves OilEdible Uses: Drink Gum OilFruit - raw or cooked[398]. The pulp surrounding the seed is eaten, it has a sweet flavour and is eaten mainly by children and travellers[398]. The brown pod is cracked open, the seeds removed, and the pulp eaten as a snack or as emergency food[398]. It is normally only eaten in small amounts[398]. The fruits are collected in large quantities

during famine periods. They are then pounded and the powder soaked in water; the liquid stirred and drunk[398]. The flat, brown, woody pods are 15 - 20cm long. They persist on the tree but eventually decay on the ground to free the pea-sized seeds[398]. Tender young leaves - raw or cooked[303 , 617]. Chewed to relieve thirst[303]. The leaves are very occasionally eaten as a cooked vegetable[617]. The leaves are sometimes cooked in water; then the water is used for cooking millet[774]. Carbon Farming - Staple Crop: balanced carb.

tcanta Dye Fibre Fodder Fuel Gum Mulch Oil Pioneer Soap Soil reclamation String Tannin Waterproofing WoodAgroforestry Uses: A pioneer species within its native area, where it tends to colonize clearings and fallows[375]. Since it is a legume, and fixes atmospheric nitrogen, it might be a useful species to use when restoring woodland or setting up a woodland garden[K]. A deep rooting species that produces considerable amounts of leaf litter, it can be used in soil protection initiatives. The use of the leaf litter as a mulch enhances soil fertility because the leaves decompose slowly[303]. The tree competes very little with maize if left in fields and pollarded to reduce shade[303]. Other Uses A fibre from the inner bark is used to make string, ropes and cloth[303 , 398 , 466 , 774]. A red-brown dye can be obtained from the macerated bark[303 , 774]. A blue dye can be obtained from the seeds and pods[303 , 774]. A black dye is obtained from the roasted seed[774]. The bark contains up to 18% tannins[303 , 774]. The roots are a source of tannins[303]. The inner bark is said to contain a gum that sweels in water and so can be used for caulking boats etc[303 , 774]. The unripe seedpods are used as a soap substitute[303 , 466]. The ashes of the plant are used for making soap[303 , 774]. The seeds contain oil[466]. No more information is given[K]. The heartwood is pinkish to dark brown; the sapwood is light brown. The wood is straight-grained. It is used for poles, grain mortars, tool handles, spoons and bedsteads[303 , 398]. The wood is used for fuel[303 , 398]. Carbon Farming - Agroforestry Services: nitrogen. Fodder: pod.

dwatta Antitussive Contraceptive Mouthwash Skin StomachicTender leaves are chewed and the juice swallowed to treat stomach-ache, coughs and snakebite[398]. The ash obtained from burnt leaves is rubbed into snakebite wounds after scarification in order to hasten healing[398]. The leaves are combined with those of mpandanjobvu and the liquid used to relieve the inflammation from sore eyes[466]. The roots are used to treat prolonged menstruation, haemorrhage and miscarriage in women and also for the treatment of coughs, colds, body pain and STDs[398]. An infusion of the root, combined with the root of the wild cow pea (*Vigna* sp.), is said to be a contraceptive[466]. It is drunk for seven consecutive days during which time no intercourse is allowed[466]. An infusion of the bark is used to treat coughs, colds, chest pains and snakebite[398]. An infusion of the bark is used for the cure of an infection of the gums called ciseye[466].

nrakta Tropical Africa - widespread from Sierra Leone to Ethiopia and Kenya, south to Angola, Botswana, northern S. Africa, Swaziland. ksacta Woodland, wooded grassland and bushland, at elevations from sea level to 1,830 metres[398].

propta Seed - it has a hard seedcoat and benefits from scarification before sowing in order to speed up and improve germination. This can usually be done by pouring a small amount of nearly boiling water on the seeds (being careful not to cook them!) and then soaking them for 12 - 24 hours in warm water. By this time they should have imbibed moisture and swollen - if they have not, then carefully make a nick in the seedcoat (being careful not to damage the embryo) and soak for a further 12 hours before sowing[303]. Suckers[375].

nwatta Agroforestry Services: Nitrogen Fodder: Pod Management: Standard Regional Crop Staple Crop: Balanced carbClimate: tropical. Humidity: semi-arid to humid. A plant of the semi-arid to moist tropics, where it can be found at elevations up to 1,850 metres. It is found in areas where the mean annual temperature can be around 20°C, and the mean annual rainfall is in the range 600 - 1,500mm[303 , 398]. Succeeds on a variety of soils[398]. Likes a rich, alluvial soil[466]. Heavy clayey soils or medium loamy soils are preferred[303]. The tree usually yields heavy crops of seedpods[375]. The plant has deep roots and can sucker freely[303 , 375]. It also responds well to coppicing and

pollarding[303]. A dioecious species, both male and female forms need to be grown if fruit and seed are required[303]. 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[303]. Carbon Farming - Cultivation: regional crop. Management: standard.

5.1.8 Cordeauxia edulis

Yeheb. Yeheb nut

tfo2n 10 tlin 12 cyuc 3 kcaak 3 tcan 2 dwat 4 m hkuc htut cyutli hgatkycutcup hwicli hyishrasjlt hpa7tli flatprikliwis hpa7tmwatli hjonli

drutta Cordeauxia edulis is an evergreen Shrub growing to 4 m (13ft) by 4 m (13ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 10. It can fix Nitrogen. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

ksakta Edible Parts: Leaves SeedEdible Uses: Coffee Drink TeaSeed - raw, roasted or boiled as a vegetable[418]. A sour flavour when eaten fresh or dried, but they have a sweetish, agreeable, chestnut-like taste after roasting[299]. The seeds may also be boiled for a sweet liquor[418]. The size of a large fibrelt with a smooth consistency and a delicious chestnut-like flavour[301 , 418]. Nutritious[301]. The seed has a thin, easily broken shell[63]. The carbohydrate and protein content of the seeds is lower than in pulses and other legumes, but they are richer in sugars and fats, hence providing a balanced diet and high energy[303]. The seeds have been mentioned as a coffee substitute[299]. An infusion of the leaves is used as a tea substitute[299 , 301 , 324 , 418].

tcanta Dye Fodder Fuel Mordant Soap making WoodThe plant contains cordeauxiaquinone, a brilliant red dye which is unknown elsewhere in the plant kingdom[324 , 418]. Cordeauxiaquinone produces fast, insoluble dyes with some metals and is used as a mordant in dyeing factories[324]. The bones of animals that browse the plant become pink due to the cordeauxiaquinone[324]. A substance between liquid oil and fat, less pleasant than olive oil but useful for soap making, is extracted from it[303]. I assume it is extracted from the seed[K]. The seed oil is useful for soap making[299]. The wood is used for firewood[324 , 418]. A hard wood, it burns well even when still wet[303].

dwatta Cordeauxiaquinone, a substance found in the leaves and other parts of the plant, is used medicinally to stimulate haemopoensis[303]. Cordeauxia edulis is said to regulate gastric secretion and to permit treatment of ulcers due to hot food. It is also believed to alleviate anaemia by augmenting the number of red blood cells[299].

nrakta Northeastern tropical Africa - Somalia, Ethiopia. ksacta Dry areas[63]. Semi-arid scrub on coarse, deep red sands with a water table at 6.5 - 25.5 metres and at an elevation of 100 - 1,000 metres[324].

propta Seed - best sown as soon as it is ripe, when germination is usually good[324]. The viability is low if the seed is stored for a few months; however, seeds coated in wood ash and stored in a sack are reputed to remain viable for at least a year[324]. Germination is rapid, but subsequent growth of the aerial parts is very slow, especially in the seedling stage, whereas the root system grows rapidly. Plants 60cm tall may already have roots 2 metres long[299]. Sowing in situ is recommended because problems exist with moving seedlings from the nursery due to rapid tap-root development[324]. Vegetative propagation possible.

nwatta Agroforestry Services: Nitrogen Fodder: Bank Management: Standard Staple Crop: Balanced carb Under Development Wild Staple CropA plant of the lowland arid tropics and subtropics, where it is found at elevations up to 1,000 metres. It grows best in areas where annual daytime temperatures are within the range 25 - 30°C, but can tolerate 20 - 38°C[418]. It prefers a mean annual rainfall in the range 200 - 400mm, but tolerates 100 - 600mm[418]. In more humid climates, plants produce more vegetative growth, but often at the expense of fruiting[324]. Requires a sunny position in a light, very well-drained

pencil-sized pieces[332]. The roots are also used as chew sticks, sometimes in preference to the wood[332]. They are believed to prevent dental caries, though tests have shown no anti-biotic activity[332].

dwatta Antibacterial Antidote Antitussive Aphrodisiac Astringent Bitter Cancer Cytostatic Diuretic Dysentery Purgative Stomachic Tonic Urinary VermifugeBitter kola is widely used in traditional medicine in Africa with most parts of the plant being used and a wide range of ailments being treated[332]. Several medically active compounds have been identified. Tannins, a reducing sugar and traces of an alkaloid have been detected in the bark; flavonins are also present, the whole being extremely bitter, resinous and astringent[332]. A number of pharmacological actions have also been demonstrated. Extracts of stems, roots and seeds have been shown to have strong anti-hepatotoxic and hepatotropic activity[332]. Petroleum ether and acetone extracts were found to be markedly anti-microbial[332]. The bark contains an abundant sticky resinous gum[332]. This is taken internally in the treatment of gonorrhoea[332]. Externally, the gum is applied to skin-infections and used to seal new wounds[332]. The bark is said to be aphrodisiac, galactagogue[332]. A decoction is used to treat female sterility and to ease child-birth, the intake being daily until conception is certain and then at half quantity throughout the term[332]. It is also used to induce the expulsion of a dead foetus[332]. The powdered bark is applied externally to malignant tumours, cancers, etc.[332]. A tea of the bark, combined with the bark of *Sarcocephalus latifolius*, has a strong reputation as a diuretic, urinary decongestant and treatment for chronic urethral discharge[332]. The bark, combined with Piper guineense and sap from a plantain stalk (*Musa* sp.) is used to embrocate the breast for mastitis[332]. The seed and bark are taken to treat stomach-pains[332]. The leaves and bark are used in the treatment of pulmonary and gastro-intestinal troubles[332]. The root and bark are used as a tonic for men 'to make their organs work well'[332]. The leaves have a bitter taste. A leaf-infusion is purgative[332] The fruits are eaten in Nigeria as a cure for general aches in the head, back, etc., and as a vermifuge[332]. The seeds are said to be anti-dote, antitussive, aphrodisiac, astringent and vermifuge[332]. Mastication of the seeds is said to relieve coughs, hoarseness, and bronchial and throat troubles. They are taken dry as a remedy for dysentery. They are said to provide an antidote against *Strophanthus* poisoning[332]. The active principle, or principles, in the nut remain enigmatic. Caffeine, which is present in the true kola, is absent. A trace of alkaloid has been reported in Nigerian materials, but absent in other samples. Tannins are present which may contain the anti-bacterial compounds morellin and guttiferin[332]. Activity may also lie in resins which are as yet unidentified[332].

nrakta Tropical Africa - Sierra Leone to S Nigeria and into Zaire and Angola. ksacta An understorey tree of dense rainforest, often in wet situations, riverine and swamp, found at elevations up to 1,200 metres[332].

propta Seed - it has a short viability and so should be sown as soon as possible. The fresh, mature seeds are dormant but viable, creating difficulties with rapid and uniform germination within seed lots. The thin leathery seed cover is not a barrier to water penetration in the embryo, however, de-coating or ethanol treatments (soaking in 70% ethanol solution for 1 to 2 hours) can increase germination to more than 90% after about 5 months[325]. Germination of intact, fresh seeds is about 50%, starting after about 3 months at ambient temperature (25 - 28°C) and most seeds will have germinated 7 - 8 months after sowing (in river sand)[325]. However, in nursery trials, the seeds continued to germinate for 18 months, reaching a final germination level of 75%[325].

nwatta Plantation cultivation can be successfully carried out: three year old stump-planting under shade is recommended, but sowing the seed in situ by a stake is possible[332].

5.2.52 Schinziophyton rautanenii

Mongongo Nut. Manketti Tree 10 tlin 12 cyuc 3 kcaak 3 tcan 2 dwat 12 m hkuc htut cyutli hgatkycutcup hwicli hyishrasjlt hpa7tli flatprikliwisslip hpa7tmwatli dyat hjonli

drutta Schinziophyton rautanenii is a deciduous Tree growing to 12 m (39ft) by 12 m (39ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. The plant is not self-fertile. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very alkaline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant is not wind tolerant.

ksakta Edible Parts: Fruit Oil SeedEdible Uses: OilFruit - raw or cooked[301]. A flowery pulp, when fresh it resembles a date, though it is not as sweet[299 , 301 , 398]. After boiling, it turns maroon and tastes like apple sauce[301]. The fruit can also be dried and ground into a powder for use in porridge[301]. It is a good source of carbohydrates, potassium and thiamine[325]. The fruit is an egg-shaped drupe. It is 35 x 20 - 35mm when dry, up to 70 x 50mm when fresh, and weighs 8 - 10g[325]. Seed - raw or cooked[299 , 301 , 308]. Tasty and nutritious[301]. When roasted, they taste like cashews or Brazil nuts, but after prolonged roasting they have the flavour of 'fine old cheese'[301]. The seed contains about 60% oil[63]. The seeds are up to 25mm long and 20mm wide and are contained in a hard shell[308]. An edible drying oil is obtained from the seed[46 , 301]. It is used locally for cooking[325]. The oil deteriorates rapidly once extracted from the seed[325]. The oil is extracted traditionally by boiling the shelled (and crushed?) seeds in water and skimming the oil off the surface of the water[299]. Staple Crop: Protein-Oil.

tcanta Cosmetic Fencing Fibre Hair Hedge Oil Paint Soap String Varnish WoodAgroforestry Uses: Cuttings have been used in Angola for live fences and the tree has potential in desert encroachment prevention[325]. A number of cases have been reported where fence posts made from freshly cut posts grew into large trees[299]. Other Uses: The seeds contain 50 - 60% of a drying oil[46 , 325]. It is used commercially for making soaps, cosmetics, paints and varnishes[325]. In cosmetics the oil is used for its hydrating, regenerating and restructuring properties and UV protection for hair and skin[299]. The oil deteriorates rapidly once extracted from the seed[325]. The fibrous inner bark is used to make strings for nets etc[299]. The seeds are used in board games[299] The heartwood is pale yellow to straw-coloured; it is distinctly demarcated from the sapwood. The grain is straight or wavy, texture coarse. The wood is very soft and light, but comparatively strong in relation to its weight, it is not durable and is susceptible to termites and *Lyctus* attack. It air-dries rapidly with little distortion. It tends to become woolly on sawing, and sharp tools are needed to obtain a good surface; nailing properties are good. It can be used as a substitute for balsa wood. The wood is used for diverse purposes, including floats, canoes, notice boards, boxes, tools, musical instruments and carvings[299 , 325].

dwatta SkinThe roots have been used to treat stomach aches[299].

nrakta Tropical Africa - Angola, southern DR Congo, Zambia, southern Tanzania, Malawi, Mozambique, Namibia, Botswana, Zimbabwe, northern S. Africa. ksacta Low to medium altitudes in sandy soil, well developed deciduous woodland on sand, short grassland with scattered trees, wooded hills and amongst sand dunes and sandy alluvium by rivers, sometimes forming pure stands, at elevations of 50 - 1220 metres[308].

propta Seed. The woody endocarp makes germination difficult and therefore needs to be removed or the end cut off to expose the kernel prior to sowing[325]. After shelling, the seeds can be soaked in water for a week followed by storage under high temperature and humidity for two days in order to reach better germination[325]. Germination is erratic and takes place over an extended period. Without pre-treatment a germination rate of 26% has been obtained[325]. If the shell is removed prior to sowing and the kernel is treated with ethylene the germination rate can reach 80% or more within 6 days[325]. The rate of non-surviving seedlings is high but once a seedling has been established it needs little attention[325]. The seeds should be sown in sandy soil in half shade and the temperature kept above 7°C[325]. The seedlings very quickly develop deep roots. When the seed has germinated, the radicle grows slowly. When it is 5 - 10cm long, 5 - 12 secondary roots emerge in a ring from immediately above the root-tip, resembling a Medusa's head. When these roots are 20 - 50mm long the plumule starts to

fruit is pale yellow, obovoid, up to 37mm long with a leathery rind like a mango and a similar fibrous soft pulp covering the stone[200 , 307 , 332]. The expressed juice makes an agreeable drink, and in many areas is fermented into an alcoholic beverage[332]. The juice may also be boiled down to a thick black consistency used for sweetening guinea-corn gruel[332]. The fruits cannot be stored for more than a week, they bruise easily and therefore are difficult to transport[324]. Seed - raw or cooked[301 , 325]. A flavour similar to walnuts or peanuts[301]. They can be ground into a flour[301]. The nut contains two or three seeds with oily and edible kernels[332 , 398].Each seed is up to 20mm long and 8mm wide[308]. The seed is difficult to extract from the nut[324]. An edible oil is obtained from the seed[335 , 398]. Containing 28% protein, it is used for cooking[301]. The oil consists of 64% oleic acid, 17% myristic acid and small quantities of several others[332]. The oil has a quality and fatty acid composition comparable to olive oil but with a stability that is 10 times greater[303]. Staple Crop: Protein-Oil.

tcanta OilAgroforestry Uses: The tree is used to provide shade and act as a windbreak[325]. Other Uses: The bark yields a strong fibre[324 , 332 , 774]. It is used for making ropes[325]. When injured, the bark exudes a nearly colourless gum which becomes brittle and friable on drying. The gum, dissolved in water and mixed with soot, is used to make ink[332 , 774]. The bark contains around 20% tannins[303]. The bark is used to prepare a mauve, pink, brown or red dye, the colour depending on methods used[299]. The seed contains 56% of a non-drying oil[303]. The oil obtained from the seed is used for skin care[299]. The oil-rich seeds burn brightly like a candle[307]. The heartwood is greyish dirty white to red-brown; it is not clearly demarcated from the thin band of sapwood. The wood is coarse textured, interlocked grain, light to moderate weight, soft and weak. It is moderately durable when well-seasoned; easy to work with well-sharpened tools; takes nails; turns well; can be carved; and takes a good polish. When big enough it is used for mortars and strong black-stained bowls[332 , 774]. Of the woods used to make these bowls, this species is considered the best[332]. In Jebel Marra wooden platters are made of it, and in Ethiopia milking vessels and axe-handles[332]. The wood is also used for making drums and hollowed-out canoes; pestles and mortars; bowls, furniture, saddles and carvings[307 , 324]. The wood is used for fuel[299]. Several moths breed on the tree including *Argema mimosae* - the beautiful African Moon Moth.

dwatta Vitamin CThe bark is analgesic, anti-inflammatory[332]. An infusion is used in the treatment of stomach-pains and constipation, to ease labour-pains[332]. A decoction is used as a purge[332]. The analgesic action is utilized to quell a toothache by chewing the bark and placing it in carious cavities in the teeth[332]. The bark, especially of the roots, but also of the trunk, is used as a remedy for snake-bites[332]. Pounded to a paste, it must be rubbed on the area until a swelling is raised, then a decoction of the bark is drunk and a dressing applied over the area[332]. The leaves may also be used for this purpose[332]. The bark is used externally as an anti-inflammation preparation and, with butter added, is applied to the forehead for headache, and to the eyes for blepharitis[332]. A decoction is used as a wash on skin-eruptions[332]. The root is pounded up with water, and the water is drunk in the treatment of schistosomiasis[332]. This water is also used for washing scabies[332]. The fruit is said to be laxative[332]. The leaves and fruits are chewed as a treatment for coughs[398].

nrakta Tropical Africa - drier areas from Mauritania, Senegal to Eritrea, Ethiopia, Uganda and Kenya, south to Namibia, Botswana, NE S. Africa, Madagascar. ksacta Drier savannah of the Sahel[332]. Wooded grasslands, riverine woodlands and bushlands[325]. Mixed deciduous woodland and wooded grassland, often on rocky hills, from sea level to 1,200 metres.

propta Seed - dried seed can retain its viability for several years[325]. The hard seed shell forms a physical barrier to seed germination and removal of the opercula (lids) will significantly improve germination, with the seeds germinating faster and more uniformly. This must be done manually with a small chisel and is normally too time consuming to be feasible[325]. Germination has also been reported to be improved if the stones are cracked in a vice but this must be done carefully as the seeds are very fragile and easily damaged[325]. Furthermore, cracking may increase seed mi-

croflora. It is not recommended to extract the seeds. Treatment with acid has shown good results[325]. If the opercula have been removed, germination is fast and uniform, reaching 70% after one week and 85% after two weeks from sowing. Without treatment, germination may take as long as nine months[325]. It is easily propagated from cuttings[332].

nwatta Management: Standard Staple Crop: Protein-oil Wild Staple CropA plant of low to medium elevations in hot, dry, tropical savannah and forest areas[335]. It grows in areas where the mean annual temperature is within the range 19 - 35°C; the mean annual rainfall is in the range 200 - 1,600mm; and there is a well-defined dry season[303 , 325]. It prefers a warm, frost-free climate but is also found at high altitudes where temperatures may drop below freezing point for a very short period in winter[303]. Requires a sunny position[307]. An easily grown plant requiring very little attention once established, it succeeds in soils that are too poor to support other crops[63 , 200]. It prefers well drained sandy soils and loams in the wild, though it is also often found growing on rocky hills[325]. The plant is very tolerant of saline soils[325]. Tolerates a pH in the range 4.5 - 6.5[200]. Young trees are susceptible to fire damage[398]. Marula is fast growing, reaching 3.5 metres in height within 8 years in areas with 600mm mean annual rainfall[299]. Mean heights of planted trees 4 - 5 years old in Israel were 4.1 - 6.2 metres, with boles 13 - 18 cm in diameter[299]. Wild trees in Mali, estimated 11 - 12 years and 32 years old, were 8.2 metres and 6.9 metres tall respectively, with boles 28cm and 45cm in diameter[299]. It is one of the fastest growing trees in South Africa, with a growth rate of up to 1.5 metres per year when young[303]. Trees have set fruit after just 3 years in a trial in Israel[324]. A single female tree can yield 2,100 - 9,100 fruits in a season, the fruits falling while still green and ripening on the ground[324]. A dioecious species, although occasional trees bear flowers of both sexes. Usually, both male and female forms need to be grown if fruit and seed are required.

5.2.51 Garcinia kola

Bitter Kola

10 tlin 12 cyuc 3 kcak 3 tcan 4 dwat 12 m hkuc hmimhtut cyutli tcuphja7n hwicli hrasjlutnyik hpa7tli flat-prikliwis hpa7tmwatli hjonli

drutta *Garcinia kola* is an evergreen Tree growing to 12 m (39ft) by 10 m (32ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. 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.

koakta Edible Parts: Fruit SeedEdible Uses: GumSeed - raw[301]. They have a bitter, astringent, aromatic flavour; somewhat resembling that of a raw coffee bean[301 , 332]. This is followed by a slight sweetness (or lingering pepperiness)[332]. The seeds are chewed along with the seeds of the true cola (*Cola* spp.). They are thought to enhance a person's enjoyment of the cola as well as allowing for consumption of larger quantities without indisposition[301 , 332]. The extremely sour fruits are sometimes eaten[301]. They are orange-sized, and contain a yellow pulp surrounding four seeds[332].

tcanta Gum Insecticide Kindling Lighting Tannin Teeth Waterproofing WoodAgroforestry Uses: The tree is used to provide shade in cocoa plantations[325]. Other Uses: The bark contains an abundant sticky resinous gum that has water-proofing properties[332]. It can be used to protect powder in the priming pans of flintlock guns from rain[332]. The gum in the bark is incendiary, the twigs burning brightly and therefore used as tapers[332]. The bark is used in tanning, and has at times been exported as a tanning material[332]. The leaves have a bitter taste and are used as a deterrent to fleas[332]. The sap-wood is creamy white, the heart-wood yellow, darkening to brown at the centre, hard, close-grained, finishing smoothly and taking a good polish[332]. It is durable and fairly resistant to termites[332]. The principal application of the wood is for chew-sticks[332]. They are said to whiten the teeth and clean the mouth, and are widely used in western Africa[332]. Smaller trees are more commonly used and are specifically felled for this purpose, the wood being cut and split into

soil[324 , 418]. Succeeds in poor soils that are extremely low in nitrogen[303]. Prefers a pH in the range 6.5 - 7.5, tolerating 6 - 8.4[418]. Established plants are very drought tolerant[303]. Early aerial growth of young plants is slow until the massive root system is established[324]. Plants only 1 cm tall can have roots 15cm or more long[324]. Plants begin to bear well when 3 - 4 years old[324]. Plants begin to bear proficully when only 1 - 1.2 metres tall[301]. Yields of around 5 kg of seeds per shrub can be achieved[324]. Such is the demand and free access to all wild plants that the fruits are often collected from the shrubs before they are fully mature[324]. Plants can live for 200 years or more[299]. A very deep rooted tree[63]. The tree has somewhat fleshy leaves that stain the fingers red on being rubbed[63]. 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[303].

5.2 mran

5.2.1 Elaeis guineensis

African Oil Palm

10 tlin 12 cyuc 5 kcac 5 tcan 2 dwat 15 m hkuc htut cyutli tcuphja7n hwicli hrasjlutnyik hpa7tli frusflatprikliwis hpa7tmwatli dyat hjonli

drutta *Elaeis guineensis* is an evergreen Tree growing to 15 m (49ft) by 5 m (16ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by insects. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid soils. It cannot grow in the shade. It prefers moist or wet soil.

kcakta Edible Parts: Apical bud Oil Sap SeedEdible Uses: Drink OilEdible portion: Seeds, Cabbage, Fruit, Palm heart, Sap, Vegetable, Seeds - oil. Oil - two types of oil are obtained from the plant. Palm oil is obtained from the fruit whilst palm kernel oil is obtained from the seed[297]. They are obtained in a volume ratio of approximately 9 : 1[299]. Palm oil has a wide range of uses, including making margarine, vegetable ghee, bakery fats, ice cream and as a cooking oil[297]. Palm oil is popular in West Africa and Malaysia for cooking and is now imported by India to meet local shortages in edible oil, being cheaper than many other vegetable oils[303]. In West Africa, the unrefine red palm oil is an essential part of the diet and is often added directly to bring richness to soups and sauces[303]. Addition of oil to cereal preparations greatly increases their calorific density, which is particularly advantageous for young children[303]. Palm oil is also used as frying oil in the preparation of snacks such as bean cakes and fried plantain[303]. Its 10% linoleic acid content makes it an excellent source of carotene. This is important in reducing incidence of vitamin A deficiency and the occurrence of nutritional blindness[303]. Palm kernel oil is similar in composition and properties to coconut oil. It also has a wide range of uses, including making margarine, ice cream, confectioneries and as a cooking oil, where it is sometimes combined with coconut oil[297 , 299]. The boiled and pounded nuts yield palm nut butter; a thick red liquid popular in Ghana and Liberia for making palm butter soup and other dishes[299 , 301]. The plant also provides heart-of-palm, where the soft portion of the apical bud is eaten as a vegetable[299 , 303]. Since the tree is single-stemmed, and palm trees are generally unable to produce side branches, harvesting this bud leads to the death of the tree[K]. Palm wine is commonly produced in West Africa by tapping the unopened male inflorescences, or the stem just below the apex of felled oil palms, and fermenting the sap[299].

tcanta Basketry Beads Broom Cosmetic Fencing Fertilizer Fibre Fuel Hair Oil Paper Preservative Resin Soap String ThatchingAgroforestry Uses: Oil palm is a good crop for rehabilitating degraded areas. In Sumatra it has successfully been established on abandoned farmlands taken over by Imperata cylindrical[303]. Other Uses: Two types of oil are obtained from the plant: Palm oil is obtained from the fruit[46 , 297]. About 10% of all palm oil, the inferior grades in particular and also refining residues, is used to manufacture

soaps, detergents, candles, resins, lubricating greases, cosmetics, glycerol and fatty acids. Palm oil is employed in the steel industry (for sheet-steel manufacturing and tin plating, where it protects the iron before the tin is applied) and epoxidized palm oil is a plasticizer and stabilizer in PVC plastics[46 , 299]. Palm kernel oil, obtained from the seed, is a non-drying oil. It is used as an alternative to coconut oil in making high quality soaps, as a lubricant etc[46 , 297 , 299]. It is a source of short-chain and medium-chain fatty acids. These acids are chemical intermediates in the production of fatty alcohols, esters, amines, amides and more sophisticated chemicals, which are components of many products such as surface-active agents, plastics, lubricants and cosmetics[299]. Both oils also have a wide range of other uses, including making detergents, shampoos, cosmetics, lubricating oil additives and fluxes[297]. It is technically possible to produce from palm oil either carbohydrates for conversion to alcohol or a methanolizable oil as a diesel substitute[303]. In Togo, the pressed fruits are dried and fashioned into cakes for cooking fuel[303]. The empty bunches, fibre and also the effluent (0.5 t sludge for each t of milled fruit bunches) from the oil mills can be converted into products such as organic fertilizers[299]. Palm fronds are useful for thatch[303 , 320]. The entire palm fronds of this species are less suitable for thatching than those of the coconut palm, because of irregular leaflet insertion. However, the leaflets are often woven into baskets and mats; the leaflet midribs are made into brooms and the rachises used for fencing[299]. Young leaflets produce a fine strong fibre, used for making fishing lines, snares and strainers[299]. The seed shells are polished and carved into ornamental rings and beads[299]. Palm trunks, available at replanting, provide excellent material for paper and board production, but this has not yet attracted much commercial interest[299]. The seed shells are much appreciated by local blacksmiths as a high calorific fuel for furnaces[299].

dwatta Analgesic Antiemetic Detergent Diuretic Emollient Laxative SkinTraditional medicinal uses in Africa are numerous[299]. Preparations made from the palm heart are used to treat gonorrhoea, menorrhagia, and perinatal abdominal pain, and are considered laxative, anti-emetic and diuretic[299]. The leaf sap is used in preparations used to treat skin affections[299]. The roots as analgesic[299]. The oil from the pulp is emollient and is used as an excipient for herbal ointments[299 , 739]. It is used to treat suppurations, whitlows and swellings of the legs caused by erysipelas and infestations by Filarial[739].

nrakta Tropical wet and central Africa - Sierra Leone to Uganda and Kenya, south to Angola and Mozambique. ksacta More or less open forest in moist, sandy soils that are often poorly drained[297]. Often found along the edges of rivers[303].

propta Seed - pre-soak 24 hours in warm water and sow in containers. Germination takes place in 2 - 5 months[297]. Commercially, the seeds are placed in intact 500-gauge polythene bags arranged on wooden boxes in a germinator at 39-40 deg. C for 75-80 days. They are then soaked in cold water for 3 days, changing water every 24 hours. The seeds are drained and dried under shade and kept at room temperature. They are examined every 2 weeks for germination and drying. Drying seeds are sprayed with water; germinated seeds are picked for potting. This treatment gives an 80% germination rate[303].

nwatta Global Crop Industrial Crop: Fiber Management Standard Other Systems: Multistrata Other Systems: Parkland Staple Crop: OilA major cash crop but also significant as a food by farmers in many areas. Plants succeed in moist to very wet tropical climates up to elevations of 1,300m. Commercial cultivation is below 700m and preferably lower than 300 m[303]. It grows best in areas where annual daytime temperatures are within the range 20 - 35°C, but can tolerate 12 - 38°C[418]. The plant is quite tolerant, though, and succeeds in southern China where there are light frosts and mean daily temperatures can drop below 10°C for weeks on end[303]. It prefers a mean annual rainfall in the range 1,500 - 3,000mm, but tolerates 1,000 - 8,000mm[418]. Optimally, there should be at least 150 mm of rain each month of the year, ideally falling mostly at night[303]. Plants grow well in full sun, even when small[297]. Grows and thrives on wide range of tropical soils, provided they have adequate water supply[303]. Requires a humus-rich soil[297]. Waterlogged, highly lateritic, extremely sandy, stony or peaty

soils should be avoided[303]. Tolerant of temporary flooding, provided the water is not stagnant[303]. Prefers a pH range 4.5 - 6, tolerating 3.2 - 8[418]. The root system is adventitious, forming a dense mat with a radius of 3 - 5m in the upper 40 - 60cm of the soil. Some primary roots are directly below the base of the trunk descending for anchorage for more than 1.5m; the roots produce pneumatodes under very moist conditions[299]. It is a succession species favoured by slash and burn, and its gene pool has expanded as farmers clear land and create more open habitat for the germination of its seeds[303]. Plants can commence bearing 3 years after the seed has germinated[297]. The plant produces both male and female flowers, but not usually at the same time. An individual inflorescence will be all male or all female flowers; after a series of inflorescences of one sex the plant will then produce a series of inflorescences of the opposite sex[768]. Plants flower all year[335]. The fruit is produced in clusters approx 100 fruits[335]. The inflorescence is produced from about every second leaf axil. There are up to 1,500 deep violet fruits (ripening to orange-red) in each roundish dense cluster, weighing 30 kg or more[320]. Yields of 5 tonnes of oil per hectare have been obtained from mature plants[297]. Spacing: 15-20 ft. (4.7-6 m) 20-30ft. (6-9m) .

5.2.2 Terminalia catappa

Indian Almond, Tropical Almond Tree
10 tin 12 cyuc 4 kcaak 3 tcan 2 dwat 30 m hkuc
htut cyutli hgattcup hwicli hrasljut hpa7tli frusflatprik-wissliphom hpa7tmwatli hjonli

drutta Terminalia catappa is a deciduous Tree growing to 30 m (98ft) by 35 m (114ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10 and is frost tender. The flowers are pollinated by Insects. It is noted for attracting wildlife. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid, very alkaline and saline soils. It cannot grow in the shade. It prefers moist soil and can tolerate drought. The plant can tolerate maritime exposure.

pcista Various species of biting and stinging ants have been found inhabiting hollow twigs on this tree[407].

kcakta Edible Parts: Fruit Oil SeedEdible Uses: Gum OilSeed - raw or cooked[46 , 303]. The almond-flavoured seeds can be eaten out of hand or roasted[301]. They can be chopped and added to cookies, bread mixes, dessert fillings, sweets, soups and stews[301]. The seed contains about 50% oil[63]. The seed is 3 - 4 cm long, 3 - 5 mm thick and enclosed in a thick shell that is difficult to crack[63 , 324]. The seeds are a rich source of zinc[658]. The seeds yield 38 - 54% of a colourless, bland tasting yellow semi-drying oil that is used in cooking[46 , 301]. Rather similar to almond oil, but less prone to become rancid[63 , 301 , 345 , 451]. The fruits have a tender skin and a thin layer of subacid juicy flesh[301]. It is often fibrous and not very tasty in spite of the pleasant smell[303]. The sweetish, fibrous flesh is palatable when very young, and is usually liked by children[307].

tcanta Containers Dye Fodder Furniture Gum Ink Mulch Oil Soil conditioner Soil stabilization Tannin WoodSeaside tree. Public open space. Xerophytic. Agroforestry Uses: The tree's vast root system binds together both sands and poor soils. It has a heavy leaf fall and so is a good provider of mulch for the protection of the soil[303]. It is a promising species for the reforestation of sandy areas[303]. Planting the tree can help eradicate Imperata cylindrica and other unwanted aggressive grasses[303]. Other Uses The trunk is a source of gum[303]. The oil from the seed is used for making soap, but its industrial use is limited by the difficulty in extracting the kernel[324]. Bark, leaves, roots and fruit are all important sources of tannin with the astringent bark containing 9 - 23% tannin[46 , 303]. The outer shell is also rich in tannin. It is used in leather preparation and as a base for inks; sometimes the roots and fruits are used for the same purposes[303]. A black dye that is used to make ink is extracted from the bark and fruit[146 , 307]. A yellow-green dye is obtained from the leaves[307]. The trunk is a source of yellow and black dyes[303]. Wood chips soaked in water give a yellow colour[721]. A black dye is obtained from the fruit[46]. The heartwood varies from light to dark

brown to reddish brown, and often with irregular darker and lighter belts; it is not clearly demarcated from the lighter coloured sapwood. The texture is fine to coarse, the grain crossed and often curly and twisted. The wood is moderately hard; moderately heavy; strong and pliable; somewhat durable, but very susceptible to termite damage. It seasons well and works easily. A good quality timber, it is used for cabinet work, furniture and for the construction of buildings, boats, bridges, floors, panelling, boxes, crates, planks, carts, wheelbarrows, barrels and water troughs[146 , 303 , 307 , 451 , 459 , 721].

dwatta Antidiarrhoeal Antidiarrhoeal Antirheumatic Antitussive Astringent Diaphoretic Dysentery Emetic Febrifuge Galactogogue Laxative Leprosy Skin Tonic VermifugeVarious parts of the tree, such as the leaves and fruit, contain tannins and are astringent[303 , 459]. The leaves, crushed with Dacrydium elatum and rhizomes of Cyperus rotundus, are combined to treat dysentery[303]. The red leaves act as a vermifuge, while the sap of young leaves, cooked with oil from the kernel, is used to treat leprosy[303]. The juice of the leaves is ingested for coughs[311]. An infusion of the leaves is used to treat jaundice[311]. The leaves are used to treat indigestion[311]. The young leaves are used to cure headaches and colic[303]. Externally, the leaves may be rubbed on breasts to cure pain or, when heated, may be applied to numb parts of the body[303]. They may be used as a dressing for swollen rheumatic joints[303]. The leaves, applied to the head and sides, are refreshing and sudorific[582]. Leaves, bark and fruit are used to treat yaws[303]. The bark and root bark are useful for bilious fever, diarrhoea, thrush, and as a remedy for sores and abscesses[303 , 311]. The fluid from the bark is used to treat diabetes and as a tonic[311]. An infusion of the bark is used to treat stomach ache and also as an emetic for infants[311]. Externally, the bark is used to treat sores, pimples and fungal skin diseases[311]. The kernel of the fruit mixed with beeswax stops putrid exudation and bloody faeces. It is recommended as a mild laxative and a galactagogue for women, but too frequent use causes diarrhoea[303].

nrakta Africa - Maagascar; E. Asia - China, India, Myanmar, Cambodia, Vietnam, Malaysia, Indonesia, Philippines, New Guinea to Australia and the Pacific. ksacta A mid-canopy tree in areas just inland from ocean beaches, near river mouths, and on coastal plains. These areas are typically flat, but they may have dunes or rocky bluffs[303 , 653]. Sandy or rocky beaches[451].

propta Seed - pre-soak for 24 hours in cold water[303]. About 70% of ripe seed germinate in about 20 days[303]. Seeds remain viable for a long time and germinate readily, even after floating in water for long distances[303].

nwatta Fodder: Insect Management: Standard Minor Global Crop Staple Crop: Protein-oilPlants grow best in the lowland tropics at elevations below 800 metres[303]. It grows best in areas where the mean maximum and minimum annual temperatures are within the range 21 - 32°C, though it can tolerate 10 - 36°C[418]. It prefers a mean annual rainfall in the range 1,500 - 3,400mm, though can tolerate from 700 - 4,200mm[418]. Succeeds in any moderately fertile, well-drained soil in a sunny position[200]. Prefers sands and loamy sands, though it also does well on silts, loam, and even clays if the drainage is good[303]. Tolerates saline soils[324]. Prefers soil that are neutral to moderately alkaline and rich in bases, however it will also grow in strongly acid soils[303]. A particularly useful plant for coastal gardens, being tolerant of salt spray[200 , 303]. Established plants are drought tolerant[303]. Prefers a pH in the range 5 - 7, but tolerates 4.3 - 8[418]. Plants are fast growing, often in excess of 1 metre a year when young[303]. Trees can yield two crops a year in some areas, and in places have been known to exhibit more or less continuous fruiting[324]. A tree may yield around 5 kg of kernels per year[324]. There has been some selection in cultivating forms with larger seeds[451]. The tree sheds its leaves all at once, quite suddenly, usually twice a year (January or February and July or August). Unlike most tropical trees, the leaves turn first yellow, then vivid red before falling, giving a well-marked 'autumn colour'[451]. The inconspicuous flowers have a sweet, delicate fragrance[200]. Various species of biting and stinging ants have been found inhabiting hollow twigs on this tree[407]. Flowering Time: Late Winter/Early Spring Mid Spring Late Spring/Early Summer Mid Summer Late Summer/Early Fall. Bloom Color: Cream/Tan Inconspicuous/none (white). Spacing: 15-20 ft.

]. The fruit pulp, seed and bark are reputedly an antidote to Strophanthus poisoning[303]. The pulp is widely used in Africa as a diaphoretic to combat fevers, and to treat dysentery[46]. The gum from the bark is used for cleansing sores. It is also used as an expectorant and a diaphoretic[303]. The bark is used in steam baths for calming shivering and high fever[303]. The bark is boiled and taken as a cure for body pains. This infusion is also used to treat colds, fever and influenza[303]. A decoction of the roots is taken as a remedy for lassitude, impotence and kwashiorkor[303]. Chemical composition - leaves (sun-dried): rich in calcium, containing 3.6% calcium oxide, potassium tartarate, common salt and tannin. Acid composition of seed oils (Nigerian sample): Oil = 15%. Fatty acid composition - 14:0 = trace. 18:0 = 5%, 18:1 = 33%, 18:2 = 29%. Cyclopropanoid acids (as sterculic (HBr-acetic acid in benzene)) = 7%. Chemical composition (after Abdelmuti): Protein (crude) = 3.1% (dry). Fat = 0.5% (dry). Fibre (crude) = 9.2% (dry). Ash (insoluble) = 5.8% (dry). Carbohydrate (soluble): Starch = 15.3% (dry). Sucrose = 19.3% (dry). D-glucose = 0.6% (dry). D-fructose = 5.6% (dry). Amino acids (g (16g N)-1): Aspartic acid = 9.8g, Threonine = 5.2g, Serine = 5.9g, Glutamic acid = 10.1g, Proline = 7.5g, Glycine = 5.5g, Alanine = 5.2g, Valine = 5.2g, Cysteine = 1.3g, Methionine = 1.3g, Isoleucine = 4.2g, Leucine = 6.8g, Tyrosine = 3.3g, Phenylalanine = 4.2g, Lysine = 4.6g, Histidine = 1.6g, Arginine = 4.6g, Minerals: Sulphur = 0.13% (dry). Potassium = 0.06% (dry). Magnesium = 0.14% (dry). Calcium = 0.36% (dry). Na = 0.01% (dry). K = 2.57% (dry). Zinc = 13mg/kg -1 (dry). Iron = 17 mg/kg-1 (dry). Manganese = 8 mg/kg-1 (dry). Copper = 8 mg/kg-1 (dry). Aluminium = 10 mg/kg-1 (dry).

nrakta Tropical Africa - Mauritania to Sudan, south to Angola and Tanzania. ksacta Characteristic of thorn woodlands of the African savannahs, which are characterized by low elevations with 4 - 10 dry months a year split into 1 or 2 periods[303].

propta Seed - sow in containers. Germination is usually 90-100% and takes 1-3 months at 21°C[200 , 303]. Germination is more rapid and successful if the seeds are first nicked or boiling water is poured on them, after which they are left to soak for 24 hours[303]. Soaking in water overnight softens the seed coat and makes water absorption for germination easy[303]. When the seed coat is nicked it may take only 6 days to germinate[303], though it is more likely to be 15 - 40 days[325]. It is preferable to sow the seed directly into the soil[303]. When seedlings emerge it is best to shade them for 8 days, then provide half shade for 4 - 7 days before exposing them to full sun[325]. Seedlings need to be 3 - 4 months old, reaching a height of 40 - 50cm, before transplanting[325]. The seed can be stored for at least 4 years at room temperature with no loss of viability[325]. Seeds per kg: 2500. Plants can also be grown by cuttings.

nwatta Fodder: Bank Industrial Crop: Fiber Management: Coppice Management: Standard New Crop Other Systems: FMAFS Other Systems: Parkland Staple Crop: Protein-oilPlants succeed in the lowland drier tropics up to an elevation of 1,500 metres[303]. They grow best in areas with a mean annual temperature in the range 20 - 30°C[325]. They prefer a mean annual rainfall of 250 - 1,000mm, but can tolerate it as low as 100mm or as high as 1,500mm[303]. They cannot succeed in areas subject to frost, being able to tolerate no more than one day of frost each year[303]. Requires a position in full sun in a sandy, well-drained soil[200]. Plants do not grow in deep sandy soils, presumably because they are unable to obtain sufficient anchorage and moisture, but are commonly found in sandy soils overlying loam and with a high water table[303]. Established plants are very drought tolerant[303]. Prefers an acidic soil with a pH lower than 6.5[303]. After reasonably fast growth when very young[303] Trees grow quickly reaching 2 m in 2 years, it becomes a very slow-growing and long-lived tree, with some gnarled specimens believed to be around 2,000 years old[200]. The thick, fibrous bark is remarkably fire resistant, and even if the interior is completely burnt out, the tree continues to live[303]. The wood inside the bark is unusually soft - hollowed out trees have been used as bars, shops and even prisons[362]. Plants are resistant to termites[303]. The baobab is a popular species for bonsai specimens[303]. In dry regions, the baobab plays a vital role in water storage; a hollowed trunk may be carved out in 3 - 4 days. A medium-sized tree may hold 400 gallons while a large tree could contain over 2,000 gallons, and water stored

in them is said to remain sweet for several years if the hollow is kept well closed The flowers emit what some describe as a strong carrion smell, which is presumably attractive to the bats[303]. Optimal spacing is thought to be 20 to 30 m apart. Suitable for xeriscaping. Trees produce fruit after 2 to 15 years.

5.2.49 Landolphia heudelotii

Guinea gumvine, Landolphia rubber
10 tin 12 cyuc 3 kcaak 3 tcan 2 dwat 15 m hkuc
htut cyutli tucpja7n hwicli hyishrasljut hpa7tli flatprik hpa7tmwatli hjonli

drutta Landolphia heudelotii is a CLIMBER growing to 15 m (49ft) by 0.3 m (1ft in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils. It cannot grow in the shade. It prefers moist or wet soil.

kcakta Edible Parts: FruitEdible Uses: DrinkThe fruit pulp is edible and refreshing[332]. It is slightly acidulous and mucilaginous and is said to promote good digestion[332]. The pulp surrounding the seeds is filled with a juice that is regarded as very healthful and is sometimes prescribed as an aid to digestion[323]. Rich in organic acids, this pulp is used as a snack, as a breakfast food, and as a source of refreshing drinks[323]. The juice is commonly used to season rice with its sprightly sourness[323]. It is fermented to make an alcoholic drink[332]. The yellow fruit is pear-shaped or globose and often suddenly contracted into a stout stipe, 3 - 8cm in diameter.

tcanta LatexThe plant contains an abundance of white latex and the rubber obtained from it is of good quality[46 , 323]. The sap is no longer used commercially, but has local applications - to fix bicycle tubes, for example[323].

dwatta Antiaemorrhoidal Odontalgic TonicA decoction of the stems, or of the roots, is given for treating intestinal pains[332]. It is not purgative[332]. Vapour from a boiling concoction of leafy twigs is inhaled orally for tooth troubles[332]. The plant (part not stated) is used in draughts and added to squat-baths in treating haemorrhoids[332]. A decoction of the roots, and of the fruit pulp, with some lime-juice is added to baths as a remedy for fatigue[332]. The seeds have unspecified medicinal use in Sierra Leone[332].

nrakta Western tropical Africa - Senegal to N. Ghana. ksacta Mainly a savannah and understorey shrub, it is often found in open forests and on laterite and sandy soils near rivers[323].

propta Seed - Cuttings
nwatta Industrial Crop: Hydrocarbon Management: Coppice Regional CropThe plant grows under trees and is promising for agroforestry[323]. The plant is said to withstand bush-fires and grazing[332].

5.2.50 Sclerocarya birrea

Marula
10 tin 12 cyuc 3 kcaak 2 tcan 3 dwat 13 m hkuc
htut cyutli hgatyuctcup hwicli hrasljutnyik hpa7tli frusflat-prikshom hpa7tmwatli dyat hjonli

drutta Sclerocarya birrea is a deciduous Tree growing to 13 m (42ft) by 13 m (42ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Moths. The plant is not 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 and neutral soils and can grow in very acid and saline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

kcakta Edible Parts: Fruit Oil SeedEdible Uses: OilFruit - raw or cooked[301]. The fully ripe fruits have a mucilaginous texture with a sweetly acid but pleasant taste[301 , 307 , 332 , 774]. It is variously described as tasting like a mango, like a guava or as not being tasty at all[307]. Often eaten as a snack, travellers out in the bush find them satisfying to suck for their thirst-quenching effects[332]. The pulp can be used to prepare jam and wine[398]. It can be boiled down to a thick black syrup and used as a sweetening agent[301]. Contains four times as much vitamin C as oranges[301]. The

scorpion bites[299]. The bark, ground-up with capsicum pepper (Capsicum annum), is rubbed on the body as a stimulant[299]. The seeds are taken to treat stomach complaints, including nausea and vomiting[299]. Aqueous seed extracts are administered to expel parasites[299]. The fruit pulp is used to treat whitlow[299]. A water-soluble and heat-stable toxic compound, hypoglycin A, is present in the aril of unripe seeds, as well as in the seed and in the pinkish to reddish tissue at the base of the aril. The Jamaican vomiting sickness is associated with this compound and is characterized by vomiting, generalized weakness, altered consciousness and sometimes even death. Hypoglycaemia and depression of the central nervous system are common. The aril of fully ripe seeds after natural dehiscence of the fruit is nearly free of the toxic compound. The consumption of unripe seed arils has probably caused many cases of encephalopathy in children in Burkina Faso and other West African countries.

nrakta Western and central tropical Africa - Senegal to Cameroon and Gabon. ksacta Seasonally dry lowland woodland[307]. Forest outliers on the savannah and drier parts of forests[332].

propta Seed - they are sensitive to desiccation and are considered short-lived. It is recommended to sow them within a few days after extraction from the fruit. However, seeds can be kept for 3 months in moist storage at 21°C. Germination starts after 2 - 4 weeks, with a germination rate of 80%[299]. Greenwood cuttings. Air layering Grafting

nwatta Management: Standard Other Systems: Home-garden Other Systems: Parkland Regional Crop Staple Crop: Protein-oilA plant of the drier to very wet lowland tropics and subtropics, where it is found at elevations up to 900 metres. It grows best in areas where annual daytime temperatures are within the range 24 - 27c, but can tolerate 20 - 34c[418]. Mature plants can be killed by temperatures of -3c or lower, but young plants are intolerant of any frost[418]. It prefers a mean annual rainfall in the range 2,000 - 4,000mm, but tolerates 700 - 6,000mm[418]. Grows best in a sunny position[307]. Prefers a moist, loamy, fertile, well-drained soil[200 , 307]. Plants can succeed in a range of soils, including infertile, rocky soils[335]. Prefers a pH in the range 5.5 - 6.5, tolerating 4.3 - 8[418]. Established plants are drought tolerant[307]. Initial growth is fast on moderately fertile soils. Seedlings grow best in gaps in the forest canopy, with a mean annual height increment of 70cm[299]. Plants can commence cropping when 3 - 4 years old from seed[335]. The plant has been known to escape from cultivation when grown in sandy soils[307]. Plants flower intermittently throughout the year[307]. A dioecious species, both male and female forms need to be grown if fruit and seed are required[299].

5.2.48 Adansonia digitata

Baobab, Judas Fruit, Monkey Bread Tree

10 thin 12 cyuc 3 kcaak 4 tcan 3 dwat 20 m hkuc htut cyutli hgatkyuctcup hwicli vyhshrasljutnyk hpa7tli frusflatprik hpa7tmwatli hjonli

drutta Adansonia digitata is a deciduous Tree growing to 20 m (65ft) by 15 m (49ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 10 and is frost tender. The flowers are pollinated by Bats, Bush Babies, Insects. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant is not wind tolerant.

pcista The bark is boiled for days to extract a substance poisonous to ants[303].

kcaakta Edible Parts: Flowers Fruit Inner bark Leaves Oil Root SeedEdible Uses: OilEdible portion: Roots, Leaves, Fruit, Seeds, Bark, Sprouts, Flowers, Vegetable. The acid pulp of the fruit is eaten and made into drinks[301]. An edible white, powdery, dry pulp found in the fully ripe fruit is very rich in vitamin C and B2 and makes a refreshing drink[303 , 775]. The drink is said to taste like lemonade[377]. Ripe fruits are collected and cracked to remove the 'fleur', which is mixed with milk to prepare a flavoured fermented porridge[303]. The pendant fruits are velvet-covered, gray and gourd-like, about 30cm long, and apparently look like dead rats hanging from the tree by their tails[372]. The acid

pith of the fruit is used as a substitute for cream of tartar in baking[303]. It is also roasted and used as a coffee substitute[303]. Young leaves - cooked[301]. A tasty spinach[774]. Eaten as a potherb or dried, ground into a powder and used to thicken soups, stews etc[46 , 301]. Rich in Vitamin C, they also contain uronic acids - they are in high demand in West Africa as a soup vegetable[303]. An extract of the leaves, called 'lalo', is used to give couscous a smooth consistency[303]. The leaves also form an excellent condiment and seasoning[303]. Seed - eaten mixed with millet meal[46 , 301]. Ground into a flour; they are used as a flavouring or baking powder substitute[301]. When slightly fermented, this powder has the flavour of almonds[301]. The roasted seed is a coffee substitute[301]. The seeds contain appreciable quantities of tartaric acid and potassium bitar; they are refreshing to suck, and when soaked in water make a palatable drink[303]. An edible oil can be obtained from the seed[301 , 303]. A pleasant flavour[46]. Flowers - raw[301]. Tender roots are eaten[301]. Mature, thick roots are cooked and eaten during times of famine[303]. A root decoction is widely used in Sierra Leone as food. It is prepared by boiling, roasting, soaking or fermenting the roots, and tastes like almonds[303]. The shoots of germinating seeds are edible[301]. Eaten as a vegetable[303]. A delicious flavour[393]. Having a high water content, the wood is chewed by humans and animals in cases of extreme water scarcity[303]. The wood can be used as a salt substitute[303].

tcanta Adhesive Dye Fertilizer Fibre Fodder Fuel Hair Insecticide Oil Soap Soil conditioner Tannin Wood WoodAgroforestry Uses: Decaying wood of a tree that has died of old age or from lightning is spread on fields as a fertilizer[303]. Ashes from the shell, bark and seed are rich in potash and are useful as a fertilizer[303]. Other Uses Ash from the shell, bark and seed, rich in potash, is widely used in making soap, prepared by boiling the bark and fruit ash in oil[303]. The shell can be used as a dish, water dipper, vessel for liquids, snuffbox, fishing float etc[303 , 775]. It also makes an excellent rat trap[303]. The powdered husk or peduncle may be smoked as a tobacco substitute or added to snuff to increase pungency[303]. The pulp extract can be used as a hair wash[303]. The acid pulp is used as a coagulant for rubber[46]. The acid pith is used to coagulate rubber[303]. A glue can be made by mixing flower pollen with water[303]. The wood and bark contains some tannins[46 , 303]. The roots produce a useful red dye[303]. A non-drying, golden yellow oil of agreeable taste can be obtained by distilling the seeds[303]. It is used for making soap[46]. The seed contains about 14% oil. The fruit pulp burns with an acrid, irritating smoke that can be used as a fumigant to deter insects troublesome to livestock[46 , 303]. The bark is boiled for days to extract a substance poisonous to ants[303]. The bark from the lower part of the stem of younger trees and of the roots can be removed to produce a valuable fibre[46 , 303]. The fibres are long, from 90 - 120cm in length[325]. If managed properly the trees are not seriously damaged, and even after repeated use the bark regenerates and can be stripped again some years later. It is used to make excellent cordage, ropes, harness straps, mats, snares and fishing lines, fibre cloth, musical instrument strings tethers, bed-springs and bow strings[303]. The fibres can be woven into waterproof hats that may also serve as drinking vessels[303]. The fibre is the best for making the famous 'kiondo' baskets of Kenya. Strong, tough and tear-resistant paper is produced from the fibre. It is commercially exploited in India for currency notes[303]. The wood is whitish, spongy and light (air-dried 320 kg/cubic m). Easily attacked by fungi, it has no commercial value, but is used locally for making canoes, rafts, insulating boards, wooden platters and trays, boxes and floats for fishing nets[303 , 325]. The long-fibred wood is suitable for firewood[303]. The wood is unsuitable for use as a fuel[325]. The shell and seeds are also used for fuel, which potters use to smooth earthenware necklaces before firing[303].

dwatta Dysentery Vitamin CThe leaves are hyposensitive and antihistamine[303]. They are used to treat kidney and bladder diseases, asthma, general fatigue, diarrhoea, insect bites, and guinea worm[303]. Leaf and flower infusions are valued for respiratory problems, digestive disorders and eye inflammation[303]. Seeds are used to cure gastric, kidney and joint diseases. They are roasted then ground and the powder smeared on the affected part or drunk in water[303]. The seed paste is used for curing tooth and gum diseases[303

(4.7-6 m).

5.2.3 Treculia africana

African Breadfruit or Breadnut

10 thin 12 cyuc 4 kcaak 2 tcan 2 dwat 30 m hkuc hmimhtut cyutli tcup hwicli jlutnykfrip hpa7tli flatprikwis hpa7tmwatli hjonli

drutta Treculia africana is an evergreen Tree growing to 30 m (98ft) by 30 m (98ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10 and is frost tender. Suitable for: medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

pcista The sap of the male tree is caustic and toxic, though the sap from female trees is used medicinally[307].

kcaakta Edible Parts: Oil SeedEdible Uses: Milk OilSeed - cooked[301]. A flavour similar to peanuts[335]. Eaten as dessert nuts after roasting or boiling, they are also ground into a meal, used in soups and to produce a variety of baked foods such as bread and paste[63 , 303]. The seeds are extracted after macerating the fruit in water[303]. The grains have an excellent polyvalent dietic value - the biological value of its proteins exceeds even that of soybeans[303]. Numerous seeds about 6mm long are embedded in a massive fruit that can weigh up to 14 kilos[63]. A non-alcoholic beverage, almond milk, can be prepared from the powdered seeds, which is recommended as a breakfast drink in Nigeria[303]. An edible oil can be extracted from the seed[301 , 303].

tcanta Charcoal Fencing Fuel Furniture Mulch Oil Paper Soil conditioner Teeth WoodShade tree. Fruiting tree. Humid shade garden. Botanical collection. Agroforestry Uses: The tree has been used in soil conservation programmes[303]. The leaf fall is a good source of mulch[303]. It has also been recommended as a promising species for use in home gardens, and for intercropping systems in agroforestry[303]. Other Uses The heartwood is yellow with very narrow pale sapwood; very dense, fairly elastic and flexible, rather heavy, with fine, even structure. It is suitable for furniture, carving, turnery and inlay wood[303]. It is suitable for pulp and papermaking[303]. The wood is used for fuel and making charcoal[398].

dwatta Anthelmintic Antitussive Febrifuge Laxative Leprosy OdontalgicIn Ghana, a root decoction is used as an anthelmintic and febrifuge[303]. The caustic sap of male African breadfruit is applied on carious teeth[303]. A decoction of the bark is used in the treatment of cough and whooping cough[303]. The ground bark, mixed with oil and other plant parts, is used in the treatment of swellings[303]. It is also used in the treatment of leprosy and as a laxative[303].

nrakta Tropical Africa - Senegal to southern Sudan, Uganda and Kenya, south to northern Angola, Zambia, Malksacta Usually found near streams or in swampy areas in forests at an altitude up to 1,500 metres[303]. Riverine, mixed evergreen and swamp forests, woodlands, sea level to 1,300 metres[308].

propta Propagation is by seedlings, which are sown in pots, and direct spot sowing at site. Pre-treatment of seeds is not necessary. It is also propagated through budding, cuttings and shield grafting. Using adult scions, budded trees have produced fruits with viable seeds within 2-4 years. With juvenile cuttings, one can obtain 69% rooting. Where climatic conditions are favourable, fruit collection is possible throughout the year

nwatta Agroforestry Services: Living fence Management: Standard New Crop Staple Crop: ProteinTolerant of a wide range of climatic conditions, it will thrive in most tropical and subtropical regions at elevations up to 1,500 metres[303]. It is found in areas where the mean annual rainfall is within the range 1,250 - 3,000mm, and the mean annual temperature ranges from 22 - 35°C[303]. Prefers a rich, deep, moisture-retentive soil and a position in partial shade or full sun[303]. It is not a very light demanding plant, and will grow in a wide variety of soils[303]. Plants start to fruit when about 4 years old[303]. Under favourable climatic conditions and in a good soil, 120 - 200 kilos of dried grains can be harvested in a year from each tree; this would translate to between 5 - 10 tonnes per hectare[303]. A fairly fast-growing tree.

There is a striking variation in the number of fruit heads produced by trees belonging to *T. africana* var. *africana* (with large fruit heads) and *T. africana* var. *inversa* (with small fruit heads). The former is clearly superior in the weight of seeds produced while the latter produces more fruit and also produces twice as many branches[303]. Bloom Color: Cream/Tan. Spacing: 8-10 ft. (2.4-3 m).

5.2.4 Irvingia gabonensis

Dika Nut

10 thin 12 cyuc 4 kcaak 3 tcan 3 dwat 30 m hkuc hmimhtut cyutli tcup hwicli hrsrajlutnyk hpa7tli frusflatprikwis hpa7tmwatli hjonli

drutta Irvingia gabonensis is an evergreen Tree growing to 30 m (98ft) by 30 m (98ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

kcaakta Edible Parts: Fruit Oil SeedEdible Uses: Chocolate Condiment Drink OilEdible portion: Seeds, Fruit, Kernels, Leaves, Bark - drink. Seed - cooked. In season, the fallen fruits are collected in the forest and stacked till the pulp has rotted away[332]. The nuts are opened and the cotyledons removed and dried[332]. These cotyledons are a common item of market produce and are used in soups and as a food flavouring[301 , 332]. They are said to have a pleasant taste with a lingering slight bitterness[63 , 332]. The seeds are 25 - 38 mm long, 17 - 27 mm wide, 8 - 12 mm thick; the endosperm is almost non-existent[405]. The principal domestic use of the seed is for the preparation of dika, or dika bread, also known as Gabon chocolate[301 , 332]. For this the cotyledons are ground and heated in a pot that is lined with banana leaves in order to melt the fat, and then left to cool. The resultant grey-brown greasy mass is dika bread. It has a slightly bitter and astringent taste with a more or less aromatic odour. Pepper and other spices may be added, and it may perhaps be subjected to wood smoke. The end product may be made up into cylindrical packets wrapped in a basket-like or leaf-wrapping. It can be kept for a long time without going off and it is used as a food-seasoner[332]. An alternative method of preparation, more akin to the making of vegetable butters, is to take the fresh or stored cotyledons and pound them into a paste[332]. A third preparation, known in Gabon as oven'ke, is to soak the kernels for 15 - 20 days till soft and then to knead them by hand into a cheese-like paste[332]. A fourth practice is known in Sierra Leone, in which the cotyledons are dried and ground to a brown 'fleur' in which form it can be stored for use as an additive to food as and when required[332]. The kernel is an important source of vegetable oil[301 , 332]. There is a wide variation in quantity and composition of the oil; even so the seeds are considered a suitable source of industrial and edible oils[332]. Total fat content has been recorded as 54 - 68%[332]. The crude dika paste yields on heating or boiling 70 - 80% of a pale yellow or nearly white solid fat, dika butter, which has qualities comparable with cacao-butter, and is, in fact, a possible adulterant or substitute for the latter in chocolate manufacture[63 , 301 , 332]. Freed from its slight odour it can also be regarded as suitable for margarine manufacture[332]. The yellow, fibrous fruit looks somewhat like a small mango and has a similar flavour[63]. The fruit pulp is palatable and can be used for a fruit drink and for jam production[303]. The fruit is variable, with special forms[332]. The pulp of some trees is edible with a turpentine flavour, and of others inedible, bitter and acrid[332]. The edible ones are a good source of vitamins[332]. The ellipsoidal to cylindrical fruit is 40 - 65mm long, 42 - 64mm wide, 34 - 60mm thick, smooth, green at maturity; mesocarp bright orange, soft and juicy with few weak fibres[405].

tcanta Dye Oil Paper Tannin Teeth Wax WoodAgroforestry Uses: The tree is commonly preserved on farms when woodland is cleared in order to provide shade for crops, especially cocoa and coffee[299]. Other Uses: A wax has been extracted from the plant which has been found useful as an adjunct in making medicinal tablets[332]. Both the bark and the roots contain tannins[303]. The fruit pulp is used to prepare a black dye for cloth[299 , 332] The fat ex-

tracted from the seed is suitable for soap-making and other industrial uses[332]. The sap-wood is light brown, the heartwood a slightly darker or greenish-brown[332]. The wood is tough, very heavy, very hard, durable, immune to termite attack but rather difficult to split[46 , 332]. It has a fine moderately close grain and a good polished finish can be achieved[332]. It is not easy to cut, which limits its usefulness for native people who often only have simple implements[332]. Its weight is said to preclude it from all but the most rugged construction-work, e.g., for railway-ties, house building, etc[332]. It is used for street paving[46]. Canoes can be made from the trunk, and pestles for yam-mortars[332]. Tests for paper manufacture have shown cellulose content 48.8%, fibre length 1.5 mm, and the resultant dark brown paper to be inferior, rather weak and soft, and not bleachable[332].

dwatta Aphrodisiac Bitter Dysentery Mouthwash Pultice Purgative SkinThe bark has a bitter taste and has the usual usages of bitter barks in Africa[332]. It is used as a purgative for treating gastro-intestinal and liver conditions; sterility; hernias; and urethral discharge[332]. It is considered by some to be a powerful aphrodisiac and to be beneficial in cases of senility[332]. It is used in an enema, or added to a baked banana in order to relieve diarrhoea and dysentery[332]. Applied externally, it is ground up with water for rubbing on to the body for easing pains[332]. It is used in mouth-washes for relieving toothache, made into a poultice and applied to sores and wounds[332]. Tannin has been reported present in both the bark and the roots, also a strong presence of alkaloid in the bark, though none in the roots[332].

nrakta Tropical Africa - Nigeria to Central African Republic, south to Congo, DR Congo and Angola. ksacta Evergreen dense, moist, lowland rain-forest[303 , 332].

propta Seed - it has a short period of viability and so should be sown as soon as it is ripe. Germination takes more than 14 days and the seed should first be extracted from the fruit and then dried for at least 2 days prior to sowing. A germination rate of 80% can be reached in this way[299]. Can be grown from stem cuttings under mist. Plants can be budded.

nwatta Management: Standard Regional Crop Staple Crop: OilA plant of the moist to wet, lowland tropics, where it is found at elevations from 200 - 500 metres. It grows best in areas where annual daytime temperatures are within the range 25 - 32c, but can tolerate 20 - 38c[418]. It prefers a mean annual rainfall in the range 1,500 - 3,000mm, but tolerates 1,200 - 3,300mm[418]. Prefers a sunny position, tolerating light shade[418]. It does not have any particular soil preference, though it grows well in well-drained, acidic soils[303]. The plant is restricted in the wild to fairly wet, well-drained loamy to clayey soils[338]. Prefers a pH in the range 5 - 7, tolerating 4.5 - 7.5[418]. Growth in young plants is very slow; later it becomes moderately fast[299]. The fruits are mostly gathered from the ground around each tree, or are harvested by climbing when the tree is not too tall. The next step consists of extracting kernels from seed, which is split in halves with a cutlass, and the kernel is removed with the help of a knife. The kernels are then dried in the sun or on bamboo drying racks over the fireplace in the kitchen[299]. Twelve year-old trees in Nigeria have yielded 1060 fruits (180 kilos) per tree, but in drier areas yields are much lower. Good kernel yields are about 100 kilos per tree per year[299]. Trees are not resistant to fire[299]. A number of different forms are recognised in Africa. These differences are not always recognized by botanists:- In Liberia there are two: one is small-leaved with inedible seeds, and the other larger-leaved with edible seeds[332]. In Nigeria: var. Gabonensis has sweet edible fruit-pulp, whilst var. Excelsa has bitter inedible pulp but is slimy and is added to soup for this quality[332]. Modern treatments distinguish these two forms as distinct species, var excelsa being separated as *Iringia excelsa* Mildbr.[K]. In Lower Dahomey a variety with a thick edible pulp is cultivated[332]. In Ivory Coast large-leaved and small-leaved forms are given separate vernacular names, the former being considered inedible[332].

5.2.5 Trichilia dregeana

Cape Mahogany
10 tin 12 cyuc 4 kcaak 3 tcan 3 dwat 25 m hkuc

hmimhtut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprikliwis hpa7tmwattli hjonli

drutta Trichilia dregeana is an evergreen Tree growing to 25 m (82ft) by 25 m (82ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

pcista The bark is very toxic. It is used in the preparation of fish poison[299].

kcakta Edible Parts: Fruit Oil SeedEdible Uses: OilFruit - raw or cooked[299]. It can be cooked and used as a vegetable, or crushed and made into a sweet drink or sauce[295 , 299]. Seed - boiled and eaten as a side dish[299]. The seedcoat contains toxins and must be removed before the seed is cooked[295 , 299]. The seeds provide an oil that is used for cooking even though it has a bitter flavour[299]. The seedcoat is poisonous and only well-prepared oil is safe for consumption[299].

tcanta OilAgroforestry Uses: The tree is grown to provide shade for coffee plantations, or is left standing as a shade tree when the forest is cleared[299]. Other Uses The seeds contain 55 - 65% oil. This is used as a body ointment and hair oil, as well as to make candles, soap and cosmetics[295 , 299]. The approximate fatty acid composition of the oil is: palmitic acid 34%, stearic acid 3%, oleic acid 51%, linoleic acid 11%, linolenic acid 1%[299]. To obtain the oil, the seeds are first ground into a powder and pounded, they are then boiled in water and the oil is skimmed off[299]. The heartwood is pale brown to pink, the sapwood whitish, though the wood darkens with age and exposure. When oiled, it darkens considerably, leaving little difference between the heartwood and sapwood. The grain is generally straight, texture medium coarse, the wood has a distinct figure[299]. The wood is not durable and is subject to attack by borers. It is easily worked and polishes well. It is not durable and susceptible to borer attack[299]. The wood is particularly important as a material for making carvings, especially in southern Africa, and is also used for indoor furniture, household utensils, shelving, construction, dugout canoes etc[295 , 299 , 398]. The wood is used for fuel and for making charcoal[299 , 398].

dwatta Dysentery Eczema LeprosyThroughout Africa the seed oil, leaves, root and bark are used in similar ways uses to those of *Trichilia emetica*, though they are generally considered to be inferior. They are used to treat a variety of complaints ranging from lumbago to leprosy and sleeplessness[299]. A large number of limonoids have been isolated from the seed, especially from the seedcoat, including evedulone and preuriarin derivatives. Limonoids of other plants in this family (Meliaceae) are well known as antifeedants and growth regulators of insects, but they also have some antimicrobial and anti-inflammatory activities[299]. The bark, which is very toxic, contains inhibitors of the prostaglandin-synthesis, which play a role in inflammation and pain suppression[299]. The seed oil is rubbed into cuts made in the skin of a fractured limb in order to hasten healing[299]. It is used as a massage oil to treat rheumatism and as a general body ointment[299]. The fruit has emetic and purgative properties[299]. Poultices made of the leaves or fruits are applied to bruises and eczema[299]. A decoction of the roots is used as a general tonic; to treat fever; and as a purgative[299]. It is also used to induce labour in pregnant women; and to treat intestinal worms, colds and infertility[398]. A decoction of the bark is drunk as a purgative or abortifacient, and also to treat dysentery and diarrhoea, fevers and lumbago[299 , 398]. The bark is used externally as a treatment against scabies[299]. Decoctions of the bark, applied in the form of an enema, are used as a purgative and abortifacient, as well as to treat back pain caused by kidney problems[299].

nrakta Tropical Africa - Cote D'Ivoire to Ethiopia, south to Angola, Malawi, Mozambique, Zambia, Zimbabwe a ksacta The transition zone between forest-savannah mosaic and moist evergreen forest, mostly at elevations of 500 - 1,600 metres in the north of its range, but gradually descending to sea level in S. Africa[299].

propta Seed - it is intolerant of being dried and has a short viability, so should be sown as soon as it is ripe. Seed is sometimes sown in situ; if sowing in a nursery seedbed then choose a position with some shade. No pre-treatment is

from the dried kernels, is used to flavour carbonated drinks, ice cream, candy, baked goods etc[301].

tcanta Fuel Furniture WoodAgroforestry Uses: Plants are often used as shade trees in cocoa (*Theobroma cacao*) plantations[238]. Other Uses The sapwood is pinkish-white and the heartwood dull yellow[303]. The wood is susceptible to borers[324]. It is suitable for furniture, house and boat building, coach-work, plates, domestic utensils, gun stocks, joinery and carvings[303 , 324]. The wood is a good source of fuel[303].

dwatta Antidepressant Antidiarrhoeal Antihæmorrhoidal Appetizer Astringent Bitter Diuretic Dysentery Stimulant TonicThe seeds are an astringent, bitter-sweet, antidepressant herb that has a stimulant effect, especially on the heart[238]. The powdered seeds are taken internally in tonics, in the treatment of exhaustion, low energy and poor appetite[238]. They are also used in treating diarrhoea[238]. The following information has been copied from the entry for *Cola acuminata* since the seeds are used interchangeably[254]. *Cola* nuts contain up to 2.5% caffeine, plus theobromine, tannins, phlobaphene and an anthocyanin[254]. They stimulate the nervous system when chewed and are also considered to be a digestive tonic, diuretic, astringent and antidepressant[254 , 303 , 307]. They counteract overstrain and depression thus improving the physical and mental state. The principle action is that of caffeine. Other active principles include theobromine and kolatine[303]. Because of its astringent properties, *cola* is used as a non-addictive stimulant in the treatment of diarrhoea and dysentery[254 , 303], and also to prevent vomiting in cases of high fever[303]. It has also been used in the treatment of headaches and migraine[254]. It has been used in combination with coca leaf (*Erythroxylum coca*) to produce a stimulant drug that has been used as 'Forced March' tablets by explorers and military expeditions[303]. The crushed nuts are boiled together with the leaves of *Morinda lucida* and the liquid taken internally to cure piles[303]. The nuts ground to a fine paste together with the leaves of *Scoparia dulcis*, are dissolved in a little water and a few drops are administered orally to babies for headache[303]. The seeds are harvested when fully ripe and dried in the sun[254]. An infusion of the bark mixed with ginger and a little pepper is taken internally to cure stomach ulcers[303].

nrakta Western Tropical Africa - Sierra Leone, Côte d'Ivoire eastward to Ghana. ksacta Lowland forest, usually at elevations up to 300 metres, but also found up to 800 metres[324 , 418].

propta The seeds are thought to require a period of dormancy for effective germination and growth. Pre-soaking for 24 hours can improve the level of germination[325]. Sow the seed individually in containers[200]. Germination is slow, taking 2 - 3 months[324]. Germination within 10 - 18 days has been achieved when the seed was sown at a temperature of 30°C[325]. Higher germination levels have been achieved when the cotyledons were parted before sowing[325]. The improved germination could be a result of the removal of this mechanical constraint[325]. Seedlings can be planted out after about 12 months[325]. The seeds are sensitive to drying and low temperatures[325]. They do not tolerate drying to less than c. 30% moisture content. They can be maintained for one year or more without loss in viability, with the seeds wrapped in banana leaves at room temperature.[325]. Cuttings of mature wood[200].

nwatta A plant of the hot, humid, lowland tropics, where it is found at elevations up to 800 metres. It can be cultivated in drier areas as long as ground water is available[324]. It grows best in areas where annual daytime temperatures are within the range 21 - 30°C, but can tolerate 10 - 35°C[418]. It prefers a mean annual rainfall in the range 1,400 - 2,500mm, but tolerates 1,200 - 3,500mm[418]. It is capable of withstanding 3 or more months of dry season[324]. Prefers a rich, well-drained soil and a position in full sun[238]. Young trees require some shade[324]. Prefers a pH in the range 5 - 6, tolerating 4.3 - 7[418]. Initial growth is slow, with trees reaching only 3 metres in 4 years[324]. Trees start producing at around the age of 12 - 15 years and can produce 10 - 16 kilos of seed annually for more than 80 years[238]. Yields of 300 nuts per tree are considered good[324]. In some regions the tree may flower almost all the time, so harvesting is continuous throughout the year[418].

5.2.47 Blighia sapida

Akee, ackee apple or ayea
10 tin 12 cyuc 3 kcaak 3 tcan 2 dwat 20 m hkuc
htut cyutli htgaccup hwicli hysjlutnyik hpa7tli flatprikliwis hpa7tmwattli dyat hjonli

drutta Blighia sapida is an evergreen Tree growing to 20 m (65ft) by 20 m (65ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Bees. The plant is not self-fertile. It is noted for attracting wildlife. Suitable for: 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 moist soil and can tolerate drought.

pcista Great care should be exercised if eating this fruit. It must only be eaten when fully ripe since both before and after that stage it is considered to be poisonous[200]. A toxic peptide, hypoglycine A, is contained in the unripe aril[307]. The pink raphe that attaches the aril to its seed is deadly toxic and must be carefully and completely removed[307]. The pounded fruit is used as fish poison[299].

kcakta Edible Parts: Fruit OilEdible Uses: OilFruit - eaten raw when fully ripe[301]. The fleshy arils surrounding the seeds are firm and oily, with a nutty flavour, though they can soon become rancid[46]. The fleshy fruit can also be curried, used in soups, stews, etc[301]. The fruit is harvested when they have split open naturally, revealing four large glossy black seeds embedded in spongy, cream-coloured buttery arils[307]. The pear-shaped fruit is about 75mm long, 45mm wide, and is produced in clumps of 3 - 10[46 , 335]. The fruit must be allowed to open fully, or at least partly, before it is detached from the tree[317]. Unripe or overripe arils, as well as the seeds, contain hypoglycin and its derivative - they are strongly toxic[301 , 317]. The seeds yield a yellowish oil that is believed to be edible[299].

tcanta Charcoal Containers Fuel Furniture Ink Mordant Oil Parasiticide Potash Soap Soap making Soil conditioner Soil stabilization WoodDesign: Small shade tree; small fruiting tree; specimen tree; xerophytic. Agroforestry Uses: The tree is often planted to provide shade[299 , 317]. It is considered useful for soil improvement and erosion control[299]. Other Uses: The dried fruit husks are rich in potash; the ashes can be used in making soap[299 , 307]. The flowers are used in the preparation of an aromatic water[46 , 301]. Used as a cosmetic[46]. The green fruits lather in warm water and are used as soap for washing and as a mordant for dyeing[299 , 307]. The oil from the seeds are used in making traditional soap[299]. The seeds contain about 26% of oil which is suitable for industrial applications[299]. An ink for tattoos is made from the seeds[299]. The heartwood is orange-brown or reddish brown; it is distinctly demarcated from the whitish sapwood. The texture is moderately coarse; the wood has little lustre. It is moderately heavy, hard, moderately durable and quite resistant to termite attack. It is easy to work with both machine and hand tools. The wood moulds and sands well and takes an attractive finish. The wood is mainly used for light construction and furniture, but sometimes also for casks, boxes, crates, food containers, packing cases, tool handles, paddles, pestles, mortars, handicrafts, carving and turnery. It is suitable for interior trim, joinery and railway sleepers[299]. Dried fruit husks are rich in potash. The wood is used for fuel and to make charcoal[299]. Wild fruit for birds and bats nectar for bees. A honey plant.

dwatta Antidiarrhoeal Antipruritic Diuretic Dysentery Epilepsy Febrifuge Laxative Ophthalmic Parasiticide Skin StomachicThe plant (part not specified) is used to treat anaemia and itching[617]. In traditional medicine in Cote d'Ivoire, *Blighia sapida* is widely used for the treatment of yellow fever, epilepsy and oedema, and as a laxative and diuretic[299]. Sap from terminal buds is instilled in the eyes to treat ophthalmia and conjunctivitis[299]. The pulp of ground-up leafy twigs is rubbed on the forehead to treat migraine[299]. The ground-up leaves, combined with plant salts, are applied as a paste to treat yaws and ulcers[299]. The leaves are used in the treatment of fever and vertigo, and twigs to treat hepatitis, cirrhosis and amygdalitis[299]. Bark and leaf decoctions are administered to treat oedema, intercostal pain, dysentery and diarrhoea[299]. Decoctions of bark or fruit walls are applied to wounds[299]. Pounded bark is administered as an antidote to snake and

taanta Basketry Cork Fencing Fibre Fuel Furniture Ink Insulation Mulch Paper Pioneer Roofing Soap making Soil conditioner String Teeth WoodAgroforestry Uses: A pioneer plant of rapid growth, but short-lived; often gregarious[328]. It rapidly occupies old clearings, first singly, but then gregariously by coppicing from the stilt-roots[332]. The tree canopy produces a dense leaf-litter which creates a heavy layer of humus. This serves as a nursery for other hardwood species which take over in succession[332]. The tree's rapid growth may be an adverse factor in forest management if left unchecked, but with suitable control practices it could no doubt be used to good effect in regeneration after felling[332]. The tree is sometimes used as a shade plant for coffee plantations[332]. Other Uses The wood is used as a cork substitute. Its extreme lightness lends itself to make fishing-net floats and rafts[332]. Wood-ash from freshly felled trees provides a lye for soap-making[332]. The sap, which tends to be tacky, turns black on exposure to air and is used as ink[332]. The sap from the stilt roots is used to produce a protective film on earthenware pots[332]. Long strong fibres can be extracted from the bark amounting to 25 - 30% by weight. They can be bleached and turned into a resistant paper, or made into twine[332]. The heartwood is white; the sapwood is white and with a slight sheen. The wood is a whitish grey to slightly pink. It is exceptionally light, and is one of the lightest African woods. It is soft, coarse-grained, easily worked though not planing, nor finishing well; strength is poor but it is said that with proper seasoning this can be improved. It is easily split and is used for making palings for enclosing compounds and fields, rough partitions in temporary huts, shingles for interior lining of roofs having an insulating effect. As roof-rafters it is said to last two years. It can be worked into a variety of domestic articles such as stools, musical instruments, walking-sticks, trays, baskets, toy popguns, etc. It has been used to float heavy bridging timbers to inaccessible river-bank sites, and it is recorded that on Lake Bosumtwi in Ghana where canoes or constructed craft are taboo rafts of it are used instead. Larger trunks are used to fashion out canoes and dugouts, long drums and blacksmith's bellows. The wood is currently recommended in Ghana for use in industrial insulation and in aircraft construction and for models[332]. The wood yields a strong paper and has found recommendation as pulp[332]. The wood is sometimes used as firewood, though it is of low quality[303 , 332]. In olden times it provided the fuel for anyone condemned to death by burning[332

dwatta Analgesic Antirheumatic Antitussive Appetizer Blood purifier Diuretic Emmenagogue Epilepsy Expectorant Febrifuge Galactogogue Leprosy Odontalgic Skin TonicThe bark is intricately layered: light grey outer layer, then green, white, pink, white, all becoming brown on exposure. The outer part exudes a red-brown juice[332]. This exudate is mixed with maize pap and then eaten in the belief that it is a galactagogue. Women who have been taking it over a period of several days experience an increased milk flow, and even those who have no child to breastfeed can experience a flow of milk[332]. The sap of this plant has been investigated and found to contain the female hormone oestrogen and a galactagogue that can stimulate milk flow[332]. The use of this plant to treat dysmenorrhoea may perhaps be explained by the presence of these hormones[332]. The plant is said to have some analgesic properties and is used in the treatment of asthenia and loss of appetite[332]. Fumigation of the bark and leaves, mixed with the leaves of *Adenia lobata*, acts as an expectorant and dehydrator; it is given to infants in order to relieve asthenia[332]. A decoction of the bark-macerate is used as a treatment for pulmonary troubles[332]. This decoction is also used as a gargle for treating toothache[332]. A strip of the heated bark is placed over the lumbar region to relieve lumbago[332]. The root bark, combined with kola nuts (*Cola spp.*) is chewed as a cure for coughs[332]. Bark obtained from calluses on the tree is tied onto wounds where it is supposed to effect a rapid healing - although this seems a case of sympathetic treatment, perhaps it has some justification[332]. The sap from the stilt roots is considered to be medicinal for women[332]. Sap from the larger roots is drunk as a galactagogue; blood-purifier; to clean the stomach; and for treating blennorrhoea, cough and chest affections[332]. The sap is applied as a wash for persons with sleeping sickness; leprosy; fevers; and to relieve aches and pains, asthenia, rheumatism etc[332]. The root-sap is used in a topical embrocation for treating pulmonary congest-

tion[332]. Ash from the powdered roots, mixed with palm oil into a paste, is applied as a healing dressing to circumcision wounds[332]. The leaf and inflorescence buds are enclosed in a red stipular sheath which may be 20 cm long. This attracts attention, in part, at least, on the Theory of Signatures, for the treatment of gynaecological conditions. To hasten childbirth, the whole sheath is boiled in soup is used as a powerful emmenagogue[332]. The leaves are a popular medicine, especially to treat a range of feminine complaints. They are used in a prescription to prepare a vaginal douche for painful menstruation; whilst the pulped buds are given to women with leucorrhoea and other vaginal affections[332]. The buds are crushed and boiled in water which, after filtering, is taken by draught and by enema to treat abdominal troubles. They are combined with the bark of *Uapaca guineensis*; pepper (either a red chilli or other pungent seed); salt and newly deposited soil from the top of a termite mound, then boiled up - the liquid after filtering is taken by mouth to treat swollen stomach and swellings in other parts of the body. The action is presumed to be diuretic[332]. The terminal bud is crushed whole and taken, often with the sap added, to calm attacks of epilepsy and insanity, to treat blennorrhoea and heart-pains[332]. Sap expressed from the bud is used as an eardrop for treating earache and is applied topically for localized swellings[332]. Hairs from the inside of the stipule are considered good for healing burns and sores[332]. The catkins are cooked with groundnuts (*Arachis hypogaea*) and are taken to facilitate childbirth[332].

nrakta Tropical Africa - Guinea to DR Congo and Uganda. ksacta Secondary forests in recent clearings on superficially damp soils; common on old farms in closed forest; rare in rain-forest; swamp forest; along rivers; often in pure regular stands; at elevations from near sea level to about 1,200 metres[328].

propta Seed -

nwatta A tree of the wet, lowland tropics, where it can be found at elevations up to 200 metres[418]. It grows best in areas where the mean maximum and minimum temperatures are within the range 28 - 36°C, though it can tolerate 20 - 40°C[418]. It prefers a mean annual rainfall in the range 3,000 - 4,000mm, tolerating 2,000 - 5,000mm[418]. Requires a sunny position[332]. Prefers a pH in the range 4.5 - 5.5, tolerating 4 - 6.5[418]. Although we have seen no reports of this species becoming invasive, it produces fruits embedded with small seeds. These fruits are much relished by wildlife, which thus spread the seed widely. Within the plants native range it is a vigorous pioneer, rapidly invading cleared land. This habit gives it the potential to escape from cultivation and invade non-native areas if it is cultivated outside its native range[K]. A very fast-growing tree when young, with some plants reaching a height of 5 metres within 12 months[303]. The tree is short-lived, with a life span of around 20 years. It generally dies even before it is overshadowed by taller species[303]. A dioecious species, both male and female forms need to be grown if fruit and seed is required.

5.2.46 Cola nitida

Cola Nut, Kola, Bissy Nuts

10 thin 12 cyuc 3 kcaak 2 tcan 4 dwat 20 m hkuic hminhtut cyutli hgatkyuctcup hwicli hrsaljutnyik hpa7tli frusflatprikhwisslip hpa7tmwati hjonli

drutta Cola nitida is an evergreen Tree growing to 20 m (65ft) by 20 m (65ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid and very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought.

kakta Edible Parts: SeedEdible Uses: Coffee DrinkThe aromatic seed is especially rich in caffeine, with some seeds having up to 3.5% caffeine, and acts as a stimulant[238 , 301]. It can be chewed or ground into a powder and made into a drink in order to give energy, increase alertness, retard hunger and fatigue, aid digestion and increase stamina[301]. When chewed, it also has the effect of modifying the taste sensation so that any food or drink consumed immediately afterwards seems sweet[301]. An extract, prepared

required, but removal of the fleshy outer seedcoat speeds up germination[299]. A rich mixture of sandy soil and compost with plenty of moisture is recommended. The seed usually sprouts within 2 - 4 weeks[299]. Protect the seedlings from frost[299]. Natural reproduction is abundant owing to regular and copious seeding from a fairly early age, comparative immunity from damage by animals and its power of recovery from injury. Seeds germinate during the early rains and seedlings attain a length of 10 - 20cm by the end of the first year[299].

nwatta A plant of the moist tropics, but avoiding the wetter regions. It is found at elevations from 800 - 2,000 metres near the Equator, but descends to sea level as it enters the subtropics. It is usually found in areas where the mean annual rainfall is in the range 1,500 - 2,500 mm[299]. The plant is sensitive to frost, but as long as the damage is not too severe, it recovers easily[299]. Succeeds in full sun and dappled to fairly deep shade[295 , 299]. Grows best in humus-rich, fertile, moist soils[299]. Young trees grow fairly quickly, with a mean annual girth increment of 20 - 25mm[299]. Older plants are fast growing and require little or no management[299]. Trees growing in open positions start fruiting when about 10 years old, those in more shaded, forest-like conditions may not bear fruit before they are 20 years old[299]. The tree is tolerant of fire[299]. The tree coppices well. For ornamental purposes, it may be pruned into shrub form[299]. Average seed yields per tree in Mozambique are about 20 - 25 kg/year, but in a good year a large tree may produce 180 kg[299]. Trees that have produced heavily in one year tend to produce little in the next year[299]. A dioecious species, both male and female forms need to be grown if seed is required.

5.2.6 Borassus aethiopum

African Fan Palm, Palmyra Palm

10 thin 12 cyuc 4 kcaak 3 tcan 2 dwat 20 m hkuic htut cyutli hgattcup hwicli hyishrasljutnyik hpa7tli frusflatprikhwisslip hpa7tmwati dyat hjonli

drutta Borassus aethiopum is an evergreen Tree growing to 20 m (65ft) by 5 m (16ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Insects. The plant is not self-fertile. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid and very alkaline soils. It cannot grow in the shade. It prefers moist soil and can tolerate drought.

pcista Plant has spines or sharp edges; use extreme caution when handling

kckakta Edible Parts: Fruit Leaves Oil Sap Seed ShootsEdible Uses: Drink Oil SweetenerEdible portion: Fruit, Cabbage, Sap, Seeds, Palm heart, Vegetable. Fruit - fresh or dried[335]. Slightly sweet, but with a mild turpentine-like flavour[398]. The fruits have a large, fibrous pulp, weighing around 500g each, that smells strongly of turpentine[418]. They are consumed raw or cooked, preferably with rice[418]. Eaten as a food supplement[325]. Rich in oil[301]. The ripe, fallen fruit are collected, peeled and the juicy pulp is squeezed in water to form a solution which is added to porridge during cooking in order to improve the flavour[398]. The fruit is 15cm in diameter and is produced in large clusters[335]. The immature seed contains a sweet juice which can be drunk like coconut water[301 , 335]. As it matures, it solidifies becoming jelly-like and eventually solid. It can be eaten at all stages, the flavour gradually becoming more nut-like[301]. Young seedlings - eaten as a vegetable like asparagus[317]. Highly esteemed[301]. The mature seeds can be buried in pits and allowed to germinate, and the shoots are said to be a delicacy[418]. The tuberous portion of the first juvenile leaves are rich in starch - they make a highly prized vegetable[774]. Apical bud and young leaves - raw or cooked[301 , 317]. Eaten in salads, or used as a vegetable[301]. Eating this bud leads to the eventual death of the plant since it is unable to produce side shoots[K]. The sap is extracted from the stem. Rich in sugars, it can be made into a refreshing beverage, fermented to make palm wine (toddy) or vinegar, or the sugars can be extracted[301 , 317 , 335]. The tip of the trunk is cut and excavated so that a bowl-shaped depression is made where sap accumu-

lates. The sap is then collected and slightly fermented into a refreshing drink[398]. Destructive harvesting is sometimes employed, where the cut is renewed twice every day for 3 - 4 weeks until the tree is exhausted and dies[303]. Chemical composition: Protein (crude) = 2.8% (dry). Fat = 0.5% (dry). Ash (insoluble) = 3.5% (dry). Fibre (crude) = 16.8% (dry). Amino acids (g (16g N)-1): Aspartic acid = 9.3g. Threonine = 3.6g. Serine = 3.9g. Glutamic acid = 8.9g. Proline = 5.0g. Glycine = 5.0g. Alanine = 5.0g. Valine = 5.0g. Cysteine = 0.1g. Methionine = 1.2g. Isoleucine = 3.6g. Leucine = 6.1g. Tyrosine = 2.8g. Phenylalanine = 3.6g. Lysine = 3.9g. Histidine = 2.1g. Arginine = 2.4g. Minerals: Sulphur = 0.04% (dry). Potassium = 0.09% (dry). Magnesium = 0.10% (dry). Calcium = 0.08% (dry). Na = 0.01% (dry). Zinc = 4 mg/kg (dry). Iron = 488 mg/kg (dry). Manganese = 8 mg/kg (dry). Copper = 2 mg/kg (dry).

taanta Basketry Broom Charcoal Fencing Fibre Filter Fire retardant Fuel Furniture Oil Potash String Thatching WoodOther uses rating: Medium (3/5). Agroforestry Uses: The tree is used to form an excellent firebreak, especially in the arid regions of West Africa, which are prone to wildfires[418]. Other Uses The leaves are used for various purposes including for shelter, thatch, making mats and baskets[314 , 398 , 774]. Young leaves, before unfolding, can be split into strips and woven into thin mats, baskets and other household objects[303]. Mature leaves are used for thatch[303]. A fibre obtained from the leaves is used for making nets[774]. The leaf petioles are used for making furniture, baskets, fences etc[774]. The fibre extracted from the base of the leaf stalk has valuable qualities of resistance to chemicals, termites and water[303]. The leafstalk endings can be soaked in water to provide fibres that are used as sponges or filters[303]. The leaf midribs are used to make brooms, fish traps and nets[303]. An oil is extracted from the fruit[418]. Ashes from the male flowers make a good potash[774]. The dark brown, coarsely fibrous wood is a highly prized timber locally. It is very solid, hard, heavy, very resistant to termites and fungi. It is difficult to saw, plane or sand; splits when nailed. Only the outer part of the stem, between the base and the first swelling, is suitable for use. This layer, which can be 7 - 10cm thick on male trees, but only 4 - 5cm on female trees, is used in carpentry, construction, for telegraph poles, piers, and also for household articles[325 , 774]. The wood is used for fuel and to make charcoal[303 , 418].

dwatta Anthelmintic Antiasthmatic Aphrodisiac Mouth-washThe roots serve for the treatment of stomach parasites, bronchitis, sore throats and asthma, as well as being used for a mouthwash[325]. The leaves are said to be an aphrodisiac[325]. The sap is reported to have many uses[325].

nrakta Tropical Africa - semi-arid and sub-humid zones of Senegal to Somalia, south to S. Africa. ksacta Riverine flats and coastal plains; open secondary forest; dense forest borders; savannah in drier areas where it is restricted to grassland with high ground water table, or along water courses, often forming dense stands in temporary flooded areas[325].

propta Seed - it has a short viability and should be sown as soon as it is removed from the fruit pulp[325]. The seed does not require pre-treatment and germinates in about 4 weeks. The plant produces a very long taproot, which can be 1 metre long when top growth is only 1cm tall, and so it is best sown in situ[325].

nwatta Management: Standard Other Systems: Parkland Regional Crop Staple Crop: Oil Staple Crop: SugarA plant of hot, tropical climates with low to medium rainfall, usually at elevations below 400 metres, but up to 1,200 metres in east Africa[335]. It grows best in areas where annual daytime temperatures are within the range 20 - 35c, but can tolerate 15 - 45c[418]. It prefers a mean annual rainfall in the range 500 - 1,000mm, but tolerates 400 - 1,200mm[418]. Requires a well drained soil and a position in full sun[314]. It is usually found in sandy, well-drained soils, but prefers alluvial soils near watercourses[418]. Plants are able to extract nutrients, and thus grow, on very nutrient-poor soils[325]. Prefers a pH in the range 5.5 - 7, tolerating 5 - 7.5[418]. Established plants are drought tolerant[314]. A slow-growing but long lived tree to over 100 years old[325]. Three phases of growth are recognized. The first phase, taking around 6 - 8 years, involves leaf development, in which about 20 leaves grow in a wide crown around 3 metres by 3 metres. Very

little upward growth takes place at this time. The second phase involves rapid growth of the trunk above the ground and takes place around the ages of 8 - 20 years. The bark of the tree is still rough at this stage and have many leaf stalks. The third phase, from about 20 years onwards, involves flowering and shedding of leafstalks. The trunk becomes smooth and swellings appear on it[303]. The plant usually flowers and produces fruit all year round[303]. The flowering stems are tapped for their sap, a process that starts when the tree is about 30 years old and can continue for another 30 years if managed carefully. Yields of 2 litres of sap per day can be achieved[774]. Plants are very tolerant of forest fires[418]. A dioecious species, both male and female forms need to be grown if fruit and seed are required. A female palm can produce 20-50 fruits per flower stalk. Green to orange round fruit 15 cm across. Each fruit contain 3 hard coated seeds weighing 100g each. The individual fruit is about 1 kg.

5.2.7 Manilkara discolor

Red milkwood, Silvery milkwood
10 thin 12 cyuc 4 kcaak 2 tcan 0 dwat 20 m hkuc
hmmihtut cyutli kyuctup hwicli hrasjlutnyik hpa7tli flat-prikliwis hpa7tmwatli hjonli

drutta Manilkara discolor is an evergreen Tree growing to 20 m (65ft) by 20 m (65ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Bees. 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 dry or moist soil.

kcaakta Edible Parts: FruitEdible Uses: Fruit - raw[398]. The juicy, fleshy pulp is very tasty[398]. Eaten as a snack, especially by children and travellers, the seeds are discarded[398]. The yellow to red, fleshy, oval berries are up to 13mm in diameter, enclosing an oval flattened pale-coloured seed[398].

tcanta Fuel Latex WoodAgroforestry Uses: The tree is good for shade[398]. Other Uses The plant exudes a white latex[398]. The wood is hard[398]. It is used for poles, tool handles, carvings and spoons[398]. The wood is used for fuel[398].

nrakta East tropical Africa - Kenya, Tanzania, Malawi, Mozambique, Zimbabwe, S. Africa. ksacta Lowland and upland dry evergreen forest and well-drained sites in upland rainforest, at elevations from sea level to 2,100 metres[398].

propta Seed -

nwatta Prefers a well-drained soil[308].

5.2.8 Irvingia wombolu

Bitter bush-mango

10 thin 12 cyuc 4 kcaak 2 tcan 2 dwat 20 m hkuc
hmmihtut cyutli tcup hwicli hrasjlutnyik hpa7tli frusflatprikliwis hpa7tmwatli hjonli

drutta Irvingia wombolu is a TREE growing to 20 m (65ft) by 20 m (65ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

kcaakta Edible Parts: Fruit Oil SeedEdible Uses: OilThe seeds are used for making a mucilaginous sauce in cooking[405]. The seeds are 35 - 50 mm long, 17 - 26 mm wide, 8 - 10 mm thick; with an endosperm that is almost non-existent[405]. The kernels from the fruit are an important ingredient in cooking and are generally preferred over those of other Irvingia spp. They are processed by grinding and crushing, and are then used to thicken soups and stews. The kernels are also made into a cake called 'dika bread' or 'odika bread' for year-round preservation and easy use[299]. The preparation of 'dika bread' consists of drying, roasting and grinding the kernels. The paste obtained is put in a container or 'cake tin' and left to cool for a few hours. Once solid, the cake is removed from the container and is ready for use. If well dried, it can be stored for more than a year. Sometimes

women place a tin below the grid on which the dika cake is stored, to collect the oil that drips from it[299]. An edible oil is extracted from the seed and used in cooking. As it is solid at ambient temperatures it has been used as a substitute for cocoa butter[299]. The oil is extracted by boiling the ground kernels and then scooping off the oil from the top of the water[299]. The pulp of the fruit is very bitter and slimy, but it is occasionally added to soups as thickener[299]. The yellow pulp is soft, juicy and very bitter, with fairly numerous fibres[299]. The bright yellow then black fruit is an ellipsoid drupe, slightly laterally compressed, 45 - 80mm long and 45 - 50mm wide[299]. The nutritive value of the kernels per 100g edible portion is: water 4 g, energy 2918 kJ (697 kcal), protein 8.5 g, fat 67 g, carbohydrate 1.5 g, Ca 120 mg, Fe 3.4 mg, thiamin 0.22 mg, riboflavin 0.08 mg, niacin 0.5 mg (Platt, 1962). Drawability (sliminess) and viscosity of soups imparted by the kernels varies between kernels from different trees. The kernels of Irvingia wombolu are considered better than those of other Irvingia spp. Fat content of kernels also varies between trees and is about 37.5 - 75 g/100 g; the approximate fatty acid composition is: lauric acid 20 - 59%, myristic acid 33 - 70%, palmitic acid 2%, stearic acid 1% and oleic acid 1 - 11%. The residue obtained after separation from the fat is suitable for processing in the food industry[299].

tcanta Fuel Oil Soap making WoodAgroforestry Uses: The tree is commonly preserved when clearing land for agriculture so that, as well as being harvested for its seeds, it can provide shade for various crops, especially cocoa and coffee but also for annual crops[299]. The tree has a high agroforestry potential. In its native range it is found cultivated with other crops in farm systems[303]. Other Uses: An oil is extracted from the seed. Solid at ambient temperatures, it has been used for soap-making[299]. The heartwood is pale greenish brown or orange-yellow fading to greyish brown; the sapwood is lighter, but not always clearly differentiated. The grain is straight or interlocked, texture fine to medium. The wood is fairly heavy, it is durable and fairly resistant to termites, but susceptible to powder-post beetles and marine borers. The timber is moderately difficult to saw or plane and tools should be kept sharp; it dresses to a smooth finish and glues well, though nailing is difficult[299]. The wood, called 'andok' in Cameroon, is used locally for heavy construction work and for making ships' decks, paving blocks and planking. Young trees are used for making poles and stakes, while branches are made into walking sticks or thatched roof supports[299]. Dead branches are used as firewood[299].

dwatta Antidiarrhoeal Antidote Febrifuge Odontalgic SkinThe medicinal uses of the various Irvingia species are many, but can hardly be assigned to an individual species[299]. The bark is used in the treatment of diarrhoea[299]. Preparations mainly from the bark are used to treat hernia and yellow fever, and also as an antidote for poisoning[299]. Preparations from the bark are rubbed on to the body in order to relieve pains; they are applied to sores and wounds and are also used against toothache[299]. A leaf extract is used as a febrifuge[299]. The kernels are used to treat diabetes[299].

nrakta Tropical Africa - Senegal to southern Sudan, south to Angola, DR Congo and Uganda. ksacta Evergreen lowland forest, mostly seasonally flooded, and on damp soil, beside streams; valley forest; also forest on dry land; in small patches of forest and gallery forest; at elevations around 900 - 1,170 metres[328].

propta Seed - it has a very short viability of around 1 month and so should be sown as soon as it is ripe[299].

nwatta A plant of the moist tropics, growing in areas where the mean annual rainfall exceeds 1,500mm[299]. The tree starts flowering when 6 - 10 years old. It does not have a clearly demarcated flowering season, but flowering peaks at the end of the rainy season or beginning of the dry season, while fruiting peaks at the end of the dry season[299]. The fruits are mostly gathered from the ground around the tree. The next step consists of extracting the kernel from the seed, which is split in halves with a cutlass, after which the kernel is removed with the help of a knife. The kernels are then dried in the sun or on bamboo drying racks over the fire-place in the kitchen[299]. Good yields of kernels have been estimated at 100 kilos per tree per year[299]. The tree is intolerant of fire[299].

flavonins in the bark and roots, some tannins, and traces of steroids and terpenes[332]. An alkaloid has been reported in the fruit-sap, a derivative of tryptophane and related to eseroline found in the Calabar bean, Physostigma venenosum and is mildly stimulatory[332].

nrakta West tropical Africa - Guinea to Ghana. ksacta Undergrowth in rain and secondary forest; at elevations up to 250 metres[328]. Most abundant in wet evergreen forest zone, especially on slopes and away from disturbed areas. Less common in semi-deciduous forest[299].

propta Seed - germination can take 24 - 30 months and germination rates are very low[299]. Keeping the fruits for a few months on damp sites (covered with banana leaves and buried partially) and scarification of the seedcoat improve germination rates only slightly[299]. Methods of propagation by cuttings and grafting are being developed[299].

nwatta Management: Standard New Crop Staple Crop: OilFound in the wild on strongly leached, acid soils with a pH in the range 3.8 - 4.1[299]. The tree has brittle branches and requires a position sheltered from strong winds[299]. The degree of maturity of fruits on the tree can not be estimated; therefore mature fruits are left to drop to the ground and are then collected[299]. The fat from the seeds of Allanblackia parviflora is very similar in composition to that of Allanblackia floribunda and Allanblackia stuhlmannii[299].

5.2.44 Cola acuminata

Cola Nut, Kola, Bissy Nut

10 thin 12 cyuc 3 kcaak 2 tcan 4 dwat 20 m hkuc
htut cyutli hgattcup hwicli hrasjlutnyikfripr hpa7tli flatprik hpa7tmwatli hjonli

drutta Cola acuminata is an evergreen Tree growing to 20 m (65ft) by 20 m (65ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10 and is frost tender. The flowers are pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay soil. Suitable pH: mildly acid and neutral soils. It cannot grow in the shade. It prefers moist soil and can tolerate drought.

pcista Parts of plant are poisonous if ingested

kcaakta Edible Parts: SeedEdible Uses: Coffee Colouring Condiment DrinkEdible portion: Seeds, Herb, Flavouring, Fruit, Leaves. The aromatic seed is rich in caffeine, containing 1.25 - 2.4% caffeine, and acts as a stimulant[238 , 301]. It can be chewed or ground into a powder and made into a drink in order to give energy, increase alertness, retard hunger and fatigue, aid digestion and increase stamina[301]. When the whole nuts are chewed, they taste bitter at first but they leave a sweet taste in the mouth later that affects other foods or drinks that are consumed[301]. Thus chewing cola nuts before drinking water helps to render the water sweeter[303]. The bitter tasting seeds are much appreciated by Muslims in the drier region of West Africa, especially during the month of Ramadan[303]. The nuts are used for non-alcoholic soft drinks like Coca-Cola[303]. An extract, prepared from the dried kernels, is used to flavour carbonated drinks, ice cream, candy, baked goods etc[301]. The kernels can be red, white or pink[301]. The red ones can be used as a natural food colorant[301].

tcanta Filter Fuel Furniture WoodOther Uses: The seed is reputed to act as a water purifier[303]. The sapwood is pinkish-white and the heartwood dull yellow. It is suitable for furniture, house and boat building, coach-work, plates, domestic utensils, gun stocks, joinery and carvings[303]. The wood is a good source of fuel[303].

dwatta Antidepressant Antidiarrhoeal Antihæmorrhoidal Astringent Digestive Diuretic Dysentery Stimulant TonicCola nuts contain up to 2.5% caffeine, plus theobromine, tannins, phlobaphene and an anthocyanin[254]. They stimulate the nervous system when chewed and are also considered to be a digestive tonic, diuretic, astringent and antidepressant[254 , 303 , 307]. They counteract overstrain and depression thus improving the physical and mental state. The principle action is that of caffeine. Other active principles include theobromine and kolatine[303]. Because of its astringent properties, cola is used as a non-addictive stimulant in the treatment of diarrhoea and dysentery[254 , 303], and also to prevent vomiting in cases of high fever[303]. It has also been used in the treatment of headaches

and migraine[254]. It has been used in combination with coca leaf (Erythroxyllum coca) to produce a stimulant drug that has been used as 'Forced March' tablets by explorers and military expeditions[303]. The crushed nuts are boiled together with the leaves of Morinda lucida and the liquid taken internally to cure piles[303]. The nuts ground to a fine paste together with the leaves of Scoparia dulce, are dissolved in a little water and a few drops are administered orally to babies for headache[303]. The seeds are harvested when fully ripe and dried in the sun[254]. An infusion of the bark mixed with ginger and a little pepper is taken internally to cure stomach ulcers[303].

nrakta Southern, western and central tropical Africa. ksacta An understory tree in humid lowland forests[303 , 307].

propta Seed - sow individually in containers[200]. The seedlings are sometimes raised in pots or in polythene bags before planting out[303]. Ripe fruits harvested before the follicles split open, the seeds or nuts are extracted from the follicles and the white aril removed after 5 days of fermentation. Nuts for planting are the mature ones that have undergone after-ripening[303]. Cuttings of mature wood[200]. Aerial layering.

nwatta Cola needs a hot humid climate, with a mean annual temperature in the range of 26° - 35°C, and a mean annual rainfall of 1,200 - 1,800mm[303]. However, it can withstand a dry season on sites with a high groundwater level and it may be cultivated in drier areas where groundwater is available[303]. Though it is a lowland forest tree it has also been found at altitudes over 300 metres on deep rich soils under heavy and evenly distributed rainfall[303]. Prefers a minimum temperature no lower than 13°C[238]. Prefers deep, rich, well-drained soil[303 , 307], although it may also be found in marshy areas[303]. Does well in both light and heavy soils[303]. Intolerant of soils with a high pH[335]. Cola grows naturally in the shade, but it develops a better spreading crown which yields more fruits when grown in open places[303]. Trees start producing at around the age of 12 - 15 years and can produce 10 - 16 kilos of seed annually for more than 80 years[238]. Trees commence flowering and fruiting when they are small[307]. Yields of 300 nuts per mature tree are considered good[303]. Plants are often used as shade trees for cocoa (Theobroma cacao) plantations[238]. Muslims consider the cola nut as sacred and brought by the prophet Mohammed. They use the nut for ceremonial and social occasions[303].

5.2.45 Musanga cecropioides

Corkwood

10 thin 12 cyuc 3 kcaak 4 tcan 4 dwat 20 m hkuc
htut cyutli tcup hwicli hrasjlutnyik hpa7tli frusflatprik hpa7tmwatli dyat hjonli

drutta Musanga cecropioides is an evergreen Tree growing to 20 m (65ft) by 5 m (16ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Birds. The plant is not 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 and neutral soils and can grow in very acid soils. It cannot grow in the shade. It prefers moist soil.

kcaakta Edible Parts: Fruit Inner bark SapEdible Uses: Drink SaltThe aerial stilt-roots, and also the younger branches, are noted for their capacity of yielding a large amount of potable sap. 'Half a bucketful' is said to be obtainable from a single tree overnight[332]. The sap is colourless, odourless and of an insipid sweetish taste[332]. This source of drinking water is of great importance in some areas of the tree's range, where whole villages can depend upon it in dry seasons. Hunters and others break off stems to draw an impromptu drink, and even monkeys have learnt to do this. A renewed flow can be obtained by re-cutting the cut surface and beating the severed limb[332]. Fruit[332]. A succulent flesh with embedded small seeds[332]. Although edible, the fruit does not seem to be much relished by local people[332]. The yellowish-green fruit is 10 - 13 cm long by 5 - 6 cm wide[332]. Bark-scrapings are added to fermenting sugar-cane sap to increase the potency[332]. Wood-ash from freshly felled trees provides a vegetable salt for use in cooking[332].

that can be used without transformation to improve the consistency of margarines, cocoa butter substitutes and similar products[299]. Fruits are stored under a cover of leaves to allow the fruit pulp to disintegrate. To extract the seeds, fruits are crushed between the hands and seeds are rubbed clean. To extract the fat, seeds are dried and crushed; the resulting mass is mixed with water and boiled until the fat separates and floats to the surface, from where it is scooped off[299]. More modern hydraulic and screw press equipment is now also used[299]. The seeds are eaten in times of food scarcity[299]. The fruit's slimy pulp can be made into jams and jellies[299]. The fruit is large, up to 30cm long by 10cm in diameter with upward of 100 seeds borne within in a translucent mucilage[332].

tcanta Lighting Oil Resin Soap WoodAgroforestry Uses: Trees are left on the farms when clearing the land for cultivation and managed especially for shading cocoa[299]. Other Uses: An oil obtained from the seeds is used for soap making and in the cosmetics industry[303]. Small twigs are used as chew-sticks or toothpicks[299]. Twigs have been used as candlesticks[299]. A sticky, yellow resin is obtained from the inner bark[332]. The heartwood is pale red or brown; it is usually fairly distinctly demarcated from the thick, pinkish beige sapwood. The grain is fairly straight, texture medium to coarse; the lustre is low. The wood is fairly hard, fairly durable, and moderately resistant to termites[299]. It is resistant to marine borers[303]. When dry it saws well, but green wood may spring on conversion. It is fairly easy to work with hand and machine tools[299]. It is used locally, but is of secondary importance. In Nigeria, it is used in construction of local houses[299].

dwatta Anodyne Antiasthmatic Antiarrhoeal Dysentery MouthwashA decoction of the inner bark is taken to treat diarrhoea, dysentery and stomach aches[299 , 303]. A decoction of the inner bark is used as a mouthwash to relieve the pain of toothache[299 , 303]. The bark is anodyne. A decoction of the bark or leaves is taken to treat asthma, bronchitis and cough[299]. The bark is pounded and rubbed on the body to relieve painful conditions[332]. Sap squeezed from the bark is a component of a medicine used to treat urethral discharge[299]. Sap expressed from a crushed up mixture of the bark, combined with that of *Mammea africana*, *maleguetta* and sugar-cane, is taken as a remedy for urethral discharge[332]. A decoction of the whole fruit is used to relieve elephantiasis of the scrotum, though this may simply be based on the Theory of Signatures because of the size and shape of the fruit[332]. A prenylated xanthone, named allanxanthone A, has been isolated from the bark, as well as 1,5-dihydroxyxanthone and 1,5,6-trihydroxy-3, 7-dimethoxyxanthone. The compounds isolated showed moderate in-vitro cytotoxicity against the KB cancer cell line[299]. Plant material from the Congo has been reported to contain abundant flavonins in the bark and roots, some tannins, and traces of steroids and terpenes[332].

nrakta Tropical Africa - moister regions from Togo to eastern DR Congo, south to the Congo. ksacta A common understory tree of lowland closed evergreen rainforest and riverine forest, and also in secondary and swamp forest, at elevations up to 1,000 metres. It is common on strongly leached, acid soils with pH 3.8 - 4.1[299].

propta Seed - germination takes 6 - 18 months and germination rates are very low[299]. Keeping the fruits for a few months on damp sites (covered with banana leaves and buried partially) and scarification of the seedcoat improve germination rates only slightly[299]. Methods of propagation by cuttings and grafting are being developed[299].

nwatta Management: Standard New Crop Staple Crop: OilA plant of the moist tropics where it can be found at elevations up to 1,500 metres[303]. It grows best in areas where the maximum mean annual temperature ranges from 24 - 33c, whilst the minimum can fall below 10c. It prefers a mean annual rainfall in the range 1,200 - 2,400mm[299]. Grows best in a sunny position[303]. Prefers well-drained soils especially lithosols[299]. Common in the wild on strongly leached, acid soils with pH 3.8 - 4.1[299]. Under natural conditions, trees start flowering after about 12 years, with the flowering occurring during a large part of the year. Fruits take nearly a year to mature and ripe fruits are also found during a large part of the year[299]. The degree of maturity of fruits on the tree can not be estimated, so mature fruits are left to drop to the ground and are then collected[299]. The fat from the seeds of *Allanblackia* floribunda is very similar in composition to that of *Allanblackia parviflora* and *Allanblackia stuhlmannii*[299]. A dioecious species, both male and female forms need to be grown if fruit and seed are required[299].

5.2.43 Allanblackia parviflora

Vegetable tallow tree, Quotera

10 tin 12 cyuc 3 kcak 2 tcan 2 dwat 20 m hkuc hmimhtut cyutli tcup hwicli hrasljutnyik hpa7tli frusflatprik hpa7tmwatali dyat hjonli

drutta *Allanblackia parviflora* is an evergreen Tree growing to 20 m (65ft) by 15 m (49ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

kcakta Edible Parts: Fruit Oil SeedEdible Uses: OilThe fat obtained from the seed, known as 'allanblackia fat' or 'beurre de bouandjo' in Congo, is used in food preparation[299]. Recently, the international food industry has become interested in the fat as a natural solid component for margarines and similar products[299]. The seeds contain a fat that is solid at ambient temperatures. The kernel, which makes up about 60% of the seed, contains about 72% fat. The fatty acid composition of the fat is approximately: stearic acid 45 - 58% and oleic acid 40 - 51%. Only traces of other fatty acids are present. Its composition and relatively high melting point (35°C) makes the fat a valuable raw material that can be used without transformation to improve the consistency of margarines, cocoa butter substitutes and similar products[299]. Fruits are stored under a cover of leaves to allow the fruit pulp to disintegrate. To extract the seeds, fruits are crushed between the hands and seeds are rubbed clean. To extract the fat, seeds are dried and crushed; the resulting mass is mixed with water and boiled until the fat separates and floats to the surface, from where it is scooped off[299]. More modern hydraulic and screw press equipment is now also used[299]. The seeds are eaten in times of food scarcity[299 , 332]. The fruit's slimy pulp can be made into jams and jellies[299]. The fruit is large, up to 30cm long by 10cm in diameter with upward of 100 seeds borne within in a translucent mucilage[332].

tcanta OilAn oil obtained from the seeds is used for soap making and in the cosmetics industry[303]. The twigs are used as candlesticks[332]. Smaller twigs are used as chew-sticks and tooth-picks[332]. The inner bark contains a sticky yellow resin[332]. The heartwood is pale red or brown; it is clearly demarcated from the whitish sapwood. The wood is fairly hard, resinous, moderately heavy. It is said to be resistant to termites but is not particularly durable. It is fairly easy to work and finishes well but it is of little commercial importance though it has appeared on the market in Liberia as 'lacewood'. It has an attractive figure when quarter-sawn, and is suitable for carpentry[332]. The wood is used in hut-building for making walls, doors and window-frames and planks. Small trees are cut for poles and find use as mine pit-props and bridge-piles[332].

dwatta DysenteryA decoction of the inner bark is taken to treat diarrhoea, dysentery and stomach aches[299 , 303]. A decoction of the inner bark is used as a mouthwash to relieve the pain of toothache[299 , 303]. The bark is anodyne. A decoction of the bark or leaves is taken to treat asthma, bronchitis and cough[299]. The bark is pounded and rubbed on the body to relieve painful conditions[332]. Sap squeezed from the bark is a component of a medicine used to treat urethral discharge[299]. Sap expressed from a crushed up mixture of the bark, combined with that of *Mammea africana*, *maleguetta* and sugar-cane, is taken as a remedy for urethral discharge[332]. A decoction of the whole fruit is used to relieve elephantiasis of the scrotum, though this may simply be based on the Theory of Signatures because of the size and shape of the fruit[332]. A prenylated xanthone, named allanxanthone A, has been isolated from the bark, as well as 1,5-dihydroxyxanthone and 1,5,6-trihydroxy-3, 7-dimethoxyxanthone. The compounds isolated showed moderate in-vitro cytotoxicity against the KB cancer cell line[299]. Plant material from the Congo (this would be of *A. floribunda*[K]) has been reported to contain abundant

5.2.9 Telfairia pedata

Oysternut

10 tin 12 cyuc 4 kcak 2 tcan 2 dwat 20 m hkuc hmimhtut cyutli hgattcup hwicli hrasljutnyik hpa7tli frusflatprik hpa7tmwatali dyat hjonli

drutta *Telfairia pedata* is an evergreen Climber growing to 20 m (65ft) by 1 m (3ft 3in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Insects. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought.

kcakta Edible Parts: Oil SeedEdible Uses: OilSeed - raw or cooked[299]. A soft but firm texture with an excellent flavour[63]. The seed can be used to replace almonds or brazil nuts in confectionery and are also used in a variety of food dishes by local people[63]. The seed is usually roasted[300]. The seed contains about 30% protein[300] and has a high oil content[63]. It is irregularly circular in shape, about 4cm in diameter and 12mm thick[63]. It is easily extracted from its shell[63]. Seeds can be stored in their shells for several years in good condition[63]. To remove the bitter principle, whole seeds can be soaked for 8 hours in 3 changes of water. To remove the kernel from the shell, the fibrous husk is first partly cut away, then the shell is cracked and opened using a knife[299]. An oil extracted from the seed has a pleasant, slightly sweet flavour[63]. It makes a good cooking oil[298]. The seed contains up to 61% oil[303]. It is important to remove the husk of the seed before extracting the oil since it contains an intensely bitter substance that could contaminate the oil[63 , 299].

tcanta Cosmetic Lighting Oil Polish Soap makingAgroforestry Uses: Oysternut is part of the rich agroforestry systems of Mount Meru and Mount Kilimanjaro in Tanzania, where it is grown in combination with coffee and banana[299]. Other Uses The oil extracted from the seed can be used to make soap, candles and cosmetics[46 , 63 , 299]. The fibrous husk of the seed is sometimes used for polishing native earthenware pots[63].

dwatta Antirheumatic Galactagogue StomachicThe seeds are said to have valuable galactagogue properties and are in great demand amongst native mothers who consume them shortly after the birth of a child as a tonic in order to regain their strength and also to improve the flow of milk[63 , 299]. The oil obtained from the seed is used as medicine for stomach troubles and rheumatism[299].

nrakta Tropical Africa - Tanzania, northern Mozambique. ksacta Coastal rain and riverine forest from sea level to 1,100 metres[308].

propta Seed - it has a short viability and is best sown as soon as ripe. Repeated soaking and drying promotes germination[299]. The seed can be sown in situ or in containers[300]. The drip line of trees is a favoured site for planting in situ[299]. When grown in containers, sow 2 - 3 seeds in each container thinning to the strongest plant once they germinate. The seed usually germinates in 7 - 14 days[303]. Seedlings grow away quickly and are ready for planting out about 30 days after germinating[300]. Layering. Very easy[63]. Cuttings. Stemcuttings root in 2 - 3 weeks, and produce shoots 6 - 7 weeks after planting[299].

nwatta Management: Standard Other Systems: Multistrata Regional Crop Staple Crop: Protein-oilOysternut grows best in lowland, humid tropical areas at elevations up to 1,000 metres[300]. It can be cultivated at elevations up to 1,800 metres, though yields start to fall the more the elevation increases above 1,000 metres. It grows best in areas where annual daytime temperatures are within the range 23 - 28°C, but can tolerate 14 - 38°C[418]. It prefers a mean annual rainfall in the range 1,500 - 2,000mm, but tolerates 1,200 - 2,500mm[418]. Succeeds in full sun and in light shade[418]. Tolerant of a wide range of well-drained soils[298 , 300], though a humus-rich, fertile soil gives the best yields[300]. Prefers a pH in the range 5.5 - 6, tolerating 5 - 7[418]. Plants produce a deep taproot and, once established, are very drought resistant[63 , 298 , 300]. Plants are often trained to grow into trees[300]. They greatly dislike exposure to strong or cold winds[63]. This species has high weed potential[298]. Young plants grow very quickly, producing stems up to 7 metres long in 6 months and 15 metres

long in 18 months[299]. Flowering normally commences 15 - 18 months after planting out the young plants[303]. Female and male plants cannot be distinguished until they flower[299]. The fruit takes 5 - 6 months to ripen from flowering[303]. When fruits ripen they split open gradually. To attain full flavour, the seeds should be allowed to ripen in the fruit and be collected 7 - 10 days after the fruit begins to split[299]. The plant produces up to 30 gourds in its third year and can continue production for another 20 years[299 , 303]. Under good conditions, two harvests per year are possible, and flowers and fruits can be present at the same time[299]. Annual seed yields of 3 - 7 tonnes per hectare have been achieved[63 , 299]. The fruits burst when ripe, scattering the seeds[63]. Care must be taken when growing these plants to choose sufficiently large trees for them to grow into, since their weight, especially when bearing a crop of fruits, can be enormous[63]. A dioecious plant, both male and female forms must be grown if seed is required[63]. Generally 12 - 15 males per hectare are sufficient to fertilise a plantation of females[63]. There are reports that female plants can produce fruit and seed in the absence of a male plant by a process called apomixis[299].

5.2.10 Plukenetia conophora

Conophor. Nigerian walnut. Awusa nut, 10 tin 12 cyuc 4 kcak 3 tcan 2 dwat 18 m hkuc hmimhtut cyutli tcup hwicli hrasljutnyik hpa7tli flatprikliwis hpa7tmwatali hjonli

drutta *Plukenetia conophora* is an evergreen Perennial Climber growing to 18 m (59ft) by 0.4 m (1ft 4in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

kcakta Edible Parts: Fruit Leaves Oil SeedEdible Uses: OilEdible Portion: Nuts, Leaves, Fruit, Nuts - oil, Seeds, Vegetable. Seed - raw or cooked. The tasty seed has a pleasant odour, it is usually eaten boiled or roasted, and is often served with corn on the cob[63 , 301]. The seed can be ground into a powder and used with flour in making cakes[332]. Eaten raw they have a bitter flavour not unlike the kola nut and are considered to be tonic[332]. The seed is thin-shelled and about 25mm long[63]. The seed yields 48 - 60% of a light golden coloured oil with a flavour resembling linseed oil[332]. The oil comprises linolenic acid 64%; palmitic and stearic acids 15%; oleic acid 11 % and linoleic acid 10%[332]. Fruit - eaten with rice[301]. Leaves and young shoots - eaten with rice[301]. Carbon Farming Solutions - Staple Crop: protein-oil (The term staple crop typically refers to a food that is eaten routinely and accounts for a dominant part of people's diets in a particular region of the world) [1-1].

tcanta Oil Paint VarnishThe seed yields 48 - 60% of a drying oil[46 , 332]. The oil dries more quickly than linseed oil[46]. Known as awusa oil in the paint and varnish trade, it is usable in the paint industry provided there is a certain supply and the kernels are free from excessive free fatty acids[332]. It is unsuitable for soap-manufacture[332]. The fresh oil has an iodine value of 190, which is excellent for a drying oil, but the seeds do not store well and deterioration caused by enzymatic action needs to be prevented at the time of collection by heat-treatment[332].

dwatta Aphrodisiac TonicThe leaves are considered a headache cure[332]. The raw seed is aphrodisiac and tonic[332]. The oil obtained from the seeds has medicinal use in massages[332].

nrakta Origin: Africa. Western and central tropical Africa - Togo to the Congo. ksacta A tropical plant. Rain-forest hedge in half-shady places; low bush; secondary forest; plantations at elevations from 250 - 1,400 metres[328].

propta Plants are grown from seed. It can be grown from stem cuttings.

nwatta Management: Standard Regional Crop Staple Crop: Protein-oilClimate: tropical. Humidity: humid. Cultivated in the hot and humid zones of tropical Africa around gardens and backyards, mainly for subsistence consumption. Grows on moist, deep, fertile, well-drained loam soils and in silt clay loam soils. Nut production is seasonal. The kernels

can yield 50-60% oil. Carbon Farming Solutions - Cultivation: regional crop only. Management: standard (Describes the non-destructive management systems that are used in cultivation) [1-1].

5.2.11 Telfairia occidentalis

Fluted Gourd

10 thin 12 clyc 4 ckak 2 tcan 2 dwat 15 m hkuc pcmhmmihtuc cyutli hqattcup hwicli hrasjlutnyik hpa7tli frusflatprik hpa7tmwatli dyat hjonli

drutta Telfairia occidentalis is an evergreen Climber growing to 15 m (49ft) by 1 m (3ft 3in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Bees, Insects. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It can grow in full shade (deep woodland) semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought.

ckaakta Edible Parts: Fruit Leaves Oil Seed ShootsEdible Uses: Condiment OilSeed - cooked[46]. A pleasant almond-like flavour[301]. It can be boiled and eaten as a nut, or ground into a flour for use in soups[300]. Immature seeds are cooked or roasted; they can also be fermented for several days and eaten as a slurry[299]. Mature seeds are not consumed directly because they have a high content of anti-nutrients[299]. The raw flour shows better water and fat absorption properties than the oil, hence its useful application in baking products[299]. The seed contains up to 30% protein and a high content of a non-drying oil[300]. The large seeds are up to 5cm in diameter and are contained in a fruit that can weigh up to 50kg[298]. The seeds have a very high oil content and are used to make a cooking oil[298]. The main constituents of the oil are oleic acid (37%), stearic and palmitic acid (both 21%), linoleic acid (15%). Variation between samples, however, is large[299]. Leaves and young shoots - cooked as a potherb[46]. The leaves are used alone or together with okra (Abelmoschus caillei) and Abelmoschus esculentus), dikka nut (Irvingia gabonensis), or egusi seeds (Citrullus lanatus and other species). They can also be mixed with eru (Gnetum africanum) and Pterocarpus soyauxii[299]. The young shoots, up to 50cm long, are used in stews and as a side dish[298]. The fruit pulp, including the young seeds, is occasionally made into marmalade[299].

tcanta Fibre Oil Paint VarnishAgroforestry Uses: Fluted pumpkin is often grown as a crop in homesteads, where it is intercropped with other vegetables and food crops such as cassava, yams and maize, or is planted against fences[299]. Other Uses The oil from the seeds is reported to be non-drying, and also to be used as drying oil for paints and varnishes[299]. The stems are macerated to produce fibres that are used as a sponge[299].

dwatta TonicPregnant women, and patients suffering from anaemia, use the leaf juice as a tonic to strengthen the blood[299].

nrakta West tropical Africa - Benin to Cameroon. ksacta Lowland rainforest and riversides[200]. Rain-forest; secondary forest; forest edges; possibly often as a relic of former cultivation; at elevations up to 1,200 metres[299 , 328].

propta Seed - can be sown in situ or in containers. When grown in containers, sow 2 - 3 seeds in each container thinning to the strongest plant once they germinate[300]. Seed size affects the vigour, germination rates and establishment of the seedlings. Viability varies from 63% for small seeds weighing less than 11g, up to 89% for seeds weighing 22g. Germination takes about 14 days in natural soil, but only 7 days in a sawdust medium. Vine length one week after emergence is on average 31cm for large seeds, whereas small size seeds grow into a corresponding vine length of 16cm. Plant out container-grown plants after about 30 days[300]. Some seeds exhibit polyembryony, producing more than one seedling[299]. The seed is recalcitrant in nature. They often germinate whilst still in the fruit and have a short viability, thus seed storage is difficult[299]. The critical seed moisture content below which seeds cannot recover from desiccation is 40 - 60%[299]. Layering. Very easy[63].

nwatta Management: Standard Regional Crop Staple Crop: Protein-oilFluted pumpkin is a plant of the lowland,

humid tropics, where it is found at elevations up to 1,000 metres[303 , 418]. It grows best in areas where annual daytime temperatures are within the range 21 - 30°C, but can tolerate 19 - 38°C[418]. The plant can survive temperatures down to about 5°C[418]. It prefers a mean annual rainfall in the range 1,900 - 2,200mm, but tolerates 1,500 - 2,700mm[418]. Succeeds in shade or full sun[300]. Tolerant of a wide range of soils[298 , 300], though a humus-rich, moist, fertile soil gives best yields[300]. Prefers a pH in the range 5 - 6, tolerating 4.5 - 7[418]. Established plants are drought resistant, though yields are greatly reduced in times of drought[298 , 300]. Fluted pumpkin grows fast in the warm, humid tropics, producing edible leaves in the rainy season and at the beginning of the dry season, for a period of 6 - 10 months[299]. The plant can be managed as a short-term perennial when grown on well-drained soils, slightly shaded and well mulched. On soggy soils and in sunlit spots it can only be grown as an annual. Female plants are usually grown for their edible young shoots since males do not produce many of these[300]. The first harvest of these shoots occurs about 2 - 3 months after sowing the seed[300]. Up to 15 harvests may be obtained during the following 120 - 160 days[418]. Male plants start to flower about 3 months after planting, a month earlier than female plants[299]. Hand pollination seems to be advantageous for fruit set as it resulted in 35% fruit set compared to 15% fruit set in open pollination[299]. Female plants produce about 18 single flowers which set fruit, but only 1 - 4 develop into mature fruits. Out of the female plants of a population, only 35% bear fruits. A large variation occurs between and within plants in the number of seeds per fruit, from 6 seeds per fruit up to 196, with an average of 62 seeds. The seeds are also unequal in size, varying in weight from 1 - 68g[299]. Fruits are ready about 5 - 6 months after sowing[299 , 300]. The fresh shoot yield can be as low as 500 - 1,000 kilos per hectare, but it can also reach 3 - 10 tonnes. In home gardens in Benin, one plant occupying 3 metres of fence produced 2 kilos of young leaves per metre in the rainy season and 500g in the dry season without irrigation[299]. The seed yield can reach 1.9 tonnes per hectare, derived from 3,000 fruits[299]. A dioecious species, both male and female forms need to be grown if fruit and seed are required[299]. Identifying the female plants from either seeds or young seedlings has not been successful, but vine size 64 days after planting could be used as a sex indicator, because female plants are more vigorous than the male ones[299].

5.2.12 Myrianthus arboreus

Giant yellow mulberry, Monkeyfruit

10 thin 12 clyc 4 ckak 2 tcan 3 dwat 15 m hkuc htut cyutli tcuphja7n hwicli hrasjlutnyik hpa7tli flatprikliw hpa7tmwatli dyat hjonli

drutta Myrianthus arboreus is an evergreen Tree growing to 15 m (49ft) by 10 m (32ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist or wet soil.

ckaakta Edible Parts: Fruit Leaves Oil SeedEdible Uses: OilYoung leaves - cooked[332]. They are commonly eaten in a vegetable-soup - the soup being so highly considered by the local people as to evoke the saying that 'one will kill his child for the sake of his/her soup'[332]. Fruit - raw[332 , 398]. The fruit contains 5 - 15 seeds, each surrounded by a sweet or acidulous pulp which is generally well-liked and commonly eaten[301 , 332 , 398]. The fruit is heart-shaped and may attain 10 - 15 cm in diameter, it is very hard and green when unripe, but turns yellow and soft when mature[332]. Seed - cooked[332]. The seed contains about 45% oil, of which linoleic comprises about 93% of the whole[332]. The kernel is about 10mm long by 5 - 7mm wide, it is enclosed in a woody pericarp amounting to 60 - 65% in weight of the whole[332]. The seed also contains about 19% sugars and 30% proteins[332]. The protein is unusually rich in cystine, which is of potential value to a population suffering from a chronic deficiency of sulphur-bearing amino acids[332].

tcanta Fencing Fuel Mulch Oil Parasiticide Repellent Soap making Soil conditioner Teeth WoodAgroforestry Uses: The leaves are enormous, to 70 cm across, digitately com-

oped. Initial tests with wildlings have shown good survival rates both with farmers and in experiments[299].

nwatta Management: Standard New Crop Staple Crop: OilA tree of the tropics, the average annual rainfall in its habitat is 1,100 - 2,400mm with more than 180 rainy days a year[299]. The mean annual temperature is 18°C, maximum temperatures range from 25°C to 35°C whilst minima are occasionally as low as 3°C[299]. Grows best in a sunny position[303]. Trees grow naturally on mostly acidic clay soils derived from granite, gneiss or siliceous rock[299]. Prefers well-drained soil[303]. Under natural conditions, trees first flower when about 12 years old. Flowering is during the short rainy season in November - February and the fruits take more than 1 year to develop and mature[299]. A mature tree may yield up to 150 fruits or up to 50 kg fat per year[299]. The trees are fire-tolerant[299]. The fat from the seeds of Allanblackia stuhlmannii is very similar in composition to that of Allanblackia parviflora and Allanblackia floribunda[299]. A dioecious species, both male and female forms must be grown if seed is required[299]. Female trees are often retained when clearing land for agriculture, but planting is still rare. It is estimated that 1 male tree per 10 female trees is needed to ensure adequate pollination[299]. ICRAF, Kenya, is studying possibilities to domesticate this species and develop appropriate management techniques. A complete seed marketing chain is also being developed[299]. The selection of high-yielding trees for vegetative reproduction has started in Tanzania[299].

5.2.41 Canarium schweinfurtii

African elemi

10 thin 12 clyc 3 ckak 3 tcan 3 dwat 30 m hkuc htut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprikliw hpa7tmwatli hjonli

drutta Canarium schweinfurtii is an evergreen Tree growing to 25 m (98ft) by 30 m (98ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist soil.

ckaakta Edible Parts: Fruit Oil SeedEdible Uses: Condiment Gum OilThe slightly greenish outer pulp of the fruit is oily and edible[303]. It can be eaten raw or softened in warm water to improve palatability[303 , 398]. It tastes similar to olives and is very popular as a snack among herders and children[398]. Often used as a condiment[335]. The fruit is about 35mm long[335]. The pulp oil is about 71 % palmitic acid and 18 % oleic acid[303]. The seed-kernel is oily and edible. It is cooked, and is sometimes prepared into a vegetable-butter and eaten as a substitute for shea-butter[303]. The seeds contain several fatty acids including oleic (36 %), linoleic (28 %), palmitic (26 %), stearic (7 %)[303]. Carbon Farming - Staple Crop: oil.

tcanta Adhesive Beads Containers Essential Fuel Furniture Gum Incense Ink Insecticide Lighting Oil Resin Shelterbelt Waterproofing WoodThe bark exudes a heavy, sticky oleoresin that smells like turpentine and solidifies to a whitish resin. It is obtained by slashing the bark and allowing the colourless exudate to trickle to the ground where it solidifies into a sulphur-yellow opaque resin[303]. The resin is used as primitive illuminant and as incense and releases a lavender-like smell[303]. The resin burns readily and is used as a bush candle[303]. The flame is very smoky and soot is collected as carbon-black from the outside of pots held over it for use in tattooing and to make ink in Liberia[303]. The resin is also used to repair broken pottery, for caulking boats and as a gum for fastening arrowheads to shafts[303]. The resin contains 8-20 % of an essential oil, the main constituent of which is limonene. It is rich in phellandrenes, and contains also resins and a bitter principle[303]. The resin is used as a fumigant against mosquitoes[303]. The elemi is often left standing on cleared land to provide shade and has potential as a wind break. It has been planted for reforestation in Uganda[303]. The endocarp is used by children as spinning tops[308]. The seeds are strung into necklaces or attached to traditional instruments[303]. The bark of young trees is split off in Gabon to make boxes[303]. The wood is said to secrete oil and is used for canoe making[308]. The heart-

wood is pinkish when freshly cut but darkens to light brown mahogany colour; it is not clearly demarcated from the 5 - 15cm wide band of sapwood that is white with pinkish reflections. The texture is slightly coarse; the grain interlocked, thus causing a fine striped figure on quarter-sawn boards. The wood is light in weight; very soft; not very durable, being susceptible to fungi, dry wood borers and termites. It seasons slowly but fairly well, though there is a risk of distortion and checking; once dry it is poorly stable in service. Works easily, stains and polishes well. Used as a substitute for true mahogany. The timber is used as core veneer, for decorative panelling, parquetry, furniture, flooring and for general utility purposes. Locally, the wood is used for mortars, plank, and canoes[303 , 348]. The wood is a good fuel, igniting readily and burning with a lot of heat[303].

dwatta Antitussive Diuretic Dysentery Eczema Emetic Emollient Hypotensive Leprosy Poultice Purgative Skin StimulantIn the past, the resin was exported to Europe for pharmaceutical use. It was used as a substitute for gum-mastic in making wound dressings in World War II[303]. The resin is used against roundworm infections and other intestinal parasites[303]. It is an emollient, stimulant, diuretic and has action on skin-affections and eczema[303]. The bark is emetic and purgative[303]. A decoction is used as a treatment against hypertension, dysentery, gonorrhoea, coughs, chest pains, pulmonary affections, stomach complaints, food poisoning etc[303 , 398]. The pounded bark is used against leprosy and ulcers[303]. Root is used against adenites whereas root scrapings are made into a poultice[303]. The leaves are boiled with other herbs and the decoction used to treat coughs[398]. The seeds are roasted and pounded and the resulting powder mixed with skin oil or jelly to treat wounds[398].

nrakta Africa - Senegal to west Cameroon and extending to Ethiopia, Tanzania and Angola. ksacta Riverine forest and forest patches or remaining as isolated trees, probably because of the destruction of other forest species[308]. Rain forest, gallery forest and transitional forest[303].

propta Seed - pre-soak the seed by immersing it in hot water and then allowing it to cool in the water for 24 hours prior to sowing. The seed can be sown in nursery beds or in situ[303]. The ripe fruits should be collected when they fall to the ground and allowed to decompose, the stones should then be separated from the outer fruit coats. Seeds can be stored for a long time[303].

nwatta Management: Standard Regional Crop Staple Crop: OilA tree of the hot tropical rainforests, growing at elevations from sea level to 1,000 metres[303 , 335]. It grows best in areas where the mean annual rainfall is in the range 900 - 1,400mm[303]. Climate: tropical. Humidity: humid. Carbon Farming - Cultivation: regional crop only. Management: standard.

5.2.42 Allanblackia floribunda

Vegetable Tallow. Tallow tree

10 thin 12 clyc 3 ckak 2 tcan 2 dwat 25 m hkuc hmimhtut cyutli tcup hwicli hrasjlutnyik hpa7tli frusflatprik hpa7tmwatli dyat hjonli

drutta Allanblackia floribunda is an evergreen Tree growing to 25 m (82ft) by 20 m (65ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by insects. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

ckaakta Edible Parts: Fruit Oil SeedEdible Uses: OilThe fat obtained from the seed, known as 'allanblackia fat' or 'beurre de bouandjo' in Congo, is used in food preparation[299]. Recently, the international food industry has become interested in the fat as a natural solid component for margarines and similar products[299]. The seeds contain a fat that is solid at ambient temperatures. The kernel, which makes up about 60% of the seed, contains about 72% fat. The fatty acid composition of the fat is approximately: stearic acid 45 - 58% and oleic acid 40 - 51%. Only traces of other fatty acids are present. Its composition and relatively high melting point (35°C) makes the fat a valuable raw material

a good substitute for balsa wood (*Ochroma pyramidale*); it is very buoyant and is used for fishing-net floats and rafts for heavy timbers, because of its ease of working it is carved into fetish-masks, spoons, ladles, plates, platters, bowls, dippers, stools, etc; it is also used for rough planks and coffins[299 , 316 , 332 , 848]. The wood is used for making drums which are said to be very sonorous, and it is carved to make the whole or the resonant parts of musical instruments in various parts of Africa[332]. The wood is perhaps suitable for paper-pulp[332]. The wood is indifferent as a fuel, since it burns with great rapidity[332].

dwatta Antidiarrhoeal Antidote Antifungal Antirheumatic Antitussive Aphrodisiac Dysentery Febrifuge Laxative OphthalmicThe stem-bark is taken by enema to prevent abortion[332]. A decoction of the stem bark is used externally to wash and cicatrize sores[332]. A decoction of the root bark is considered a powerful anti-dysenteric[332]. The root bark is ground up into a powder then mixed with pepper and salt and used for treating constipation[332]. A decoction of the bark is used in the treatment of blennorrhoea, cough, painful menstruation and as an antidote to poison[332]. A bark-liquor is taken by pregnant women to relieve pains and to prevent miscarriage. It is also taken by women 'to kill a worm which is in the bowels and which prevents them from breeding'[332]. Externally, the bark is used in lotions and baths to strengthen rachitic children and premature babies, and to relieve rheumatism and oedemas[332]. The pulped bark (also the leaves) is applied externally to treat fungal infections, to maturate abscesses, furuncles and buboes[332]. The bark is beaten and warmed, then tied to the body in the treatment of elephantiasis[332]. The expressed sap is instilled to the eye in the treatment of filaria and ophthalmia[332]. The leaves are used to treat dysentery, female sterility, oedemas, and stomach-pains[332]. A leaf decoction is taken by draught and in baths as a febrifuge[332]. The roots in Ivory Coast are considered aphrodisiac[332]. Examination of various sources of the bark have found no active principles[332]. Leaves and stems have been reported to contain an unnamed alkaloid. The traditional use of the seed, husk and latex as a remedy for gonorrhoea and diarrhoea may rest on the action of a resin found in the seed, as also the use for treating amoebic dysentery[332].

nrakta Tropical Africa - Senegal to Sudan and Kenya, south to Angola and Mozambique. ksacta Fringing, deciduous and secondary forests, common throughout the semi-dry wooded-savannah zone[332]. Rain forests, but is typical of the more open, secondary formations and is common on abandoned farmland[299 , 316].

propta Seed - it has a hard seedcoat and may benefit from scarification before sowing in order to speed up and improve germination. This can usually be done by pouring a small amount of nearly boiling water on the seeds (being careful not to cook them!) and then soaking them for 12 - 24 hours in warm water. By this time they should have imbibed moisture and swollen - if they have not, then carefully make a nick in the seedcoat (being careful not to damage the embryo) and soak for a further 12 hours before sowing. Sow in a nursery seedbed in a fairly open position. Germination of treated seed commences about 3 - 6 weeks after sowing[299]. Fairly large cuttings root easily[299].

nwatta Management: Standard New Crop Staple Crop: Protein-oilA plant mainly of the tropics, where it can also be found at elevations up to 2,000 metres. It grows best in areas where the mean minimum and maximum temperatures are within the range 20 - 30°C, but can tolerate 14 - 34°C[418]. It prefers a mean annual rainfall in the range 800 - 4,000mm, but tolerates 500 - 5,000mm[418]. Grows best in a sunny position[299 , 332]. Prefers a medium textured, freely draining, acidic soil[303]. Prefers a pH in the range 5.5 - 6.5, tolerating 5 - 7[418]. A very fast-growing tree, in open light spaces it will bear fruit in its seventh to tenth year of growth[332]. The tree responds well to coppicing and pollarding, regenerating readily from the stump[303 , 332]. Some reports suggest the tree does not always coppice well[299]. The tree grows spontaneously from seed and is often preserved in the neighbourhood of forest villages[332]. A dioecious species, both male and female forms need to be grown if fruit and seed are required.

5.2.40 Allanblackia stuhlmannii

Mkani, Msambo

10 tin 12 cyuc 3 kcak 3 tcan 2 dwat 35 m hkuc htut cyutli tcup hwilci jlutnytkrip hpa7tli fruslatprik hpa7tmwatli dyat hjonli

drutta Allanblackia stuhlmannii is an evergreen Tree growing to 35 m (114ft) by 35 m (114ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10 and is frost tender. The flowers are pollinated by Insects, Birds, Bats. The plant is not self-fertile. Suitable for: medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in heavy clay soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It cannot grow in the shade. It prefers moist soil.

kcakta Edible Parts: Fruit Oil SeedEdible Uses: OilAn edible non-drying fat, called Mkani fat, is obtained from the seed[46]. It is locally important[46], where it is used in cooking and has been used as a substitute for butter and cocoa butter[299]. Air-dried seeds contain about 50% fat[299]. The fatty acid composition of the fat is remarkable as it consists mainly of stearic acid (45 - 58%) and oleic acid (40 - 51%)[299]. Only traces of other fatty acids are present. Its composition and resulting high melting point (35c) makes the fat a valuable raw material that can be used without transformation to improve the consistency of margarines, cocoa butter substitutes and similar products[299]. Seeds are extracted from the fruits by crushing them between the hands and rubbing them clean. Traditionally, the seeds are dried and crushed; the resulting mass is mixed with water and boiled until the fat separates and floats to the surface from where it is scooped off[299]. The fruit's slimy jelly-like pulp can be used in jam making[299].

tcanta Containers Dye Fuel Lighting Oil WoodOther uses rating: Medium (3/5). The bark is a source of a red dye[46]. The bark yields a yellow dye[299 , 303]. The fat from the seed is used to make candles[299]. The heartwood is dark brown to purplish, usually present only as a small core - for example there would be around 10cm of heartwood in a bole of 65cm; the sapwood is pale grey-brown. Texture is medium; the grain straight. The wood air dries slowly, with a moderate tendency to cup, but with little or no splitting. It is difficult to saw when green, but once dry it saws easily and machines well. It holds nails well. The sapwood is not durable, but is permeable to preservatives; the heartwood is very resistant[299]. The wood is used for construction, cheap joinery, boxes, crates, beehives and water containers[299 , 303]. The wood is used for fuel[299].

dwatta AntirheumaticIn traditional medicine, the leaves are chewed to treat cough, while the leaves, bark and roots are used to treat impotence[299 , 398]. A seed extract is rubbed in to treat rheumatism[299]. The fat is applied as a liniment on aching joints, wounds and rashes and small quantities are taken orally to treat rheumatism[299 , 398]. The fat, mixed with the pounded seeds of *Psorospermum febrifugum*, is rubbed on deep cracks in the soles of the feet[299]. Guttiferone F, a prenylated benzophenone, has been isolated from the wood of the roots[299]. The compound is related to a group of compounds that has been investigated for its anti-HIV properties[299].

nrakta Eastern Africa - Tanzania. ksacta Seaward slopes and valley bottoms of evergreen submontane and montane forest at elevations of 800 - 1,200, occasionally to 1,600 metres[299].

propta Although trees can be grown from seeds, it is better to take cuttings (or air layers) from female trees. These can form roots in 8-12 weeks. Seed. Well-matured fruits are kept for about 2 weeks to allow the pulp to become soft and to make extraction of the seed easy. Fruits may be kept for up to 3 months if covered with banana leaves. Clean seeds are placed in a nursery where they take about 3 months to start to germinate, but germination may take more than 7 months to start and another 18 months to complete[299]. After germination, the seedlings are transferred to polythene tubes filled with soil. Mycorrhizae are necessary for the successful growth of the seedlings and it is therefore important to add soil from around the base of mother trees to the substrate[299]. Cuttings are placed a few cm deep in the soil at a 45° angle in polythene tubes with at least 1 node above the substrate. Cuttings strike root in 8 - 12 weeks, after which sprouted and rooted cuttings are transferred to polybags[299]. Methods of layering and budding are being devel-

pound of 7 - 9 leaflets, the largest attaining 50 cm length by 25 cm breadth. When they fall and lie on the ground they form a good groundcover retaining moisture and rotting down to form a thick humus[332]. Other Uses Lye can be extracted from the ash of the wood and this is used in making soap[299 , 303 , 332]. Extracts of the plant have been shown to deter the termite *Reticulitermes lucifugus*[299 , 303]. The yellowish-white wood is moderately light, soft, fibrous and difficult to work[332 , 364]. It is used to make domestic utensils[364]. Though perishable it is also used for fencing[332]. The wood is used for fuel[332 , 398].

dwatta Antidiarrhoeal Antihæmorrhoidal Antitussive Cholagogue Dysentery Febrifuge Malaria Odontalgic ParasiticThe bark is said to be antidyenteric, cholagogue and taenifuge[332]. It is used in the treatment of chest-complaints[332]. Scrapings of the bark, cooked in palm-oil, are taken to relieve sore-throat[332]. The leaves are chopped up small are eaten raw with salt for treating heart-troubles; pregnancy complications; dysmenorrhoea; and incipient hernia[332]. An extract of the leaves, combined with *Alchornea* spp., is used in the treatment of dysentery, and the leafy shoots are chewed for this same purpose[332]. The liquid in which young leaf-flushes and a peeled green banana have been boiled is a medicine taken little and often to stop diarrhoea and vomiting[299 , 332]. The leaves are an ingredient of a febrifuge given to small children[299 , 332]. The leaf or leaf-petiole is beaten into a plaster for application to boils[332]. Sap from the young leaves, or the terminal buds, is applied topically to toothache; applied to the chest to treat bronchitis; or is used as a throat-paint for laryngitis or sore throat[332]. It is used as an analgesic for muscular pains, and is put into enemata for hæmorrhoids[332]. When combined with the leaves of *Holarthra floribunda* and a chili, it is used in an enema to relieve pain in the back and loins[332]. The aerial roots yield an abundant amount of sap when cut up. This is drunk as an anti-tussive and anti-diarrhoeic, and as a remedy for hæmaturia and blennorrhoea[332]. A vapour-bath made from the diced roots, combined with malegutta pepper, is used in the treatment of headache[332]. The whole fruit is boiled in sap from the tree or in palm wine or other fruit ferments to take as an emeto-purgative[332]. It is preferred to the less active bark or leaves which may also be used for the same purpose[332]. Several pentacyclic triterpenoids have been isolated from the wood and the roots[299]. Euscaphic acid, myrianthic acid, tormentic acid, ursolic acid and a derivative of ursenoic acid have been isolated from stems[299]. Myrianthic acid was isolated from the bark[299]. The wood also contains myrianthiphyllin, a lignan cinnamate[299]. Bark extracts of *Myrianthus arboreus* have shown antiplasmodial, antimycobacterial and antitrypanosomal effects in vitro, which support some of its uses in traditional medicine, e.g. To treat malaria[299].

nrakta Tropical Africa - Guinea to Central African Republic and Uganda, south to Angola, DR Congo and Tanzania. ksacta Secondary vegetation; more or less open places in rain-forests; damp places in forest; forest gallery and clearings; stream or lagoon and lake sides; flooded ground; sometimes in villages[328]. At elevations from 700 - 1,200 metres in Tanzania[398].

propta Seed - best sown as soon as it is ripe[398]. About 40% of the seed germinates within 1 month, but this rate can be improved by soaking the seed for 12 hours in warm water prior to sowing[299]. The seed also germinates better if it has passed through the gut of an animal[303]. Bud grafting and stem cuttings have been successfully used for propagation in experiments[299].

nwatta A plant of moderate elevations in the moist tropics, being found from 700 - 1,200 metres. It is found in areas where the mean annual temperature is in the range 16 - 26°C and the mean annual rainfall is 1,400 - 4,000mm[303]. Prefers a damp soil[303]. Young plants can begin producing fruit when 4 - 5 years old from seed[398]. The plant has mycorrhizal associations, thus helping to enrich the soil with nitrogen[299 , 303]. A dioecious species, both male and female forms need to be grown if fruit and seed are required.[299 , 303]

5.2.13 Parinari curatellifolia

Mbola, Grys Appel

10 tin 12 cyuc 4 kcak 3 tcan 2 dwat 15 m hkuc htut cyutli hgattucuphja7n hwicli jlutnytkrip hpa7tli flatprikliwis hpa7tmwatli hjonli

drutta Parinari curatellifolia is an evergreen Tree growing to 15 m (49ft) by 15 m (49ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 10 and is frost tender. The flowers are pollinated by Bees. Suitable for: medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist or wet soil and can tolerate drought.

kcakta Edible Parts: Fruit Oil SeedEdible Uses: Drink OilFruit - raw or cooked[398]. It has a dry but delicious flesh[307]. A strawberry-like flavour[46]. Somewhat astringent, it is one of the best wild fruits of the area[308]. It has a pleasant taste when it has been stored for a few days until it is thoroughly ripe[308 , 466]. The fruits can be pounded with water and the liquid obtained thickened with flour to make a gruel known as 'phala la maula'[466]. A soft drink is prepared by peeling ripe fruits and soaking them in warm water[398]. A nice jam can be made from the fruit[398]. The russet-yellow, ovoid fruit is 3 - 5cm in diameter[307]. It has a high content of protein and vitamin C[418]. The seeds make an excellent substitute for almonds[308]. Often roasted[335]. They can be pounded and used in making soup[418]. The seeds contain about 40% oil (70% in the kernels)[325]. It is extracted and used for cooking[325 , 398]. The seeds are dried, roasted, crushed, boiled in water, left to cool and the oil skimmed off[398].

tcanta Charcoal Fire retardant Fuel Furniture Oil Paint Soap making Tannin Teeth Varnish WoodAgroforestry Uses: An important tree for bee forage[398]. Other Uses The bark contains tannins[418]. It is used as a dye in basket making[325]. The seeds contain around 38% oil[303 , 418]. It is used in making paint, varnish, soap etc[325]. The twigs are used as chew sticks to keep teeth and gums clean and healthy[325]. The pale-brown to yellow-red wood is hard, durable and heavy, but is high in silica making it somewhat difficult to saw and plane[466]. It is strongly fire resistant[325]. A locally important wood, it is very suitable for fine woodwork, building and furniture making, and is also used for poles, dugout canoes and mortars[307 , 466]. The wood is used for fuel[398 , 418] and makes a good charcoal[466].

dwatta Febrifuge Mouthwash Skin Vitamin CThe root is highly valued for its medicinal properties[307]. An infusion of the roots is used to treat toothache[325]. A hot fomentation of the bark is used in the treatment of pneumonia[418]. A leaf decoction is either drunk or used in a bath as a remedy for fevers[418]. The crushed or pulped leaves are used in a dressing for fractures or dislocations, and for wounds, sores and cuts[418].

nrakta Tropical Africa - Senegal to Kenya, south to northern SW. Africa, Botswana and the Transvaal. ksacta Characteristic of wooded grassland with a high water-table and poor drainage[308]. Deciduous woodland; scattered in upland grassland, often persisting in secondary bushland and cultivated land, sea level to 2,100 metres[398].

propta Seed - it remains viable in normal storage for at least 4 years[325]. The seeds should be sown in river sand in flat seed trays. Press the seeds down until they are level with the soil surface and cover with a thin layer of sand. Germination is very poor and prolonged, commencing after about 5 weeks. Seedlings should be transplanted in the 3-leaf stage. Be careful when transplanting the seedlings, the taproot is easily damaged[325]. Plant out when about 30cm tall. Root suckers.

nwatta Industrial Crop: Oil Management: Standard Regional Crop Staple Crop: OilA plant of the tropical and subtropical savannah, growing at elevations of 900 - 1,500 metres in areas with a pronounced dry season[466]. It grows best in areas where the mean annual temperature falls within the range 14 - 30°C, but can tolerate 10 - 36°C[418]. It prefers a mean annual rainfall in the range 400 - 1,000mm, tolerating 100 - 2,700mm[418]. Prefers a deep soil in a sunny position[307]. Grows best in light soils[335]. Often found on light yellowish-brown to reddish-yellow, gritty, sandy clay loams and red to dark red friable clays with lateritic horizon[418]. Prefers a pH in the range 5.5 - 7, but

tolerates 5 - 7.5[418]. It can tolerate small concentrations of copper in the soil[418]. Dislikes cold winds[418]. Trees can be coppiced[325]. Because of its resistance to fire it features prominently in fire-maintained wooded grassland, especially in upland areas on the former site of montane forest[308].

5.2.14 Dendrocalamus asper

Giant Bamboo, Dragon bamboo, Sweet bamboo
10 tin 12 cyuc 4 kcaak 3 tcan 0 dwat 15 m hkuc
htut cyutli tcup hwicli hrasjlutnyik hpa7tli frusflatprikhwisslip
hpa7tmwatli hjonli

drutta Dendrocalamus asper is an evergreen Bamboo growing to 15 m (49ft) by 5 m (16ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are 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 acid and very alkaline soils. It cannot grow in the shade. It prefers moist soil.

ksakta Edible Parts: Shoots StemEdible Uses: Young stems - cooked. Free of bitterness[310]. Harvested before they emerge from the soil, they are tender and sweet[301 , 310]. They are used as a vegetable, pickled or preserved[301]. They can be cut into strips and used as a substitute for macaroni in soups[301]. The edible portion of young shoots is about 34%; they weigh on average 5.4 kilos before peeling and 1.8 kilos after peeling[299].

tcanta Biomass Containers Fodder Furniture Musical Paper WoodOther Uses: The upper internodes of the culm, which are longer than the lowermost ones, are used as containers for water or to collect juice being tapped from palm inflorescences[310]. The internodes of this and other bamboo species are also used as ready-made cooking pots in the field[299 , 310]. The internode is opened at one end (or the node) and filled with vegetables, meat or rice, and water, and is then covered and placed on a fire[310]. The culms have thick walls and are very strong and durable. They are used as building material for houses and bridges, for making furniture, boards, musical instruments, household utensils, crafts, outriggers of fishing boats and for paper making[299 , 310].

nrakta Africa - Madagascar; Southeast Asia - China, Sri Lanka, Myanmar, Thailand, Laos, Vietnam, Malaysia, Indonesia, Philippines, Australia. ksakta Not known in a truly wild situation

propta Seed - sow in containers and only just cover. Germination usually takes place readily. Prick out into individual pots as soon as the plants are large enough to handle. Plant out into permanent positions when 20cm tall. Plants may remain in their low-growing juvenile state for several years - cutting the culms to the ground level can stimulate taller adult growth[200]. Rhizome, culm and branch cuttings[310]. The propagules are raised in the nursery and after they have produced roots they are planted out in the field before or during the first half of the rainy season[310].

nwatta Fodder: Bank Industrial Crop: Biomass Management Managed Multistem Minor Global Crop Other Systems: Multistrata Other Systems: Strip intercropA plant of moist areas in the tropics and subtropics, where it can be found from low elevations up to 1,500 metres, though it grows best at an elevation of 400 - 500 metres[310 , 418]. It grows best in areas where annual daytime temperatures are within the range 20 - 27°C, but can tolerate 15 - 34°C[418]. It prefers a mean annual rainfall in the range 1,800 - 3,600mm, but tolerates 1,200 - 4,500mm[418]. Succeeds in any type of soil of at least moderate fertility, though it grows better on heavy soils with good drainage[310 , 418]. In Thailand, according to local farmers, the plant will grow well on sandy and rather acidic soils[310]. Prefers a pH in the range 5 - 6.5, tolerating 4.5 - 7[418]. Bamboos have an interesting method of growth. Each plant produces a number of new stems annually - these stems grow to their maximum height in their first year of growth, subsequent growth in the stem being limited to the production of new side branches and leaves. In the case of some mature tropical species the new stem could be as much as 30 metres tall, with daily increases in height of 30cm or more during their peak growth time. This makes them some of the fastest-growing species in the world[K]. Initially, a young plant raised from a lateral branch cutting will produce small shoots which will develop

into small culms[310]. As the plant grows older, so the culms produced each year increase in size and quantity until full-size culms appear five or six years after planting[310]. A mature clump may attain a diameter of 3 metres or more and contains about 60 culms[310]. A culm becomes mature when 3 - 4 years old[310]. A good healthy clump can produce several shoots annually[310]. Yields of 10 - 11 tonnes per hectare of bamboo shoots have been reported from Thailand[418]. Bamboos in general are usually monocarpic, living for many years before flowering, then flowering and seeding profusely for a period of 1 - 3 years before usually dying. This species usually flowers when around 100 - 120 years old[299].

5.2.15 Dictyosperma album

Hurricane Palm, Princess Palm, Red Palm

10 tin 12 cyuc 4 kcaak 0 tcan 2 dwat 15 m hkuc
hmimhtut cyutli tcup hwicli hrasjlutnyik hpa7tli prikhwissom
hpa7tmwatli hjonli

drutta Dictyosperma album is an evergreen Tree growing to 15 m (49ft) by 8 m (26ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: neutral and basic (mildly alkaline) soils and can grow in saline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil. The plant can tolerate maritime exposure.

ksakta Edible Parts: Apical bud LeavesEdible Uses: Leaves - cooked[299]. The apical bud of this plant is highly valued as a food[299]. This palm is single-stemmed and unable to form sideshoots - harvesting the apical bud leads to the death of the plant[K].

dwatta DiureticA root decoction is used as a diuretic[299].

nrakta Africa - Mauritius, Réunion. ksakta Coastal forests[314]. Grows at low elevations generally up to 600 metres[299].

propta Seed - sown fresh, it germinates within 60 - 120 days[423].

nwatta Plants are able to tolerate occasional light frosts with temperatures down to -1°C[423]. Prefers a position in light shade or full sun[299 , 314]. Grows best in a well-drained soil. Tolerant of saline conditions[299 , 314]. Usually growing near the coast, the plant can withstand the strongest of winds, including salt-laden hurricanes[299 , 314]. A moderately fast growing plant[299]. Blooms repeatedly

5.2.16 Uapaca kirkiana

Wild Loquat

10 tin 12 cyuc 4 kcaak 3 tcan 2 dwat 12 m hkuc
hmimhtut cyutli tcup hwicli hyishrasjlut hpa7tli frusflatprik
hpa7tmwatli dyat hjonli

drutta Uapaca kirkiana is an evergreen Tree growing to 12 m (39ft) by 12 m (39ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. The plant is not self-fertile. Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

ksakta Edible Parts: FruitEdible Uses: DrinkFruit - raw or cooked[398]. Fleshy and sweet, it has a delicious flavour[398]. The fruit is commonly eaten fresh and is highly regarded[301 , 303]. It can also be used for brewing a very pleasant wine or for making cakes that are fried and eaten[301]. The juice of the fruit is mixed with sorghum meal to form a thin, orange-flavoured porridge[301]. The fruit pulp is juicy, honey-like, very tasty and somewhat reminiscent of pears[301]. Dried fruits have a toffee-like flavour[301]. The fruit is about 4cm x 4cm.

tcanta Charcoal Containers Dye Fencing Fuel Furniture Repellent Soil conditioner Soil stabilization WoodAgroforestry Uses: The tree is planted for erosion control, shade, shelter, living fence and as an ornamental. It forms a mutual association with mycorrhizae and act as a soil improver and is an important agro-forestry tree[418]. Other Uses A blue dye is made from the roots[303]. The leaves are used as a cockroach repellent in homes[303 , 418]. Wood is light with

medicine[299]. It is applied externally to treat rheumatic pains[299]. Bark decoctions are used to treat kidney problems, toothache, rickets, vaginal infections and affections of the respiratory and digestive tracts[299].

nrakta Western tropical Africa - southern Nigeria to Gabon, Congo and south-western DR Congo. ksakta Usually scattered in primary rainforest on all soil types except marshy soil[299].

propta Seed. Shade is required for germination, which usually takes 1 - 4 weeks[299]. The germination capacity of fresh seeds is high (> 85%), but drops rapidly to 5% after 6 weeks of storage due to rapid degradation of the fatty acids[299]. However, fresh seeds stored at 4°C and humid conditions still showed a germination rate of about 50% after 11 months[299]. In the nursery the lower half of the seed is buried, with the scar pointing downwards. The mortality of seedlings in the nursery is very low. Partial shading is favourable for seedling development. Under optimal nursery conditions seedlings may reach 35 cm in height after 6 weeks, 45 cm after 3 months and 1.5 metres after 18 months[299]. The seedling develops a taproot and so it is recommended to sow into polythene pots. Seedlings are planted out into the field, when about 4 - 5 months old, at the start of the rainy season under the light shade of about 10 retained adult trees per ha. The shade should be removed gradually when a reduction in diameter growth is observed[299]. Seeds germinate in abundance under or close to mother trees - whilst it is not necessary for the seeds to pass through the intestines for germination, it does accelerate germination slightly[299].

nwatta The tree occurs in primary rain forest in humid and warm climates, with a mean annual temperature of 23 - 26°C and a mean annual rainfall of 1,500 - 3,000 mm[299]. Seeds germinate in abundance under or close to mother trees. However, young plants of 1 metre tall are rare as a result of predation by animals, mainly elephants, and the survival rate of seedlings after 18 months is practically nil under the mother tree and very low (less than 2%) elsewhere[299]. In forest undergrowth seedlings grow 4 - 5 cm/year. They respond rapidly to the opening of the forest cover and direct sunlight, and under these circumstances may grow up to 40 cm/year. When the tree bole has attained 1m in diameter and the crowns have reached or passed the forest canopy, diameter growth is up to 9.5 mm/year. It has been estimated from growth rings and C14 dating that a tree with a bole diameter of 1 metre was 260 years old and one with a diameter of 2.8 metres 600 - 700 years[299]. The tree starts flowering at an age of 50 - 70 years, when it has reached the light in the upper storey of the forest, but regular fructification starts still later, when the bole has reached 70 cm in diameter[299]. Fruits are produced annually, but mass production occurs once in 3 years. About 6,000 seeds per tree are produced within a cycle of 3 years; a single tree produced 2,460 kg of fruits, including 327 kg of seed kernels[299]. The fruiting season lasts up to 4 weeks for an individual tree, but may last 3 months for a whole wild population[299]. At present, the only management measure for natural forest is the maintenance of a minimum diameter limit for exploitation, i.e. 70 cm in Gabon, 80 cm in Congo and 100 cm in Cameroon. In Cameroon commercial exploitation of the tree implies the cutting of 90% of trees above 100 cm in diameter, leaving only poorly shaped trees. It has been estimated that after 300 years 84% of the harvested volume is re-established and after 500 years 92%. Sustainable production in natural forest is therefore not possible. Cutting cycles of 30 years, as often practised, threaten the populations seriously[299]. During the fruiting season, local people often move to localities where clusters of trees are found and stay there in temporary camps for 2 - 8 weeks. The collected fruits are depulped and the seed kernels dried. After heating, the oil is gathered by pressing with a traditional wooden press. The oil is used domestically or sold. It can be stored for 1 - 2 years[299]. In 1992, which was a very good year for fruit production, the yield of oil was estimated at 135 - 165 litres per adult tree[299].

5.2.39 Ricinodendron heudelotii

Manketti nut, Zambezi almond, African oil-nut-tree
10 tin 12 cyuc 3 kcaak 4 tcan 3 dwat 40 m hkuc

htut cyutli tcup hwicli hrasjlut hpa7tli frusflatprik
hpa7tmwatli dyat hjonli

drutta Ricinodendron heudelotii is a deciduous Tree growing to 40 m (131ft) by 25 m (82ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The plant is not self-fertile. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It cannot grow in the shade. It prefers moist soil.

ksakta Edible Parts: Leaves Oil SeedEdible Uses: Oil SaltSeed - cooked[332]. Although edible, they are not everywhere valued as food[332]. The kernels are eaten boiled in water or in sauce, or mixed with fish, meat and other vegetables[332]. They can be roasted and made into a paste, which can be stored and used for making porridge in times of food shortage[299 , 332]. In many areas the seeds are regarded as a famine food, for use when other foods are not available[398]. The black fruit is a 2 - 3-lobed drupe 25 - 30mm long and 40 - 50mm wide, containing 2 - 3, globose seeds around 15mm in diameter[299]. Fallen fruits are collected from the ground. After collection, the fruits are left to rot in big piles. Once the fruit pulp is rotten, the stones are extracted by washing and boiling the fruits vigorously. Then the stones are removed from the hot water, put in cold water and left overnight. They are boiled vigorously once more until the shells crack. Shells are then removed using a knife. After extraction, the seeds are dried[299]. The seed contains about 47% by weight of a light yellow oil with a sweet taste[301 , 332]. The seeds are pounded, boiled in water and then allowed to cool. The floating oil is skimmed off, boiled then filtered and used for cooking[398]. The oil consists of the following fatty acids: oleostearic 44%; oleic 16%; plus 10% each of palmitic; stearic; linoleic; and linolenic[332]. Leaves - cooked and eaten as a protein-rich vegetable[299]. The ash of the wood is used as vegetable salt in cooking[299].

tcanta Dye Fencing Fertilizer Ink Insulation Musical Oil Paper Pioneer Potash Resin Soap making Soil stabilization Tinder Waterproofing WoodAgroforestry Uses: The roots reach deep into the soil and cause little competition for nutrients and water in the upper soil layers with adjacent crops[299]. It is a popular shade and shelter tree in small-holder cocoa plantations[303]. There is a belief that 'collar-crack' disease will occur on a cacao farm if the tree is cut down[332]. When not grown in pure stands, this species has always been intercropped with coffee, cocoa or bananas[418]. The seed contains small amounts of toxic substances, said to be a resin, which renders the residual cake unfit for use as a cattle-food though the cake should be a good nutritious agricultural fertiliser[332]. The tree is used as a live fence and for erosion control[299]. The tree could be very useful as a pioneer species - it is very fast growing, often found in secondary formations and commonly invades old farmland in its native range[K]. Other Uses The ash of the wood is used as a source of potash for the preparation of a vegetable-salt in soap-making and in indigo dyeing[299 , 332]. The seed contains about 47% of a light yellow drying oil with a sweet taste[332]. It is usable in varnish and to make soft-soap, and it has industrial application in making water-proofing materials[332]. Decortication, however, is not easy, and as the shell amounts to 37% of the weight of the seed the total amount of oil may be as low as 14% of the whole seed[332]. The seed contains small amounts of toxic substances, said to be a resin[332]. The seeds are used in rattles and as counters in games[299 , 332]. The leaves are used as wrapping material[299]. The sawdust is extraordinarily light and is suitable for use in making life-saving belts[332]. The wood is currently recommended for use in insulation and the sawdust is no doubt suitable for sun-helmets[332]. The heartwood is dull white to pale yellow, darkening once exposed to light; it is not clearly differentiated from the sapwood. The grain is straight to interlocked, sometimes slightly wavy; the texture coarse and even. The wood is very light in weight; very soft; fibrous; brittle; not very durable, being liable to attack by termites, powderpost beetles and marine borers. It dries rapidly with little or no degrade; shrinkage rates are low; once dry the wood is moderately stable to stable in service. The wood saws and works easily with ordinary tools - there is a great tendency to woodliness, however, and tools need to be kept very sharp; it nails and screws without splitting, but holding properties are poor; gluing is correct; turning and planing are difficult. The wood is considered to be

The leaves are abortifacient, alterative, emollient, laxative and sedative[299]. They are used in the treatment of scabies, diarrhoea, coughs, hoarse throats, fatigue and lumbago[238 , 299 , 303]. A decoction of the tender shoots is used as a contraceptive[303]. Young leaves are warmed and mixed with palm oil to be eaten as a remedy for heart problems.[299]. The leaf sap is drunk as a remedy for mental illness[299]. The juice from bruised young branches is used in a preparation to treat asthma[238]. Applied externally, the pounded leaves are used as a dressing on sores, sprains, tumours, abscesses, whitlows etc[238 , 299 , 303]. The leaf sap is applied on skin infections[299]. Leaf macerations are used in baths as a treatment against general fatigue, fevers, stiffness of the limbs, headache and bleeding of pregnant women[238 , 299]. They are used as an eye-bath to treat conjunctivitis, remove foreign bodies from the eye and help heal wounds in the eye[299]. The leaves can be picked at any time during the growing season and are used either fresh or dried[238]. The bark and the leaves are used in the treatment of bronchial congestion[238]. Externally, they are used in baths to treat fevers and headaches[238]. The root and stem barks are credited with emetic and antispasmodic properties[299]. A decoction of the stem bark is taken to treat stomach problems, diarrhoea, hernia, gonorrhoea, heart trouble, oedema, fever, asthma and rickets[299]. Macerations of the bark are said to be a cure for heart trouble and hypertension, and are credited with stimulant and anthelmintic properties[299]. Stem bark decoctions are used in mouth washes for treating toothache and mouth problems, they are also applied on swollen fingers, wounds, sores, furuncles and leprous macules[299]. The bark, often as a powder, is used as a treatment on wounds[238 , 299 , 739]. A decoction of the bark is used as a wash to treat fevers[348]. The bark is usually harvested in the dry season[238]. The gum is abortifacient and astringent. It is eaten to relieve stomach upset[303]. It is also taken internally to control abnormal uterine bleeding, dysentery and diarrhoea in children[238 , 299]. The gum is harvested from incisions made into the trunk of young trees, made as the sap is rising at the end of the dry season[238]. A decoction of the boiled roots is used to treat oedema, diarrhoea, dysentery, dysmenorrhoea and hypertension[299 , 303]. The decoction is also said to be oxytocic[299]. The root forms part of preparations that are used to treat leprosy[299]. The flowers are emollient. They are used as a remedy for constipation[299]. The fruit is emollient. The powdered fruit is taken with water as a remedy for intestinal parasites and stomach-ache[299]. The seed floss is used for cleaning wounds[299]. The seed oil is rubbed in to affected areas to relieve rheumatism, and is also applied to heal wounds[299].

nrakta S. America - Brazil, Bolivia, Peru, Ecuador, Colombia, Venezuela, the Guyanas; north through C. America to Mexico; Caribbean; West tropical Africa. ksacta An emergent tree in various types of moist evergreen and deciduous forests, including those subject to seasonal inundation, as well as in dry forests and gallery forests[303]. As a pioneer species, it mostly occurs in secondary forests[303].

propta Seed - sows as soon as ripe[238]. Without any pre-treatment seeds germinate slowly (less than 10% one month after sowing) and germination may continue for 3 - 4 months[299]. In the wild, a bush fire may cause simultaneous germination of the seeds[299]. Seedling growth is relatively fast, they can be 29cm tall after 6 weeks and 63cm after 51 weeks[299]. Cuttings of half-ripe wood[238]. Cuttings of long stems, 1.2 - 2 metres long are used commercially in the tropics[238]. These are placed directly into the open ground[238]. Comments from a website user trying seed treatments for Ceiba pentandra using two-year-old seeds from West Africa showed: ten seeds soaked cold water in a petri dish - two germinated within six days. Ten seeds soaked in 250 ml boiling water in a cup and left to soak for 24hrs 10/10 germinated within five days.

nwatta Industrial Crop: Fiber Industrial Crop: Oil Management: Standard Minor Global CropA plant of the moist tropics, where it is found at elevations up to 1,200 metres, though productivity starts to decline above 460 metres[793]. It grows best in areas where annual daytime temperatures are within the range 17° - 38°C, but can tolerate 12° - 40°C[418]. It can be killed by temperatures of -1c or lower[418]. Fruiting can fail if the night temperature falls much below 20°C[320]. It prefers a mean annual rainfall in the range 1,500 - 2,500mm, but tolerates 750 -

5,700mm[418], 793. It can tolerate a dry season from 0 - 6 months long[793]. It is believed that the tree originated in Central America, but it can now be found pantropically between 16 degrees north and 16 degrees south[303]. Kapok is the tallest native tree growing in Africa[200]. Prefers a sunny position in a fertile, deep, moisture-retentive but well-drained loamy soil[200 , 238]. Prefers a pH in the range 5.5 - 6.5, tolerating 5 - 7.5[418]. Prefers a position sheltered from strong winds[238]. A fast-growing tree, the annual increases in height and diameter during the first 10 years are about 120cm and 3 - 4cm respectively[299]. In forest gaps, height growth is maybe 2 metres per year[299]. The tree can begin to bear seeds, and therefore fibre, from the age of 4 - 5 years, with yields increasing up to about 8 years[418]. The economical life of the plants is about 60 years[418]. Leafing and flowering periods are more regular in drier parts of the distribution area; in moister areas, leafing and flowering periods are highly irregular[299]. The flowers open at night and are senescent by midday. They emit a powerful odour and secrete nectar at the base of the large, bisexual flowers[299 , 303]. The fruits ripen 80 - 100 days after flowering, the dehiscent types releasing kapok with loosely embedded seeds that are wind-dispersed[299]. A single tree can bear 300 - 400 pods a year, yielding up to 20 kilos of fibre from about the age of 5 for over 50 years[238]. The tree responds well to coppicing[793]. The trees have vigorous rooting systems and are known to cause damage to buildings and roads if planted too close[793]. Cultivated kapok is believed to be a natural hybrid between two varieties respectively native of tropical America and West Africa[418]. The light seeds are widely disseminated and find ideal conditions for germination in abandoned agricultural land[303].

5.2.38 Baillonella toxisperma

African Pearwood, False Shea Butternut

10 tlin 12 cyuc 3 kcaak 4 tcan 3 dwat 50 m hkuc hmimhtut cyuti tcup hwicli hrsajlutnyik hpa7tli frusflatprikli-wisslip hpa7tmwatti dyat hjonli

drutta Baillonella toxisperma is a deciduous Tree growing to 50 m (164ft) by 40 m (131ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid and very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

pcista The residues of oil extraction are sometimes used as fish poison[299]. Sawdust from the wood can irritate mucous membranes[848].

kcaakta Edible Parts: Fruit Oil SeedEdible Uses: OilEdible portion: Nut, Seeds - oil, Fruit. The fruit pulp is eaten fresh although it contains latex[299 , 317]. The seed kernel contains a fatty oil that is used in cooking[299 , 317]. The residue after extracting the oil is toxic.

tcanta Hair Oil Soap making WoodOther uses rating: High (4/5). Other Uses The seed kernel contains a fatty oil that is used as a pomade to the hair and also in soap manufacture[299 , 317]. The allelopathic compound 3-hydroxyuridine has been isolated from the leaves, stems and roots of the tree[299]. It inhibited the growth of seedlings of some test plants[299]. The heartwood has a uniform reddish brown colour, more or less dark and finely veined; it is clearly demarcated from the 4 - 6cm wide band of sapwood. The texture is fine; the grain straight or interlocked. The wood is heavy, hard, elastic, very durable, with a resistance to fungi, Lyctus beetles, termites and marine borers. It is difficult to work due to the presence of silica (0.2 - 0.3%) - power tools that are stellite-tipped and tungsten carbide are recommended; it glues correct, though care needs to be taken because of the density of the wood; it takes nails and screws well, but pre-boring is required; it finishes well, and has good steam-bending properties. Painting and varnishing with the principal industrial products do not cause problems. It is used for many purposes including high class cabinetwork, joinery and carpentry in both interior and exterior applications, marine construction, flooring, turnery, railway sleepers, decorative uses and veneer[299 , 848].

dwatta Antirheumatic Kidney Odontalgic PectoralThe seed kernel contains a fatty oil that is used in traditional

white sapwood and reddish-brown, figured heartwood. It is hard and durable, has a straight grain, saws clean and can be planed to a smooth finish. It glues well, holds nails firmly and takes a clear varnish finish. Suitable for general carpentry, house building and domestic utensils, furniture and joinery, carvings and boxes. It is termite resistant[303]. The wood is used as a fuel and to make charcoal[418]. Charcoal made from the wood is highly regarded, and many trees are cut specifically for this purpose[303]. It is also a good source of firewood[303].

dwatta Antidiarrhoeal DysenteryAn infusion made from the roots is used to treat indigestion and dysentery[418].

nrakta Tropical Africa - Angola, Burundi, Tanzania and the Congo. ksacta Lowland forest, secondary miombo woodland such as clearing and gaps, and open woodland. Grows in well-drained escarpments, with infertile sand or gravel soils of acidic reaction[303].

propta Seed - needs to be sown fresh since it has a limited viability of about 3 weeks[303]. Germination is usually good, especially if the seed is scarified first[303]. Young seedlings need to be given some shade[303]. Division of suckers[303]. Cuttings

nwatta The plant is found wild at an altitude of 500 - 2,000 metres in the tropics[303]. It grows best where the mean annual temperature is within the range of 18 - 24°C, though it tolerates 12 - 32°C. It prefers a mean annual rainfall of 700 - 1,500mm, but can tolerate 500 - 2,000mm[303 , 418]. Plants are very intolerant of frost[323]. Prefers a sunny position, tolerating light shade[418]. Tolerant of poor, shallow, gravel and sandy loam soils[303]. Normally found in acidic soils with a pH 4 - 6.5[303 , 418]. Dioecious - both male and female forms need to be grown if seed is required[303].

5.2.17 Gnetum africanum

Eru, African Jointfir

10 tlin 12 cyuc 4 kcaak 2 tcan 2 dwat 12 m hkuc hmimhtut cyuti tcup hwicli hrsajlutnyik hpa7tli flatprikliw hpa7tmwatti dyat hjonli

drutta Gnetum africanum is an evergreen Climber growing to 12 m (39ft) by 0.4 m (1ft 4in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

kcaakta Edible Parts: Fruit Leaves Root Sap SeedEdible Uses: Leaves - raw or cooked[332]. Wherever it occurs in Africa, the leaf is valued as a tasty vegetable, usually eaten finely shredded for addition to soup or made up into condiments, or even taken raw[332]. To soften this rather tough vegetable, people often mix it with water[leaf (Talinum triangulare)]299]. Shredded leaves can be dried and preserved for later use[299]. The leaves have a very high nutritional value and constitute an important source of protein, essential amino acids and mineral elements[401]. Leafy stems remain fresh for at least a week after harvesting[299]. The dry matter content of the fresh leaves is much higher than for other dark or medium green leaf vegetables. This gives a feeling of firmness during preparation, hence certain consumers consider the leaves as a substitute for meat[299]. The leaves of this species are somewhat thinner and paler than the dark green leaves of the related Gnetum buchholzianum[299]. Fruit pulp[332]. Seed[332]. The mature seed is 15 - 15mm long, enclosed in a somewhat drupaceous orange-tinted envelope. The tubers are sometimes eaten - especially at times of scarcity[401]. Climbing members of this genus growing in Asia yield a potable sap[332]. This species should also be looked at in this respect[332].

tcanta Fibre StringOther Uses: The stem is supple and strong. It is used as a rope[299], made into traps and nooses for catching game, and into straps for portage[332].

dwatta Antidermatosis Antidote Antihemorrhoidal Cathartic HypotensiveThe leaf is used in the treatment of enlarged spleen, sore throat, piles, high blood pressure and as a cathartic[299 , 332]. It is eaten as a treatment against nausea and is considered antidotal against arrow-poison based on Parquetina nigrescens[299 , 332]. The leaves are chewed to mitigate the effects of drunkenness and they are

taken as an enema against constipation[299]. Applied externally, the chopped-up leaf serves as a dressing on warts and boils to hasten maturation[332 , 401]. The stem is cut up into small pieces and infused to produce a tisane that is taken to ease childbirth and reduce the niger[332].

nrakta Tropical west Africa - SE Nigeria and W Cameroon, extending as far south as Angola. ksacta Understorey layer of humid tropical rainforests, mostly at the periphery of primary forest and in secondary forest[299 , 332]. Thrives in a wide range of habitats, including farm fallows or abandoned farmland, secondary forests, and closed forest[401].

propta Seed - difficult to germinate in nursery conditions, though the plants self-sow successfully in the wild[401]. It is assumed that seeds need pre-treatment, such as passing through the intestines of a bird, fruit bat, squirrel or other animal, before they germinate[299]. Seed is normally found only in the tree canopy[299]. Seed collection is thus far from easy, a further reason why the plant is hardly cultivated[299]. Methods of vegetative propagation using leafy stem cuttings have recently been developed. It is recommended that leaf blades of cuttings be trimmed in half[299]. Nursery beds under shade and made of well-decomposed sawdust or fine river sand can be used for propagation[299]. Ectomycorrhizae assist the roots in absorption of nutrients; the most common species reported is Scleroderma sinnamarense. After about 6 weeks the rooted cuttings are transferred to polythene sleeves, bamboo pots or other containers where they remain for a further 2 - 3 months. The soil mixture for these containers consists of 25% sand and some compost, supplemented with forest soil[299]. Field planting, preferably next to a young tree or shrub, takes place at the beginning of the rainy season[299].

nwatta Management: Coppice New Crop Staple Crop: Balanced carbA plant of humid, lowland tropical rainforests, being found at elevations from sea level to 1,200 metres[299]. It grows best in areas where the annual rainfall is around 3,000 mm[299]. Succeeds in dappled shade in the woodland. Plants growing in full sun produce thinner leaves which are not so well liked by consumers[299]. The plant tolerates a range of habitats and environmental conditions[338]. Cultivated plants need to be given some support, such as a tree, to grow into[299]. The plant forms two distinct types of stem. Growing up from the base, the stems produce only small, scale-like leaves, and they grow rapidly towards the light. Higher up, side shoots are formed with fully-developed leaves[299]. The plant continues to grow during the dry season and new shoots may develop where the stem has been cut or where side shoots have been removed[299]. New shoots are also formed from rhizomes that spread along the forest floor[299]. Current methods of harvest from wild stands are very destructive[299]. Controlled harvesting, in which only side shoots or parts of stems are collected, allows new shoots to develop where a stem has been cut or where side shoots have been removed[299]. Preliminary observations indicate that 3 - 4 harvests per year are possible, still allowing for substantial regrowth. More frequent harvesting will result in thin leaves that are considered inferior[299]. The first harvest may take place 6 - 9 months after planting. The total lifespan of the plant is estimated at over 10 years[299]. Preliminary observation indicates that in cultivation during the first harvest year the fresh leaf yield may reach 20 t/ha. This may double in subsequent years[299]. Under wild conditions, the plant grows and forms underground tubers or roots that store plant food reserves. These can remain alive for many years when the vegetation and the plant growth above ground are cleared and the soil surface is laid bare[401]. A dioecious species, both male and female forms need to be grown if fruit and seed are required. Female plants are often have stronger stems, and are more vigorous and productive than male plants[299 , 303].

5.2.18 Pentadiplandra brazzeana

Joy perfume tree, j'oublu

10 tlin 12 cyuc 4 kcaak 2 tcan 4 dwat 12 m hkuc htut cyuti tcup hwicli hrsajlutnyik hpa7tli flatprikliw hpa7tmwatti hjonli

drutta Pentadiplandra brazzeana is an evergreen Climber growing to 12 m (39ft) by 0.5 m (1ft 8in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone

10. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist soil.

pcista The fruit is used as fish poison[299].

kcakta Edible Parts: Fruit RootEdible Uses: Fruit - raw or as a flavouring[299]. The red pulp is eaten as a snack, especially by children, or is sometimes used to sweeten maize porridge[299]. The red or mottled grey fruit is a globose berry 35 - 50mm in diameter, containing many seeds[299]. The protein brazzein, originally extracted from the fruit pulp, [299]. An extremely sweet crude protein, named pentadin, has been isolated from the fruits; in the 1990's the purified protein was isolated and called brazzein. Its temporal profile closely resembles that of sucrose, but develops somewhat more slowly and lasts longer. It is very thermo-stable and its sweetness profile does not diminish after incubation at 100°C for 4 hours. It is also stable over a wide pH range and is the most water-soluble protein sweetener discovered so far. Brazzein is reported to be between 500 and 2,000 times sweeter than sucrose depending on the method of measuring. It is being developed into a low-calorie sweetener for the food industry - however, as of early 2008, brazzein had not yet been granted GRAS (generally recognized as safe) status in the United States nor had it been granted permission for use in foods in the European Union[299]. The root is reportedly occasionally eaten as a vegetable[299]. The powdered root bark is said to be an ingredient of the cheap but dangerous 'African whiskey in sachets'[299].

tcanta Other Uses The roots smell of aspirin and are hung over the doorway or are placed inside the roof to keep away snakes[299].

dwatta Dysentery MalariaThe roots, which taste like horseradish, are used throughout central Africa to treat a wide range of conditions, but particularly to remedy several problems related to giving birth and also to deal with a range of skin problems[299]. Phytochemical analyses of the root have led to the isolation of urea derivatives including sulphur-containing compounds[299]. Carbamates obtained from the roots have shown antibacterial properties in vitro against *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*, and against the yeast *Candida albicans*[299]. The root is also rich in glucosinolates and is believed to contribute to the revitalizing of collagen and to restore skin tonicity[299]. Crude extracts of tubers have revealed moderately strong antiplasmodial activity in vitro, but were not as effective as chloroquine[299]. An aqueous extract of the root given to rats increased the weight of their testes and prostate as well as their testosterone levels[299]. The roots are antibacterial, aphrodisiac, cathartic, emmenagogue, laxative, purgative. They are widely used by women to assist in the birth process and also to deal with problems related to the uro-genital system. A root decoction can stimulate uterine contractions and has been used to induce abortion - it should generally be avoided by pregnant women until the later stages of the pregnancy[299]. A root decoction is given orally, or applied as an enema, to facilitate the expulsion of the placenta, and is also said to prevent haemorrhages after parturition[299]. The root bark is one of more than 20 constituents of the yellow, slimy 'nkui' sauce made by the Bamileke people of Cameroon; this sauce is given to mothers who have just given birth in order to stimulate milk production. A root decoction is given orally or applied as an enema to help in reducing pain caused by hernia[299]. The crushed root or root bark is applied, or an infusion drunk, to soothe chest pain, toothache, lumbago, rheumatism and haemorrhoids. The macerated roots, either alone or mixed with other ingredients, are taken orally or applied as an enema against malaria. Capsicum pepper is added to macerated roots to prepare a drink that soothes cough. A decoction of the bark, combined with the bark and roots of other plants, is taken as a treatment against stiffness or weakness of the limbs and back. The roots and tubers are also commonly used in the treatment of intestinal problems such as dysentery, colic, urethritis, gonorrhoea and other uro-genital infections[299]. A decoction of the tuber, as well as the juice from macerated roots, is combined with pounded leaves and drunk as an anthelmintic. A root decoction is taken to treat pneumonia and serious bronchitis[299]. The fresh root is pulped, or the dry root pounded and mixed with palm oil, to make an ointment for topical application to prevent infections of the navel in newborn babies. Because

the plant is vesicant, the duration of this treatment must be limited to avoid blistering[299]. A powder of dried root bark is applied to scarifications to treat intercostal and abdominal pains. The crushed root is used to treat several skin infections. The pulped roots are applied externally against itch and as an antiseptic, and to treat wounds, sores, ulcers and furuncles[299]. The roots are applied to the abdomen to treat oedema[299]. A root preparation, combined with the leaves of *Kalanchoe crenata*, is used as nose drops to stop epileptic crises[299]. A leaf decoction is used to wash the skin against scabies[299].

nrakta Tropical Africa - Nigeria, Cameroon, Central African Republic, Equatorial Guinea, Gabon, Congo, DR Congo, Northern Angola. ksacta Common in upland primary forest dominated by *Scorodophleus zenkeri*, and also commonly occurs on river banks and in secondary forest. In Cameroon, the plant is mainly found in forest edges bordering savannah. It is nowhere gregarious[299].

propta Seed -

nwatta The flowers can be single-sex or bisexual[299]. The flowering period continues for several months; fruit production is normally low and spread out, though shrubby plants seem to have a shorter but more condensed fruiting season[299]. Unconsumed fruits rot on the plant, without falling. They serve as temporary nesting sites to arboreal ants[299]. Seed dispersal is facilitated by the contrast between the extreme sweetness of the pulp of the fruit and the unpleasant bitter taste of seeds, provoking consumers to spit out the seeds. In natural habitats, squirrels, monkeys and apes contribute to the distribution of the seed; in the vicinity of human habitation, distribution by children into secondary habitats is common[299]. Commercial interest in brazzein, the protein obtained from the fruit, is strong. The technology to extract the protein from the fruit pulp as well as technologies to produce brazzein by transferring the gene coding for brazzein into other organisms have been patented, without the intention of benefit sharing[299]. The gene encoding for brazzein has been transferred to the bacteria *Escherichia coli* and *Lactococcus lactis* and to maize. Bacterial production systems for brazzein have been developed. Mutants and sections of brazzein have been discovered with sweet-taste properties superior to those of the natural protein[299].

5.2.19 Dioscorea cayennensis

Yellow Yam, Yellow Guinea yam

10 tlin 12 cyuc 4 kcaak 0 tcan 0 dwat 10 m hkuc hmimhut cyutili tcup hwicli hrasjlut hpa7tli frusflatprikli-wisslip hpa7tmwatli dyat hjonli

drutta *Dioscorea cayennensis* is an evergreen Perennial Climber growing to 10 m (32ft) by 0.5 m (1ft 8in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Wind, Insects. The plant is not self-fertile. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid and very alkaline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil.

pcista Freshly cut tubers can cause skin irritation due to the presence of raphides, which are destroyed when the tubers are cooked[299].

kcakta Edible Parts: Leaves RootEdible Uses: TeaRoot - cooked in various ways and eaten as a vegetable[300 , 301]. A palatable flavour with a dry, mealy flesh[301]. The roots are sometimes dried and milled to produce a flour for storing - this flour is then stirred into boiling water and kneaded to form a paste[299]. The roots have a rough outer skin and a pale yellow flesh[301]. The roots are up to 3kg in weight[300]. The roots can contain up to 91% carbohydrate, the highest for any yam[332]. Protein content is low, about 2.5%[332]. A tea is made from the leaves[301].

nrakta Western Africa - possibly Dahomey. ksacta Not known in a truly wild situation, having arisen in cultivation.

propta Seed - rarely produced, they are not normally used to propagate this species. Cuttings of tubers. Small tubers can be cut into 2 - 4 sections, larger ones into 6 - 8 sections. Each section should have 2 - 3 dormant buds. The cut tuber is often left in the sun for several hours to promote wound healing and reduce the risk of fungal infection[300].

5.2.36 Crassocephalum crepidioides

Okinawa Spinach, Redflower Ragleaf, Fireweed
10 tlin 12 cyuc 4 kcaak 2 tcan 2 dwat 0.8 m hkuc pcmihmhut cyutili tcup hwicli hrasjlut hpa7tli flatprikliw hpa7tmwatli hjonli

drutta *Crassocephalum crepidioides* is a PERENNIAL growing to 0.8 m (2ft 7in) by 0.3 m (1ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in full shade (deep woodland) semi-shade (light woodland) or no shade. It prefers moist soil.

kcakta Edible Parts: Leaves RootEdible Uses: A commercially cultivated vegetable. Leaves - raw or cooked. A distinctive, pine-like flavour[298]. The leaves are fleshy, somewhat mucilaginous with a nutty flavour[301]. The tender and succulent leaves and stems of ebolo are mucilaginous and are used as a vegetable in soups and stews, especially in West and Central Africa[299]. It is much appreciated for its special flavour, which is sharp but not bitter[299]. It is especially popular in south-western Nigeria. Here the leaves are lightly blanched, excess water is drained off, and the leaves are then cooked with peppers, onions, tomatoes, melon and sometimes fish or meat to make soups and stews[299]. In Sierra Leone the leaves are also popular and are made into a sauce with groundnut paste[299]. In Australia it is eaten as a salad green, either cooked or raw[299]. Roots - eaten with chilli sauce in Thailand[301].

tcanta Fodder Repellent TanninAgroforestry Uses: *Crassocephalum crepidioides* has been used successfully as a trap plant to collect adult corn weevils in banana plantations. Other Uses: Fodder/animal feed.

dwatta Epilepsy Skin StomachicThe leaves are used to treat indigestion[299]. The leaf sap is given to treat upset stomach[299]. A leaf lotion or decoction is used to treat headaches[299]. A mixture of the leaf sap, combined with *Cymbopogon giganteus*, is used orally and externally for the treatment of epilepsy[299]. Applied externally, the leaf sap is used as a treatment for fresh wounds[299]. The dried leaf powder is applied as a snuff to stop nose bleeding and smoked to treat sleeping sickness[299]. Tannin found in the roots of the plant is used to treat swollen lips[299].

nrakta Through most of tropical Africa, it has become naturalised in many other parts of the Tropics. ksacta A weed in abandoned farm land, waste places, plantations and backyard gardens[299].

propta Seed and Cuttings.

nwatta Grows well in soils that are rich in organic matter[299]. An easy to grow vegetable, especially suited to shady localities in home gardens and tree plantations[299]. Often cultivated as a food crop in the tropics, the plant has light, plumed seeds that are easily distributed by the wind. It has escaped from cultivation in many areas and become an invasive weed in some places[305].

5.2.37 Ceiba pentandra

Kapok Tree, Cotton Tree, Suma'ma

10 tlin 12 cyuc 3 kcaak 5 tcan 3 dwat 50 m hkuc htut cyutili kyuctup hwicli jlutnyli hpa7tli frusflatprikli-wisslipshom hpa7tmwatli dyat hjonli

drutta *Ceiba pentandra* is a deciduous Tree growing to 50 m (164ft) by 30 m (98ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10 and is frost tender. The flowers are pollinated by Bats, Moths, Bees. The plant is not self-fertile. It is noted for attracting wildlife. Suitable for: medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid, very alkaline and saline soils. It cannot grow in the shade. It prefers dry or moist soil. The plant is not wind tolerant.

pcista The seeds, and the oil, contain cyclopropenoid fatty acids such as malvalic acid (7 - 8%) and stercularic acid (3%), which cause abnormal physiological reactions in animals. Therefore the consumption of kapok seeds or seed oil should be discouraged unless the cyclopropenoid acids have been chemically removed[299]. Kapok fibre is irritating to the eyes, nose and throat, and workers exposed to kapok dust for long periods may develop chronic bronchitis[299]. (Plant

has spines or sharp edges; use extreme caution when handling)

kcakta Edible Parts: Flowers Fruit Leaves Oil SeedEdible Uses: Drink Oil SaltEdible portion: Seeds, Leaves, Calyces, Flowers, Vegetable, Fruit. Tender leaves, buds and fruit are mucilaginous and are eaten like okra (*Abelmoschus moschatus*) [301]. Seed - raw or cooked. Roasted and ground into a powder, it is eaten in soups and used as a flavouring[301]. The seed can be sprouted and eaten raw or cooked in soups etc[301]. One report says that the seed is toxic[238]. A pleasant tasting cooking oil is extracted from the seed[301 , 418]. Although the seed is toxic, the oil is edible[238]. The oil has a yellow colour and a pleasant, mild odour and taste resembling cottonseed oil. It becomes rancid quickly when exposed to air. Flowers - blanched and eaten with chilli sauce[301]. The dried stems are added to curries and hot, sour soup for colouring[301]. The wood ashes are used as a salt substitute[299 , 301]. The resin from the trunk is put in water and drunk.

tcanta Bedding Containers Dye Fibre Furniture Insulation Oil Paper Pioneer Plant support Potash Soap making Soil stabilization Stuffing WoodOther uses rating: Very High (5/5). Seaside tree, Public open spaces, Xerophytic. Agroforestry Uses: A large, fast-growing pioneer species, it cannot germinate in the dense forest, requiring light in order to thrive. It can be used in reforestation projects for native woodland, but is probably too large and long-lived for woodland gardens[K]. The tree is an important source of honey and is also suitable for soil erosion control and watershed protection[381]. In agroforestry, it has been grown to supply shade for coffee and cacao, whilst in Java it is used as a support for pepper plants (*Piper spp.*) [381]. Other Uses The fibre from the inner wall of the fruit is unique in that it combines springiness and resilience and is resistant to vermin, to make it ideal for stuffing pillows, mattresses and cushions; it is indispensable in hospitals, since mattresses can be dry sterilized without losing their original quality[303]. It is light (one eighth the weight of cotton[238]), water repellent and buoyant, making it ideal for life jackets, lifeboats and other naval safety apparatus[303]. It is an excellent thermal insulator, being used in iceboxes, refrigerators, cold-storage plants, offices, theatres and aeroplanes[303 , 320]. It is also a very good sound absorber and is widely used for acoustic insulation[303 , 320]. The seed contains 20-25% non-drying oil, similar to cottonseed oil[303]. It is used as a lubricant, illuminant, in soap manufacturing and in cooking[46 , 303]. The main fatty acids are palmitic acid (10 - 16%), stearic acid (2 - 9%), oleic acid (49 - 53%) and linoleic acid (26 - 29%)[299]. The ash of the wood is rich in potash and can be used in making soap[299]. The bark is used for making hut walls and doors[299]. A gum and a reddish brown dye are obtained from the bark[299]. The heartwood is variable in colour, from creamy white to light brown, often with greyish veins, but sap-staining fungi may darken it; it is not clearly demarcated from the sapwood. The grain is interlocked, sometimes irregular; the texture coarse; growth rings are prominent; the silica content is low. The wood is soft, weak and very light in weight; it is extremely vulnerable to decay when in contact with the soil and is also susceptible to termites. Both logs and lumber are very susceptible to insect and fungal attack, but preservation treatment is easy. The wood seasons normally, with only a slight risk of checking or distortion; once dry it is poorly to moderately stable in service. It machines easily but not satisfactorily, leaving surfaces fuzzy - tools should be kept very sharp; nailing and screwing are poor; gluing is correct. The wood is easy to peel for veneer. A low quality timber, the reported uses of the wood include for plywood, packaging, lumber core stock, light construction, boxes and crates, cheap furniture, matches, pulp and paper products. Traditionally, it is used for canoes, rafts and farm implements[299 , 303 , 418 , 848]. Although it has been recorded to be used for fuel, it is not considered very suitable for this purpose because it only smoulders[299].

dwatta Abortifacient Alternative Antiasthmatic Antidiarrhoeal Antirheumatic Antitussive Astringent Contraceptive Diuretic Dysentery Emollient Febrifuge Hypotensive Laxative Leprosy Mouthwash Ophthalmic Oxytocic Sedative SkinKapok is an astringent, diuretic herb that lowers fevers, relaxes spasms and controls bleeding[238]. The leaves contain several active compounds including derivatives of quercetin and kaempferol, tannins and caffeic acid[348].

the crushed leaves is used to treat jaundice, and also diarrhoea in babies[299]. A hot leaf placed on a wound is said to stop bleeding[299]. A root decoction is used as a purgative and to treat abdominal pains[299]. The sesquiterpene lactone vernolepin was isolated from plant material collected in Ethiopia. This compound showed antitumor activity and platelet anti-aggregating properties[299].

nrakta Tropical Africa - Sudan, Ethiopia, eastern DR Congo, Uganda, Kenya, Rwanda, Tanzania, Mozambique, ZI ksacta Along rivers and roadsides, in forest margins, old cultivation sites and bushed grassland, also in montane forest and often found in disturbed habitats; usually at elevations from 1,200 - 3,000 metres, sometimes descending to 600 metres[299 , 610].

propta Seed - it can be sown in situ, but is more commonly sown by broadcasting, or by sowing in lines, on raised nursery beds - these are shaded to prevent excessive evaporation. Germination commences within 5 days. When the seedlings are 2 - 3 weeks old, with 4 - 6 leaves, they are pruned by nipping the growing point and are then transplanted with a ball of soil to their permanent positions[299]. Cuttings. Stems with 4 buds, taken from mature plants, are used; they are planted slanting. Rooting of the cuttings is not always successful and plant growth is much slower than in seedlings, so that this method is only used in home gardens when a particular plant type is appreciated[299].

nwatta Baccharoides hymenolepis is a plant of moderate elevations in the tropics where it can be grown up to 3,000 metres. The plants thrive at temperatures of less than 30°C. The minimum mean annual rainfall required is 840mm[299]. Generally, the plants grow well in a loose, moist soil that is rich in humus. The degree of soil fertility greatly influences leaf size[299]. The plant is very sensitive to drought[299]. Seedlings are tasted when they are being planted out and the more bitter seedlings are discarded. This selection process not only secures a better quality crop, but also serves to reduce bitterness in the next generations[299]. Early growth of young plants during the rainy season is so rapid that they grow as tall as 40 - 50cm in just 4 weeks. This rapid growth continues as long as there is ample moisture in the soil[299]. Harvesting the leaves starts 4 - 6 weeks after sowing or 6 - 8 weeks after transplanting. Harvesting is done either by cutting the young shoots or gathering the leaves only. Although the harvest of leaves only is often preferred, this system may adversely affect the development of the plant[299]. Best results are obtained during the rainy season by cutting the shoots at 5 - 10cm above the soil, which will then be replaced by one or two side shoots. These side shoots could be harvested 3 - 4 weeks later and, depending on soil moisture and fertility, this process could be repeated two or three times[299]. In the dry season, when new shoots develop only slowly if at all, farmers pick the leaves only[299]. The highest yields are obtained during the rainy season. An initial harvest of stems yields about 1 kilo per square metre, this decreases to about 500 grammes on the third harvest[299]. Flower initiation begins with the onset of the dry season or during periods of drought[299].

5.2.34 Dioscoreophyllum cumminsi

Serendipity Berry, Guinea potato

10 tlin 12 cyuc 4 kcaak 0 tcan 0 dwat 1.8 m hkc pcimhmimht cyutli tcup hwicli hrasjlutnyik hpa7tli flatprk hpa7tmwatli hjonli

drutta Dioscoreophyllum cumminsi is an evergreen climber growing to 1.8 m (6ft) by 0.2 m (0ft 8in) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid and neutral soils. It can grow in full shade (deep woodland) or semi-shade (light woodland). It prefers moist soil.

kcakta Edible Parts: Fruit RootEdible Uses: Sweetener-Fruit - raw. The intensely sweet, mucilaginous pulp of the fruit is considered to be the sweetest known naturally occurring substance - it is up to 3,000 times sweeter than sucrose[301]. It has been recommended as a non-carbohydrate sugar substitute[301]. The fruit can keep for several weeks at room temperature[301]. Roots. Small and yam-like[301].

dwatta The fruit contains monellin, an intensely sweet protein with potential use as a sugar replacement for diabetics. For humans, monellin is 100,000 times sweeter than

sucrose on a molar basis and around 3,000 times on a weight basis.

nrakta Western, central and northeastern tropical Africa. ksacta Dense rain-forest and galleried forest, often in old cultivation sites[332].

propta Plants can be grown from seed or tubers. Seeds need to germinate in the dark. Plants can be grown from stem cuttings.

nwatta A tropical dioecious rainforest vine with tuberos underground stems. The fruit can be stored. It will keep for several weeks at room temperature.

5.2.35 Tylosema esculentum

Marama Bean

10 tlin 12 cyuc 4 kcaak 2 tcan 0 dwat 1 m hkc htut cyutli hgatyuctcup hwicli hrasjlut hpa7tli flatprklwis hpa7tmwatli hjonli

drutta Tylosema esculentum is an evergreen Perennial growing to 1 m (3ft 3in) by 0.2 m (0ft 8in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

kcakta Edible Parts: Oil Root SeedEdible Uses: Coffee Drink OilSeed - cooked. After roasting, the seeds have a delicious, nutty flavour similar to coffee beans or roasted cashews[301]. They may be boiled with maize meal or ground into flour to prepare a porridge or a coffee- or cocoa-like drink[299]. The roasted seeds have sometimes been used as a culinary substitute for almonds[299]. The seeds have a protein content around 30% (approaching that of the soya bean) and an oil content around 40% (approaching that of the peanut)[301]. The immature seeds and stems may be eaten cooked as a vegetable or in soups[299]. A coffee-like beverage can be made from the seeds[317]. An edible oil is obtained from the seed[301]. Similar to almond oil in consistency and taste[299 , 301]. Golden-yellow, with a nutty odour and a pleasant, although slightly bitter flavour[299] Tuber - cooked. The sweet-tasting tuber can be baked, boiled or roasted[301 , 317]. Young tubers have a sweet and pleasant taste and the texture has been described as similar to that of artichoke[299]. Tubers older than 2 years become fibrous and bitter and are usually not eaten, but they are an important emergency source of water for humans and animals[299].

tcanta Cosmetic OilAgroforestry Uses: Marama bean may have potential as an ornamental ground cover plant[299]. Other Uses: The seeds and kernels yield up to 50% by weight of a golden yellow, transparent oil that can be used in cosmetic preparations[1309].

nrakta Southern Africa - Kalahari desert and neighbouring sandy regions. ksacta Localized in patches in grassland and wooded grassland vegetation in sandy and limestone (including dolomite) soils, but not on soils developed over granite or basalt[299].

propta Seed it should not be pre-soaked, though germination might be improved by scarification[299]. Germination starts to take place after about 9 days[299].

nwatta Management: Standard New Crop Staple Crop: Protein Wild Staple CropA plant of the drier tropics, marama bean occurs naturally in an extreme environment with high temperatures and very low rainfall[299]. It can be found at elevations up to 1,500 metres. It grows best in areas where annual daytime temperatures are within the range 22 - 30°C, but can tolerate 16 - 50°C[418]. It prefers a mean annual rainfall in the range 300 - 600mm, but tolerates 150 - 1,600mm[398 , 418]. The plant probably survives droughts by drawing on water stored in the tuber, which shrinks greatly in dry years[418]. Requires a sunny position. Grows best in a deep, loose, sandy soil[418]. Prefers a pH in the range 5.5 - 7, tolerating 5 - 7.5[418]. An extremely drought-tolerant plant, it can grow in areas where rainfall is so slight and erratic that in some years almost no rain falls at all[418]. In its native habitat surface water is usually available only for 8 weeks a year, though in the fine-grained sandy soils water may remain in the root zone for as long as 2 months after a rainfall[418]. Unlike most members of this plant family, this species does not form nitrogen nodules on the roots[299].

nwatta A plant of the moist, lowland tropics. It grows best in areas where annual daytime temperatures are within the range 20 - 32°C, but can tolerate 12 - 40°C[418]. Plants can be killed at temperatures of 9°C[418]. It prefers a mean annual rainfall in the range 1,200 - 1,900mm, but tolerates 900 - 3,000mm[418]. It prefers a dry growth of 2 months or less[300]. Succeeds in full sun and in moderate shade[418]. For best yields, this species requires a deep, well-drained, sandy loam that is not liable to water-logging[300]. Succeeds in relatively light sandy soils[300], though the soil needs to be very fertile otherwise yields can be low[299]. Prefers a pH in the range 6 - 6.7, tolerating 5.3 - 8[418]. Daylengths of more than 12 hours are preferred during the early growing season since this encourages vegetative growth; daylengths of less than 12 hours towards the end of the growing season will encourage tuber formation and development[300]. Requiring a longer growing season than other yams, mature roots are formed in 9 - 12 months from planting[300]. The tuber has a very brief resting period and does not store well[332]. It is in fact best stored, if necessary, in the earth[332]. The tubers are formed near the surface of the soil[332] and can be carefully removed from the growing plant without disturbing it, allowing the plant to continue cropping for up to three years[300]. The tubers can be dug up as required and a common practice is to expose one side of the tuber and to cut away the distal part for consumption leaving the upper part to regenerate; hence the name 'cut-and-come-again'[332]. This practice may be repeated for upward of three years[332]. Yields of 30 tonnes per hectare have been obtained in the Caribbean[300]. There are some named varieties[300]. Although occasionally monoecious, the plant is usually dioecious, therefore both male and female forms need to be grown if seed is required[299].

5.2.20 Borassus akeassii

African Fan Palm

10 tlin 12 cyuc 4 kcaak 3 tcan 2 dwat 10 m hkc htut cyutli hgatyuctcup hwicli hyishrasjlutnyik hpa7tli frusflatprklwisllip hpa7tmwatli hjonli

drutta Borassus akeassii is an evergreen Tree growing to 10 m (32ft) by 5 m (16ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Insects. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils and can grow in very acid and very alkaline soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

kcakta Edible Parts: Fruit Sap ShootsEdible Uses: DrinkThe apical bud is hollowed out and the resulting sap is collected and fermented. The wine is made for sale enhancing local earnings), to drink at traditional ceremonies, as well as forming a part of the balanced diet in many rural areas, and used for aphrodisiac preparations[325]. Excessive tapping of the sap kills the plant[325]. Fruit - fresh or dried[335]. Eaten as a food supplement[325]. The fruit is 15cm in diameter and is produced in large clusters[335]. The endosperm of immature seeds - raw[335]. Young seedlings - eaten as a vegetable like asparagus[317]. The terminal bud of the palm is used as palm cabbage[317]. Eating this bud leads to the eventual death of the plant since it is unable to produce side shoots[K].

tcanta WoodOther uses rating: Medium (3/5). Other Uses The leaves are used for various purposes including for shelter[314]. The dark brown, coarsely fibrous wood is a highly prized timber locally[325]. It is very resistant to termites and fungi, and is used in carpentry, construction and also for household articles[325].

dwatta Anthelmintic Antiasthmatic Aphrodisiac MouthwashThe roots serve for the treatment of stomach parasites, sore throats and asthma, as well as being used for a mouthwash[325]

nrakta Semi-arid and sub-humid zones of Africa from Senegal to Sudan. ksacta Savannahs, often in close proximity to human settlements[325].

propta Seed - it has a short viability and should be sown as soon as it is removed from the fruit pulp[325]. The seed does not require pre-treatment and germinated in about 4

weeks. The plant produces a very long taproot, which can be 1 metre long when top growth is only 1cm tall, and so it is best sown in situ[325].

nwatta It is found in areas with a mean annual rainfall in the range 800 - 1,100mm[325]. Requires a sunny position and a well-drained soil[325]. Plants are able to extract nutrients, and thus grow, on very nutrient-poor soils[325]. Established plants are drought tolerant[314]. Established plants can resist fires[325]. A slow-growing but long lived tree to over 100 years old[325]. It does not start flowering until middle-aged[325]. A dioecious species, both male and female forms need to be grown if fruit and seed are required

5.2.21 Gnetum buchholzianum

Jointfir

10 tlin 12 cyuc 4 kcaak 2 tcan 2 dwat 10 m hkc pcimhmimht cyutli tcup hwicli hrasjlutnyik hpa7tli flatprklwis hpa7tmwatli dyak hjonli

drutta Gnetum buchholzianum is an evergreen Climber growing to 10 m (32ft) by 0.4 m (1ft 4in) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It can grow in full shade (deep woodland) semi-shade (light woodland) or no shade. It prefers moist soil.

kcakta Edible Parts: Fruit Leaves Root Sap SeedEdible Uses: CondimentLeaves - raw or cooked[332]. Wherever it occurs in Africa, the leaf is valued as a tasty vegetable, usually eaten finely shredded for addition to soup or made up into condiments, or even taken raw[332]. To soften this rather tough vegetable, people often mix it with waterleaf (Talinum triangulare)[299]. Shredded leaves can be dried and preserved for later use[299]. The leaves have a very high nutritional value and constitute an important source of protein, essential amino acids and mineral elements[401]. Leafy stems remain fresh for at least a week after harvesting[299]. The dry matter content of the fresh leaves is much higher than for other dark or medium green leaf vegetables. This gives a feeling of firmness during preparation, hence certain consumers consider the leaves as a substitute for meat[299]. The leaves of this species are somewhat thicker and darker green than those of the related Gnetum africanum[299]. Fruit pulp[332]. Seed[332]. The mature seed is 15 - 15mm long, enclosed in a somewhat drupaceous orange-tinted envelope. The tubers are sometimes eaten - especially at times of scarcity[401]. Climbing members of this genus growing in Asia yield a potable sap[332]. This species should also be looked at in this respect[332].

tcanta Fibre StringOther Uses: The stem is supple and strong. It is used as a rope[299], made into traps and nooses for catching game, and into straps for portage[332].

dwatta Antibilious Antidermatosis Antidote Antihæmorrhoidal Cathartic HypotensiveThe leaf is used in the treatment of enlarged spleen, sore throat, piles, high blood pressure and as a cathartic[299 , 332]. It is eaten as a treatment against nausea and is considered antidotal against arrowpoison based on Parquetina nigrescens[299 , 332]. The leaves are chewed to mitigate the effects of drunkenness and they are taken as an enema against constipation[299]. Applied externally, the chopped-up leaf serves as a dressing on warts and boils to hasten maturation[332 , 401]. The stem is cut up into small pieces and infused to produce a tisane that is taken to ease childbirth and reduce the pain[332].

nrakta Western tropical Africa - Nigeria to the Central African Republic, south to the Congo. ksacta The understory layer of humid tropical rainforests[332]. Thrives in a wide range of habitats, including farm fallows or abandoned farmland, secondary forests, and closed forest[401].

propta Seed - difficult to germinate in nursery conditions, though the plants self-sow successfully in the wild[401]. Cuttings.

nwatta Management: Coppice New Crop Wild Staple CropA tropical plant. It grows in rainforest from sea level to 1,200 m altitude. It suits humid locations. It does best with a rainfall of 3,000 mm per year. It needs shade. Plants do not grow well in full sun. A plant of humid, lowland tropical rainforests, being found at elevations from sea level to 1,200 metres[299]. It grows best in areas where the annual rainfall is around 3,000 mm[299]. Succeeds in dappled shade

in the woodland. Plants growing in full sun produce thinner leaves which are not so well liked by consumers[299]. Cultivated plants need to be given some support, such as a tree, to grow into[299]. The plant forms two distinct types of stem. Growing up from the base, the stems produce only small, scale-like leaves, and they grow rapidly towards the light. Higher up, side shoots are formed with fully-developed leaves[299]. The plant continues to grow during the dry season and new shoots may develop where the stem has been cut or where side shoots have been removed[299]. New shoots are also formed from rhizomes that spread along the forest floor[299]. Current methods of harvest from wild stands are very destructive[299]. Controlled harvesting, in which only side shoots or parts of stems are collected, allows new shoots to develop where a stem has been cut or where side shoots have been removed[299]. Preliminary observations indicate that 3 - 4 harvests per year are possible, still allowing for substantial regrowth. More frequent harvesting will result in thin leaves that are considered inferior[299]. The first harvest may take place 6 - 9 months after planting. The total lifespan of the plant is estimated at over 10 years[299]. Preliminary observation indicates that in cultivation during the first harvest year the fresh leaf yield may reach 20 t/ha. This may double in subsequent years[299]. Under wild conditions, the plant grows and forms underground tubers or roots that store plant food reserves. These can remain alive for many years when the vegetation and the plant growth above ground are cleared and the soil surface is laid bare[401]. A dioecious species, both male and female forms need to be grown if fruit and seed are required.

5.2.22 Moringa stenopetala

African horseradish tree, cabbage tree
10 thin 12 cyuc 4 kcaak 4 tcan 3 dwat 9 m hkuc
hmimhtut cyutli kyuctup hwicli hrasjlutnyik hpa7tli frusflat-prikkwis hpa7tmwatli hjonli

drutta Moringa stenopetala is a deciduous Tree growing to 9 m (29ft) by 9 m (29ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acidic, 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 dry or moist soil.

pcasta The glucosinolates in the leaves were found to cause goitre but to a lesser extent than expected on the basis of their concentration. However, in a diet poor in iodine it may be a contributing factor[299].

kcakta Edible Parts: Flowers Fruit Leaves Oil Seed-podEdible Uses: OilYoung leaves - raw or cooked and eaten as a vegetable[301 , 317]. A larger leaf with a milder flavour than the leaves of *M. oleifera*[301]. Traditionally, the leaflets are separated from the rachis and plunged into boiling water. Salt or sodium carbonate is added to the water. While the leaves are cooking, a mixture of flours is prepared, then kneaded and made into balls 2 - 5cm in diameter. These are tossed into the water as well and after about 10 minutes the balls and the leaves are ready to serve[299]. The addition of fat (grease or butter), small-sized cereal balls and a large amount of leaves are considered to make this dish a good-quality meal[299]. The young, soft fruits can also be added, but the slightly bitter taste restricts the use to periods when food is in short supply[299]. Flowers - cooked and eaten as a vegetable[418]. Seedpods - cooked[418]. This probably refers to the young seedpods, as mentioned above, which have a bitter flavour[K].

tcanta Charcoal Cosmetic Fencing Filter Fuel Oil Paper Shelterbelt Soap Soil stabilization WoodAgroforestry Uses: The tree is used as a living fence[317]. Although in cultivation the primary goal is vegetable production, the tree can also play a role in erosion control, as a live fence, as a windbreak, for shade and as a bee plant[299]. Traditionally, the trees are mainly grown in home gardens of up to 0.1 ha with 5 - 15 trees per garden. Other crops usually grown in these gardens are papaya, coffee, banana, cassava, maize, sugar cane, cotton and Capsicum peppers[299]. Other Uses The seeds of this species are very effective for water purification[299 , 317]. The seed contains a protein (cationic polyelectrolyte) that acts as a flocculent in water purification. It can be extracted from the ground seed with salt water[299

]. Even very muddy water can be cleared when the crushed seeds are added[418]. Solid matter and some bacteria will coagulate and then sink to the bottom of the container of water[418]. The cleaned water can then be poured off and boiled[418]. The seed oil is used as a lubricant, in perfumery and in soap production[299]. The wood is very soft and is useful for making paper[299]. The wood makes low-grade firewood and poor-quality charcoal[299].

dwatta Anthelmintic Antiasthmatic Antidiarrhoeal Antitussive Epilepsy Hypoglycaemic Hypotensive Leprosy MalariaAn infusion of the leaves is used as a remedy against leprosy[299]. They are also used to treat hypertension, retained placenta, asthma, colds, as an anthelmintic, to induce vomiting and to promote wound healing[299]. The leaves of certain trees of this species are renowned for their effectiveness against diarrhoea. The smoke of burning roots is used as a treatment for epilepsy[299]. The smoke is said to be inhaled by women in Sudan during a difficult labour, but as the species has not been collected so far in Somalia, this record is probably incorrect[299]. The leaves and roots are used as a cure for malaria, stomach problems and diabetes[299]. The bark is chewed as a treatment against coughs, and is also used to make fortifying soups[299]. Ethanol extracts of the leaves and roots have shown promise in control of *Trypanosoma brucei* and *Leishmania donovani* in in-vitro experiments[299]. The leaf extract causes increased uterine smooth muscle contractions[299]. The medicinal use of leaves to expel a retained placenta may be related to these increased contractions[299]. A crude seed extract strongly inhibited growth of *Staphylococcus aureus*, *Salmonella typhi*, *Shigella* sp. And *Candida albicans*[299]. An aqueous extract of the leaves has been found to lower blood glucose concentration although it was less potent than glibenclamide. The effect was observed to increase with time and with increasing dose of the extract[299].

nrakta East tropical Africa - Ethiopia and Kenya. ksacta *Acacia tortilis* woodland, riverine woodland of Hyphaene, *Acacia*, etc.; *Acacia*, *Delonix*, *Commiphora* associations, scrub and succulent steppe; usually on rocky ground by permanent water; at elevations from 390 - 1,200 metres[328].

propta Seed - sow in individual pots in a semi-shaded position, placing the seed 1cm deep in a mixture of sand and loam enriched with compost[299]. Do not allow the compost to become dry. Germination rates of fresh seeds approaches 100%, they germinate fastest at 25 - 30°C. Transplanting to permanent positions can be done when the plants are 20cm tall or 6 months old, and with proper water supply (about 25 litres of water every 3 - 4 days) all plants should survive[299]. Seeds of up to 1 year old have a germination rate close to 100%; germination of older seeds is variable and declines as a function of age and storage method[299]. The most common practice in traditional cultivation is to transplant seedlings that have become established under old trees. Before transplanting, branches and roots are cut and the seedlings are left to dry for a week, roots are covered with ash and upper parts with dung[299]. Cuttings can be used, but trees established from cuttings were found to have a poor root system[299].

nwatta Management: Coppice Management: Standard Regional Crop Staple Crop: OilA plant of the arid to moist tropics, where it can be grown at elevations from 390 - 2,200 metres. It grows best in areas where annual daytime temperatures are within the range 25 - 35°C, but can tolerate 15 - 48°C[418]. Plants can tolerate light frosts, even heavier frosts do not always kill the plant since it is able to resprout from the base[299 , 418]. It prefers a mean annual rainfall in the range 500 - 1,500mm, but tolerates 200 - 2,800mm[418]. Grows best in a sunny position, but tolerates light shade[385 , 418]. Prefers a well-drained soil with a high groundwater table, but it can also withstand dry conditions well, and consequently it is found in both wetlands and dry areas[299 , 385]. Prefers a pH in the range 6 - 8, tolerating 5 - 9[418]. Plants are very drought tolerant, remaining green and continuing to grow even during exceptionally long dry seasons[418]. In experimental plantings in Sudan, plants reached a height of 3 metres within 14 months. The first flowers appeared 30 months after sowing.[299] The first leaves can be harvested after about 3 years[299]. Trees are pruned every 5 years during the rainy season[299]. The leaves are preferably left on the trees during the rainy season when other vegetables are in ample supply[299]. The leaves have a better taste in the dry season than during the rains[299]. Yield estimates

hmimhtut cyutli hgattcup hwicli hrasjlutnyik hpa7tli frusflat-prikkwishom hpa7tmwatli hjonli

drutta *Chrysobalanus icaco* is an evergreen Tree growing to 6 m (19ft) by 8 m (26ft) at a slow rate. See above for USDA hardiness. It is hardy to UK zone 10. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acidic, neutral and basic (mildly alkaline) soils and can grow in very acid and saline soils. It can grow in semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

kcakta Edible Parts: Fruit Oil SeedEdible Uses: OilEdible portion: Fruit, Kernel, Seeds, Nut. Fruit - raw or cooked. A fairly sweet, white, spongy flesh[307]. They are stewed in sugar, dried like prunes or made into jams and jellies[301]. The ovoid fruit is 2 - 5cm long[200]. The purple or red-skinned fruits are considered to have a superior flavour to white forms[307]. Seed - raw or cooked[301]. A delicious flavour[200]. They are roasted and eaten[301]. When preserving the fruits, they are pierced right through the centre, including the seed. This allows the juice of the fruit to penetrate the seed and, after separation from the shell, the nut-like kernel is eaten[301]. An edible oil can be extracted from the seed[307].

tcanta Dye Hedge Lighting Oil Soil stabilization TanninOther uses rating: Medium (3/5). Seaside tree, Backyard tree, Screening, Hedging, Dune stabilization, Planter, Topiary, Xerophytic, Border, Espalier, Pollard, Planted as an ornamental shrub. Agroforestry Uses: Plants can be grown as a hedge[307]. They are particularly well suited for use by the sea[307]. The plant often forms large, rambling, impenetrable thickets and so it has been used to stabilize sand dunes[307]. Other Uses: An oil can be obtained from the seed[307] The seeds are so rich in oil that they can be strung on sticks and burnt like a candle[307]. The bark is rich in tannins[307]. A black dye can be obtained from the fruit[307 , 510]. A black dye can be obtained from the leaves[510].

dwatta Antidiarrhoeal Astringent Dysentery SkinThe root, bark, fruit and leaves all contain tannins and are astringent[307 , 348]. They are used internally in the treatment of diarrhoea, dysentery and dyspepsia[307 , 348]. They are used externally as a wash to treat skin complaints[307]. The juice of the roots and leaves, mixed with oil, is used to contract the sphincters of the vulva by women wishing to simulate virginity, and the same preparation is used by men for treating flaccid scrotum[348].

nrakta S. America from Brazil, north to the Caribbean, Mexico and southern Florida. West tropical Africa - coastal areas from Senegal to Angola. ksacta Forests near the shore line[200]. Coastal shoreline and sandy thickets[307]. Usually found where the soil is moist or flooded[335].

propta Seed - best sown as soon as it is ripe in a partially shaded position in a nursery seedbed. A moderate germination rate can be expected, with the seed sprouting within 20 - 25 days[420]. When the seedlings are 4 - 5cm tall, pot them up into individual containers and they should be ready to plant out 6 - 7 months later[420]. Soft nodal cuttings. Woody stem cuttings, Layering.

nwatta Agroforestry Services: Living fence Management: Standard Regional Crop Staple Crop: Protein-oilA plant for the humid lowland tropics[307]. Prefers a position in full sun or light shade[307]. Succeeds in ordinary garden soil[200]. Plants can succeed in both poor and fertile soils[335]. Requires a well-drained soil[307]. Established plants are very drought tolerant[307]. Very tolerant of salt-laden winds[307]. Plants have escaped from cultivation and become naturalized in some areas[307]. There is at least one named form[301]. Plants usually flower in two or more flushes per year[335], and can flower intermittently throughout the year[307].

5.2.32 Vangueria infausta

African medlar
10 thin 12 cyuc 4 kcaak 2 tcan 2 dwat 5 m hkuc
hmimhtut cyutli hgatkyuctup hwicli hrasjlutnyik hpa7tli flat-prikkwis hpa7tmwatli hjonli

drutta *Vangueria infausta* is a deciduous Shrub growing to 5 m (16ft) by 5 m (16ft) at a slow rate. See above for USDA

hardness. It is hardy to UK zone 10. The flowers are pollinated by Bees, Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acidic, neutral and basic (mildly alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil and can tolerate drought.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw[46 , 301 , 418]. A soft, fleshy pulp[418]. An acid, somewhat sweetish-sour flavour[301]. The brown pulp round the seeds tastes somewhat like stewed dried, apple-rings[466]. The pulp is sometimes soaked in water and then dried for later use[418]. The green fruit usually ripens to a dull orange-brown or purplish colour. It is 15 - 47mm in diameter[308]. Seeds - raw[301]. They can also be made into a relish[301].

tcanta Fuel WoodOther Uses The wood can be used as poles for houses, tool handles and agricultural implements[303]. The wood is considered a good fuel in some areas, though in others it is said to bring bad luck if burnt[295 , 303 , 418].

dwatta Anthelmintic Antidote Antiinflammatory Antitensive Malaria Odontalgic PurgativeThe root is anthelmintic, antidote and purgative[418]. A popular snake-bite remedy, it is also used to treat a variety of complaints such as malaria, pneumonia, coughs and other chest troubles[418]. A warm decoction of the roots is considered to be an effective remedy for heart ailments in Namibia[775]. The leaves are applied externally as a treatment for swellings on the legs; inflammation of the navel in children; abdominal pain; and for the relief of dental pain[418].

nrakta Tropical Africa - Cameroon to Kenya, south to Namibia, Zambia, Zimbabwe, Mozambique and northern S. ksacta Grassland, thicket and open woodlands, often on termite mounds, in rocky places and even dunes at elevations from near sea level to 1,500 metres[308].

propta Seed - best sown as soon as it is ripe[295]. It can be stored for up to 12 months if dried properly[303]. Cuttings.

nwatta A tree of the subtropics to tropics, usually growing in areas with a distinct dry season at elevations up to 1,500m [308 , 418]. It grows best in areas where annual daytime temperatures are within the range 17 - 28°C, though it can tolerate 12 - 36°C[418]. The plant is fairly frost-tolerant and is able to withstand temperatures down to -5°C when it is dormant, though even light frosts can damage the young growth[418]. It prefers a mean annual rainfall of 800 - 1,200mm, but tolerates 700 - 1,500mm[418]. Succeeds in full sun to light shade[418]. Succeeds in most soils so long as they are well drained[418]. Established plants are drought tolerant[418]. Prefers a pH in the range 5.5 - 7, tolerating 5 - 7.5[418]. A slow growing plant, usually increasing height by less than 50cm a year[295 , 303].

5.2.33 Baccharoides hymenolepis

Baccharoides
10 thin 12 cyuc 4 kcaak 3 tcan 2 dwat 4 m hkuc
htut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprikkwis hpa7tmwatli hjonli

drutta *Baccharoides hymenolepis* is an evergreen Shrub growing to 4 m (13ft) by 3 m (9ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 9. The flowers are pollinated by Insects, Wind. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acidic, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist soil.

kcakta Edible Parts: LeavesEdible Uses: CondimentLeaves - raw or cooked. Eaten in salads, as a potherb or used as a garnish[299]. The leaves can be dried for later use[299]. The leaves are less bitter than related species that are used in the same ways, such as bitterleaf (*Gymnanthemum aegyptium*)[299].

tcanta Fuel Hedge Soil stabilizationOther uses rating: Medium (3/5). Agroforestry Uses: The plant is sometimes planted as a hedge around homes and gardens, both for vegetable use and for the ornamental value of the large white or purple flowering heads[299]. The plants help to stabilize the soil, especially on slopes[299]. Other Uses Dry branches and stems serve as fuel[299].

dwatta Antidiarrhoeal Antitumor PurgativeThe plant is used medicinally as a cure for pneumonia[299]. Juice from

for treating otitis[332]. An infusion of the bark is used to treat stomach aches[398]. Applied externally, it is used as a wash on sores, ulcers, etc[332]. Shavings of the wood, combined with the pods of *Acacia nilotica* and roots of *Borassus* spp. are pounded in water and boiled for about two hours, after which the liquid is used in Nigeria to rinse the mouth for treating toothache[332]. Sap from freshly felled trees, as also water from holes in the tree, or an infusion of the black heart-wood, are similarly used[332]

nrakta Tropical Africa - Senegal to Eritrea and Yemen, south to Namibia, Transvaal and Mozambique. ksacta Riparian forest, more rarely on termite mounds or rocky outcrops or in dry semi-evergreen forest at elevations of 60 - 1,370 metres[308]. Drier northern borders of the humid rain-forest zone especially in wet situations[332].

proпта Seed - pre-soak overnight by immersing the seed in hot water which is allowed to cool in order to break dormancy[303]. They should be sown in flat seed trays filled with river sand. Under ideal conditions seeds germinate within 50 days[303]. Seedlings are then planted out when they reach the 3-leaf stage because if left longer, the taproot may be damaged when transplanting[303]. They are rather slow growing initially but the growth rate speeds up considerably after a year[303]. Young trees do not transplant easily[332] Seed storage behaviour is orthodox. Viability can be maintained for one season in open storage, but can be maintained for several years in hermetic storage at 3°C with 5-6% mc[303]. Root suckers.

nwatta A plant of the dry to moist tropics, where it is found at elevations up to 1,300 metres. It grows best in areas where annual daytime temperatures are within the range 16 - 27c, but can tolerate 12 - 34c[418]. It prefers a mean annual rainfall in the range 500 - 1,300mm, but tolerates 400 - 1,500mm[418]. Prefers a sunny position[418]. Prefers heavy soils[303]. Prefers rocky soils along seasonal water courses and swamps[303]. It grows well in moist, red loams, volcanic and loamy sands[303]. Prefers a pH in the range 5.5 - 6.5, tolerating 5 - 7[418]. Trees can be coppiced[303]. A dioecious species, both male and female forms need to be grown if fruit and seed are required.

5.2.28 *Ancylobotrys petersiana*

Mbohoya, Mwungo-wungo.

10 tin 12 cyuc 4 kcak 2 tcan 0 dwat 6 m hkuc
hmimhtut cyutli hgahtyuctup hwicli hrasjlutnyik hpa7tli flatprikwis hpa7tmwatli hjonli

drutta *Ancylobotrys petersiana* is an evergreen climber growing to 6 m (19ft) by 6 m (19ft) at a fast rate. See above for USDA hardiness. It is hardy to UK zone 10 and is frost tender. 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 dry or moist soil and can tolerate drought.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw[323]. The pulpy flesh is delicious[308]. The flavour has been likened to guavas[323]. The fruit is more or less round, with numerous seeds embedded in the soft pulp[323]. It is eaten when both ripe and nearly ripe[323]. The ripe fruit is eaten skin and all, but the semi-ripe fruit must be first peeled[323]. The pulp of the fruit is soaked in water, squeezed and filtered. The juice is then sweetened with sugar and drunk after being cooled[398]. It is also frozen and eaten as iced blocks. The fruit is around 5cm in diameter, yellow or light orange when fully ripe[308]. Fruit can be stored for about 2 weeks.

tcanta Latex StringOther uses rating: Low (2/5). Other Uses: The stem produces a white latex, which is tapped and used for making balls[398]. The stems are flexible and used for ropes[398].

nrakta Eastern Africa - Somalia and Kenya, south to S. Africa. ksacta In dune scrub, among boulders on rocky hill-sides, in mixed woodland[308]. Open bushland or woodland, coastal evergreen forest, dry forest, at elevations from sea level to 400 metres[398].

proпта Seed and Root suckers.

nwatta The plant produces sweetly-scented white flowers[323].

5.2.29 *Dovyalis abyssinica*

Abyssinian Gooseberry

10 tin 12 cyuc 4 kcak 2 tcan 2 dwat 6 m hkuc
htut cyutli tcup hwicli hrasjlutnyik hpa7tli frusflatprik hpa7tmwatli dyat hjonli

drutta *Dovyalis abyssinica* is an evergreen 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 10. The plant is not self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid and neutral soils and can grow in very acid soils. It cannot grow in the shade. It prefers moist soil.

kcakta Edible Parts: Fruit Root StemEdible Uses: Fruit - raw or cooked[398]. The fruit has a thin, tender skin and a juicy melting flesh with an aroma and flavour faintly suggestive of apricots[301]. When fully ripe it makes a very agreeable jelly[301]. The fruit is about 25mm in diameter[200]. Roots and stems are eaten in a tonic soup[301].

tcanta Other Uses: The wood is hard. It is used for tool handles, spoons and bedsteads[398]. The wood is used for fuel[398].

dwatta The leaves are pounded, soaked in water and the liquid taken as a treatment for indigestion[398]. The roots are used for treating indigestion and VD[398].

nrakta Eastern Africa - Ethiopia and Somalia, south to Malawi and Mozambique. ksacta Highland forest over 1,800 metres[307]. Rain-forest to riparian forest and scrub; dry evergreen forest; sometimes in open wooded grassland; semi-evergreen or deciduous bushland; rocky limestone slopes; at elevations from 600 - 3,050 metres[328].

proпта Seed - Layering[200]. Graft or shield-bud desirable varieties on to seedling rootstocks[200].

nwatta A plant of the hot, dry, tropics, though it also succeeds in areas of higher rainfall[335]. Grows best in a fertile, humus-rich, well-drained soil[200]. Dislikes calcareous soils[335]. Plants begin bearing when about 4 - 5 years old from seed[200]. Dioecious - both male and female plants must be grown if fruit is required. One male is sufficient for about 30 female plants[200].

5.2.30 *Vitex madiensis*

Ekarukei, Murukukwe

10 tin 12 cyuc 4 kcak 3 tcan 2 dwat m hkuc
htut cyutli tcup hwicli hrasjlutnyik hpa7tli flatprik hpa7tmwatli hjonli

drutta *Vitex madiensis* is a TREE growing to 4 m (13ft) by 4 m (13ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Bees. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid and neutral soils. It cannot grow in the shade. It prefers moist soil.

kcakta Edible Parts: Fruit OilEdible Uses: OilFruit - raw or cooked[323]. Sweet and mealy[398]. The thin pulp clings to the stone, which contains 3 to 4 seeds[323]. The purple-black fruit is about the size of an olive[323]. The oblong-rounded fruit is about 25mm long and 10 - 20mm wide[398].

tcanta Charcoal Cosmetic Fuel OilOther Uses The leaves yield an essential oil of such sweet and penetrating fragrance that it has been recommended for commercial development[323]. The branches are used as chew sticks for maintaining the health of teeth and gums[774]. The wood is used for fuel and to make charcoal[398].

dwatta Odontalgic SkinThe leaves and roots have medicinal uses[323]. Bark extracts are used in the treatment of skin diseases and toothache[774].

nrakta Tropical Africa - Senegal to Somalia, south to Angola, Zambia, Zimbabwe and Mozambique. ksacta Combretum, Terminalia and Brachystegia woodland and flood pans with Brachystegia; grassland, wooded grassland or dense woodlands; at elevations from 1,000 - 1,800 metres[398].

proпта Seed -

nwatta Not known

5.2.31 *Chrysobalanus icaco*

Coco Plum, Paradise Plum

10 tin 12 cyuc 4 kcak 3 tcan 2 dwat 6 m hkuc

are scarce. Annual production can reach 2,000 fruits or 6 kg of seed per tree under ideal conditions[299]. At elevations of over 1,650 m no fruits at all are harvested and leaf production is poor[299]. The taste of the leaves differs between trees and ranges from sweet to bitter[299].

5.2.23 *Vitex payos*

Chocolate Berry

10 tin 12 cyuc 4 kcak 2 tcan 2 dwat 8 m hkuc
htut cyutli kyuctup hwicli hrasjlutnyik hpa7tli flatprikwis hpa7tmwatli hjonli

drutta *Vitex payos* is a TREE growing to 8 m (26ft) by 8 m (26ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Bees. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil.

kcakta Edible Parts: FruitEdible Uses: Fruit - raw or cooked[308, 323]. Sweet, with a mealy texture[303]. It can be made into jam[323]. Each fruit is about 2 cm long, with pointed tips and a chocolate brown or black skin. The juicy pulp surrounds a single hard stone. A very popular fruit in parts of Africa, it is definitely an acquired taste for people who have not eaten it previously. Westerners are typically offended by the flavour, the powdery texture, the oily feel in the mouth, and the strong smell[323]. The fruits have a rather unpleasant smell, and leave a temporary black stain on the teeth, but they are much eaten by children and herds-men[398].

tcanta Fuel Mulch Soil conditioner WoodAgroforestry Uses: The leaf fall of the tree acts as a mulch to improve soil condition[303]. Other Uses The wood is very hard. It is used for poles and spoons[398]. The wood is used for fuel[303, 398].

dwatta Appetizer SkinA decoction of the root is used as a remedy for stomach problems[398]. The pounded bark is used to treat threadworm and skin problems[398]. The leaves are boiled and the liquid drunk by patients who have lost their appetite[398].

nrakta Tropical Africa - DR Congo, Kenya, Tanzania, Angola, Zambia, Malawi, Zambia, Zimbabwe, Mozambique. ksacta Open woodland, wooded grassland and on rocky outcrops at elevations from 500 - 1,500 metres[308].

proпта Seed - it has a hard seed coat which hinders germination[303]. In the wild the seedcoat is broken by annual fires[303].

nwatta *Vitex payos* is a species of the tropics, growing in hot, low and semi-arid places with a high water table. In more arid zones it is found near rock outcrops. It grows in areas where the mean annual rainfall is within the range 650 - 850 metres[303]. The tree coppices well[303].

5.2.24 *Boscia senegalensis*

Aizen, Boscia

10 tin 12 cyuc 4 kcak 3 tcan 2 dwat 8 m hkuc
pcimhmimhtut cyutli hgattcup hwicli hyschrasjlutnyikfrp hpa7tli frusflatprikwissip hpa7tmwatli hjonli

drutta *Boscia senegalensis* is an evergreen shrub growing to 8 m (26ft) by 10 m (32ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. 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 full shade (deep woodland) semi-shade (light woodland) or no shade. It prefers moist soil and can tolerate drought.

pcista Poison: The leaves are used to protect stored food against parasites in granary. Leafless twigs contain glucosinates, which can hydrolyze to mustard oils, which are highly toxic and irritant to mucous membranes.

kcakta Edible Parts: Fruit Leaves Root SeedEdible Uses: Coffee Drink SweetenerEdible portion: Seeds, Leaves, Fruit (Caution), Vegetable. The yellow cherry-sized berries (up to 15mm in diameter) are borne in clusters. When newly ripe, their rather sweet pulp is translucent and jelly-like. However, in the desiccating air it quickly dries out, turning into

something not unlike caramel before ending up a brittle, brown, and quite sugary solid[323]. Despite its good taste, this toffee-like treat is difficult to separate from the seed[323]. Besides being eaten fresh, the ripe fruits are often boiled[323]. The juice is sometimes extracted, filtered, and boiled down into a semisolid, which is commonly mixed with millet and curdled milk to make cakes[323]. The dried seeds are used as a substitute for millet or lentils[323]. They require lengthy preparation and must be eaten cooked[323]. The traditional procedure involves soaking the seeds for a week (changing the water daily) to remove bitter components[323]. Less commonly, the seeds are boiled for 3 hours (and rinsed at least twice with new water)[323]. In either case, they are subsequently dried and ground into flour and used in making porridge[323]. The roasted seed is used as a substitute for coffee[323]. Young roots, scraped of bark, may be ground, sieved, mixed with cereals, and boiled into a thin gruel or thick porridge[323]. They are very sweet[323]. The roots can be sun-dried and stored for later use[323]. The root tissues are also boiled slowly for several hours to make a sweet syrup[323]. The leaves, although just about the most leathery and least appealing foodstuffs on earth, are also consumed[323]. Most are dropped into soups or boiled and mixed into cereal products such as gruel or couscous[323]. The plant is particularly useful this way because it is an evergreen and provides food and nutrients when other plants are bare[323]. An important food in the Sudan and Mali. The seeds are used as a famine food in emergencies. Chemical composition (after Berry-Koch) (g/mg/mcg per 100g) (dried): Protein = 21g. Fat = 1.6g. Calcium = 123 mg. Fe = 6.8 mg. Beta carotene = 165 mcg Vitamin B1 = .02 mg. Vitamin B2 = .03 mg. Niacin = 8.8 mg. Vitamin C = 5 mg. Kcal = 341; (cooked): Protein = 5.4g. Fat = 0.2g. Calcium = 33 mg. Fe = 2.8 mg. Beta carotene = 25 mcg. Vitamin B1 = .01 mg. Kcal = 92. (after Abdelmuti) (un-debittered): Protein (crude) = 29.3%. Oil = 0.7%. Ash = 3.5%. Fibre (crude) = 2.7%. Carbohydrate (soluble) (starch) = 39.5%; (sugars): Sucrose = 4.3%. D-glucose = 0.2%. D-fructose = 0.7%. Amino acids (g (16g N)-1): Aspartic acid = 7.7g. Threonine = 1.7g. Serine = 2.3g. Glutamic acid = 9.0g. Proline = 6.5g. Glycine = 3.5g. Alanine = 3.2g. Valine = 4.5g. Cysteine (performic acid oxidation) = 1.3g. Methionine (performic acid oxidation) = 1.8g. Isoleucine = 2.9g. Leucine = 7.0g. Tyrosine = 2.3g. Histidine = 1.3g. Lysine = 1.5g. Arginine = 15.1g. Minerals: Sulphur = 2.20 mg/kg-1 (dry). Potassium = 0.15%-1 (dry). Magnesium = 0.10% (dry). Calcium = 0.14% (dry). Na = 0.01% (dry). K = 1.03 mg/kg-1 (dry). Zinc = 42 mg/kg-1 (dry). Iron = 10.5 mg/kg-1 (dry). Manganese = 17 mg/kg-1 (dry). Copper = 8 mg/kg-1 (dry).

tcanta Filter Fuel Shelterbelt Soil stabilization WoodOther uses rating: Medium (3/5). Agroforestry Uses: Aizen is a promising plant for establishing famine-food reserves, for protecting erodible soil, for stabilizing dunes, for windbreaks, and for other utilitarian purposes in the harshest of harsh sites[323]. Its foliage is unpalatable to livestock and other herbivores, who only eat it in times of direst need. Thus the trees are able to survive without the need for protection[323]. Other Uses The leaves are added to granaries in order to protect stored foods against pests[774]. This long-standing traditional process seems to work[323]. Leafless twigs contain glucosinates, which can hydrolyze to mustard oils, which are highly toxic and irritant to mucous membranes[303]. The plant contains natural coagulants. The bark, twigs, leaves, and roots are used to scavenge suspended and colloidal compounds from unclean water (such as that from ponds churned up by storms or from baobab-tree cisterns contaminated with soil). Normally the plant parts are sliced up and placed on the water surface. Compounds leach out and catch the clay and other particulates like magnets, causing them to clump and settle to the bottom. It is reported that truly turbid water can be safely drunk after just a day of such treatment[323]. For even faster results, aizen branches are swirled in the water[323]. Aizen wood is soft and easy to work when boiled[303]. It is cut for poles, notably those holding up houses[323]. Although smoky and stinky, the wood is used as cooking fuel when nothing better is at hand (which in the harshest areas is all too often)[323]. This plant is attractive to bees, butterflies and birds. Suitable for growing in containers.

dwatta Ophthalmic Stomachic Vermifuge Vitamin CThe leaves are used as a treatment against bilharziosis, guinea-worm sores, haemorrhoids, intestinal complaints,

headaches, colic and ulcers[774]. An emulsion of the leaves is used as an eyewash[46]. The roots are vermifuge[774]. The fruits are used in the treatment of syphilis[774]. The plant (part not specified) is used in the treatment of jaundice and swellings[774].

nrakta Africa - Senegal and Mauritania east through the Sahel to Egypt, Somalia and Kenya. *ksacta* It occupies most types of arid-land environment including stony slopes, sand dunes, and cracking-clay plains[323]. It often occurs in desiccated, barren, hard, and even fire-scorched sites [323]. It often sprouts directly out of termite mounds[323].

propta Seed - Although the seeds germinate readily, the seedlings have so far proved difficult to transplant from nursery to field. Thus, it is recommended that direct-seeding trials be established to find out how to establish healthy populations in situ[323] There are claims that root and shoot cuttings have been used to propagate aizen[323]. This could be a vital lead because with them superior plants can be replicated[323]. The possibility of grafting should be explored, because it would allow elite aizen types to be grafted onto the wild trees now so prevalent and widespread. That in turn would ensure rapid quality-fruit production. Also, it would provide lasting benefits because of the rootstock's obvious adaptability to the site[323].

nwatta A plant of the arid tropics and subtropics where it can be found at elevations up to 1,450 metres[303]. This plant's endurance is remarkable. It tolerates shade temperatures as high as 45°C, a level not rare in its habitat; it also survives in areas receiving as little as 100mm annual rainfall, although it grows best where there is at least 250 - 500mm[323]. Requires a sunny position. Prefers sandy-clayey soils, fixed dunes, abandoned croplands and termite mounds[774]. Succeeds even in very dry, poor, sandy, rocky, worn-out laterite, or clay soils[323, 774]. Contributing to the plant's built-in drought tolerance is its remarkable leaf structure: the cuticle is up to 20 microns thick, the stomata are sunk in deep cavities, and each stomata has thickened walls and a protective armouring of papillae[323]. The flowers provide bee forage, often in areas where little else capable of sustaining honeybees is available[323]. Although the fruit is a seasonal food, its season differs from the norm and comes at the beginning of the rains, a time when farm crops are just being planted and anything to eat is usually difficult to find[323]. Suitable for growing in containers. Suitable for xeriscaping.

5.2.25 *Gymnanthemum amygdalinum*

Bitterleaf

10 tlin 12 cyuc 4 kcaak 2 tcan 3 dwat 8 m hkuc
htut cyutli hgatkuyctcup hwicli hrasjlitnyik hpa7tli flatprikli-wis hpa7tmwatli hjonli

drutta *Gymnanthemum amygdalinum* is an evergreen Shrub growing to 8 m (26ft) by 7 m (23ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.

ckaakta Edible Parts: Leaves ShootsEdible Uses: **Condition**Young leafy shoots - cooked[299, 301]. Eaten as a potherb or added to soups[301]. The leaves often have an intensely bitter flavour, but forms exist that are nearly free of bitterness[301]. The plant should be harvested by trimming off the ends of whole shoots[299]. This encourages new growth whereas simply removing leaves can slow down growth[299].

tcanta Charcoal Fencing Fuel Hedge Parasiticide Plant breeding Soil stabilization Teeth WoodAgroforestry Uses: The plant is sometimes grown as a hedge[299]. The branches are termite resistant and are used as stakes to line out fields and as a live fence[299, 418]. The tree is sometimes planted to prevent soil erosion[418]. Other Uses: Bitterleaf is useful as a control agent against diseases in plants[299]. The ash from burnt branches is used to control seed-borne fungi, thus ameliorating seed viability and germination capacity[299]. Young twigs are used as toothpicks or chewing sticks[299]. They have been shown to contain substances that have a marked activity against bacteria that

cause gum diseases[299]. They also act to stimulate the appetite[418]. The wood is used for timber[418]. The wood is used for fuel and to make charcoal[303, 418]. Dry stems and branches provide fuel[299].

dwatta Antidiarrhoeal Bitter Dysentery Febrifuge Infertility Laxative Malaria Mouthwash Parasiticide Stomachic TonicBitterleaf is commonly used in traditional medicine in Africa. Leaf decoctions are used to treat fever, malaria, diarrhoea, dysentery, hepatitis and cough, as a laxative and as a fertility inducer[299]. They are also used as a medicine for scabies, headache and stomach-ache. Leaves are placed on a wound as a substitute for iodine[299]. The bitterness in the leaves is caused by sesquiterpene lactones and steroid glucosides. Some of these compounds have significant antiparasitic activity, especially vernodalin and vernonioside B1. Vernolepin showed platelet anti-aggregating properties. Vernodalin and vernomygdin have cytotoxic activity[299]. Young twigs are chewed as a stomachic tonic and appetite stimulant[301]. One of the most common medicinal uses of *Vernonia amygdalina* is as a treatment against intestinal worms including nematodes[299]. Not only humans but also chimpanzees ingest the bitter pith of *Vernonia amygdalina* for the control of intestinal nematode infections[299]. Root extracts are used as treatment against malaria and gastrointestinal disorders[299]. In Zimbabwe a root infusion is used to treat sexually transmitted diseases[299]. Bark infusions are also taken to treat fever and diarrhoea, dried flowers against stomach disorders[299].

nrakta Tropical Africa - widespread, in most countries from Guinea to Mali and south to Angola, Botswana, Zimbabwe and Mozambique. *ksacta* Along rivers and lakes, in forest margins, woodland and grassland, at elevations up to 2,000 metres. Often found in disturbed localities such as abandoned farmland and in secondary woodland[299].

propta Seed - takes 2 - 3 weeks to germinate[299]. Cuttings of mature wood.

nwatta A plant of the tropics, where it is found at elevations from 600 - 2,800 metres. It grows best in areas where annual daytime temperatures are within the range 20 - 26°C, but can tolerate 16 - 35°C[418]. It prefers a mean annual rainfall in the range 750 - 2,000mm, but tolerates 600 - 2,400mm[418]. Requires a position in full sun[299]. Succeeds on most soil types, though it grows best in well-drained, humus-rich soils[299, 418]. Plants prefer a moist environment, though they are fairly drought tolerant once established[299]. Prefers a pH in the range 5.5 - 7, tolerating 5 - 7.5[418]. Plants can be coppiced[303]. Cultivated forms have been selected that are less bitter than the wild plant[299]. Flowering is induced by short days[299].

5.2.26 *Argania spinosa*

Argan Tree, Spiny Argania, Morocco Ironwood

10 tlin 12 cyuc 4 kcaak 3 tcan 2 dwat 7 m hkuc
htut cyutli hgattcup hwicli hyhsrjaslitnyik hpa7tli flatprikli-wis hpa7tmwatli hjonli

drutta *Argania spinosa* is an evergreen Tree growing to 7 m (23ft) by 12 m (39ft). See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Bees, Butterflies. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in nutritionally poor soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist soil and can tolerate drought.

pcista Plant has spines or sharp edges; use extreme caution when handling

ckaakta Edible Parts: Fruit Leaves Oil SeedEdible Uses: **Chocolate Oil**Edible portion: Nut - oil, Leaves, Fruit. An edible oil is obtained from the seed [418]. The white seeds contain up to 50% of a light brown oil[303]. This oil is an excellent source of vitamin E, and has a high nutritional value in the human diet. The locals mix oil with almonds and honey to make an almond butter; it also mixed with wheat germ and honey to make gruel[303]. The residue from the kernels, after oil extraction, is a thick chocolate-coloured paste called 'amlou' which is sweetened and served as a dip for bread at breakfast time in Berber households. Its flavour is similar to that of peanut butter [303]. The fruit are pressed for the oil which has an aroma and is used in cooking. The oil is cold pressed from the fruit. The oil is used like olive oil for cooking, frying and salad dressing.

tcanta Charcoal Fencing Fuel Lighting Oil Shelterbelt Soap making Soil reclamation Soil stabilization WoodOther uses rating: Medium (3/5). Agroforestry Uses: *Argania spinosa* shields thin soils from erosion, especially in over-grazed lands. Its deep roots help to bind the soil, facilitate water infiltration and replenish groundwater, thus helping to stabilise environmental conditions[303, 418]. The tree provides valuable shade for humans and livestock as well protecting pasture grasses from the extreme evapotranspiration that would result from direct exposure to sunlight[303]. Argan woodlands form a green belt that functions as a buffer against desert advancement in southern Morocco[303]. The plant is used for fencing and windbreaks Other Uses: An oil obtained from the seed is used for lighting and to make soap[418]. The wood is very hard, heavy and durable. It is very resistant to damage from wood-eating organisms[303]. It is used in carpentry, for making agricultural implements and building poles[418]. The wood is a good fuel and makes a very good charcoal[303, 418]. The seed shells are also burnt as a fuel[303]. Suitable for xeriscaping

dwatta Anticholesterolemic Digestive Tonic VasodilatorThe oil from the seeds is rich in vitamin E and has properties which lower blood-cholesterol levels, stimulate circulation of the blood, facilitate digestion and strengthen the body's natural defences. It is used as a cure for chicken pox, to treat juvenile acne and help remove stretch marks on pregnant woman[303].

nrakta Northwest Africa - Algeria, Morocco, Western Sahara, Mauritania. *ksacta* Slopes of rough hills, seeming to thrive between the rocks on poor soil, at elevations up to 1,500 metres[303].

propta Seed

nwatta Management: Standard New Crop Staple Crop: OilA plant of very arid areas, mainly in the subtropical areas of northwest Africa, but just entering the tropics in Mauritania, where it is found at elevations up to 1,500 metres [418]. It grows best in areas where annual daytime temperatures are within the range of 20° - 30°C, but can tolerate 10° - 35°C[418]. Mature plants can be killed by temperatures of -2°C or lower, but new growth is severely damaged at 0°C[418]. It prefers a mean annual rainfall in the range of 200 - 300mm, but tolerates 100 - 400mm[418]. Requires a sunny position[418]. Succeeds in a wide range of soils, including very poor, dry soils[418]. The tree is well suited to calcareous soils, sandy deposits and relatively poor semi-desert soils conditions but not drifting sands or water-logged soils[303]. Prefers a pH in the range 6.5 - 7.5, tolerating 6 - 8[418]. Established plants are very drought tolerant - they can shed their foliage and remain in a state of dormancy for several years during prolonged droughts[418]. Trees may start to bear when 5 - 6 years old from seed, and reach maximum production at the age of 60 years[418]. The average fruit yield maybe about 8 kg per tree[418]. A long-lived species, with trees living for 200 - 400 years[418]. Trees respond very well to coppicing[303].

5.2.27 *Diospyros mespiliformis*

West African Ebony, Monkey guava, jackalberry

10 tlin 12 cyuc 4 kcaak 4 tcan 3 dwat m hkuc
htut cyutli tcup hwicli hrasjlitnyikfrip hpa7tli flatprikliwis hpa7tmwatli dyat hjonli

drutta *Diospyros mespiliformis* is an evergreen Tree growing to 20 m (65ft) by 20 m (65ft) at a medium rate. See above for USDA hardiness. It is hardy to UK zone 10. The flowers are pollinated by Bees. The plant is not self-fertile. It is noted for attracting wildlife. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and can grow in heavy clay soil. Suitable pH: mildly acid, neutral and basic (mildly alkaline) soils. It cannot grow in the shade. It prefers moist soil.

pcista Sawdust of this species, as also of most *Diospyros* spp., causes dermatitis after continuous contact[332].

ckaakta Edible Parts: Fruit LeavesEdible Uses: **Drink Gum**Fruit - raw, cooked, dried or made into beverages by fermentation[308, 332, 335]. A sweet flavour[332, 335], similar to the persimmon (D. kaki)[332]. A kind of soft toffee can be made from the fruits, which along with some other similar edible fruits, such as figs and dates, are known as lubiya[332]. The globose, yellow fruit is up to 25mm in diameter[308]. The leaves are sometimes eaten[317, 332].

Chemical composition (Sudan sample, after Abdelmuti): Protein (crude) = 3.0% (dry). Fat = 0.9% (dry). Fibre (crude) = 16.5% (dry). Ash = 4.5% (dry). Carbohydrate (soluble): Starch = 6.1% (dry). Sucrose = 0% (dry). D-Glucose = 7.61% (dry). F-Fructose = 9.9% (dry). Amino acids (g (16g N)-1): Aspartic acid = 5.7g. Threonine = 3.0g. Serine = 3.3g. Glutamic acid = 6.6g. Proline = 7.6g. Glycine = 4.0g. Alanine = 3.3g. Valine = 4.3g. Cysteine = 1.0g. Methionine = 1.0g. Isoleucine = 3.7g. Leucine = 5.0g. Tyrosine = 2.0g. Phenylalanine = 3.3g. Lysine = 4.0g. Histidine = 2.3g. Arginine = 4.0g. Minerals: Sulphur = 0.05% (dry). Phosphorus = 0.11% (dry). Magnesium = 0.08% (dry). Calcium = 0.37% (dry). Na = 0.01% (dry). K = 1.51% (dry). Zinc = 5 mg/kg-1 (dry). Iron = 192 mg/kg-1 (dry). Manganese = 5 kg/kg-1 (dry). Copper = 1 mg/kg-1 (dry).

tcanta Adhesive Charcoal Containers Dye Fencing Fuel Furniture Gum Teeth Varnish WoodAgroforestry Uses: Said to be a suitable species for reforestation[332]. Natural regeneration is good[332]. Other Uses: The bark contains a dark-coloured gum which is used to mend broken pottery[332]. The bark is used for dyeing mats red[398]. The fruit-pulp is applied to pottery to glaze and varnish it[332]. The wood is used as chew-sticks[332]. The heartwood is black, very hard, but appears only in older trees over a certain girth; it is clearly demarcated from the 5 - 12cm wide band of creamy to reddish yellow sapwood that produces bands of black[848]. The freshly cut wood is light pinkish-brown, slightly darker to the centre[332]. Blackening of the heart-wood develops only after felling and appears to depend on edaphic characters, trees from savannah situations blackening while those from more thickly forested areas do not[332]. Blackening is possibly a pathological process and burying is said to accelerate it[332]. The texture is fine; the grain straight or slightly interlocked. The wood is heavy, very hard, strong; very durable, being resistant to fungi, dry wood borers and termites. It seasons slowly, with a high risk of checking or distortion; once dry it is poorly stable in service. The wood is difficult to saw and work, with serious dulling effect on saws and cutting edges - stellite tipped and tungsten carbide tools are recommended; the surfaces take an excellent polish, but picking up of interlocked or curly grain may occur in planing and a reduced cutting angle is recommended; it has a tendency to split upon nailing, and pre-boring is advised; it has good slicing properties, but powerful machines are needed; the gluing properties are satisfactory. The heartwood is valued for black-wood cabinetry, furniture manufacture and high-class carpentry. It is also used for heavy flooring, interior trim, ship building, vehicle bodies, musical instruments (especially the black keys of pianos, but also guitar fingerboards), precision equipment, turnery, carvings, knife-handles and brush backs[46, 299, 308, 332, 774, 848]. The sapwood, and sometimes also the heartwood, is used for poles, posts, vehicle bodies, agricultural implements, toys, novelties, sporting goods, combs, ladders, boxes, crates, crossbows, veneer and plywood[299]. The wood makes good fuel wood and charcoal[303].

dwatta Antiarthritic Antibiotic Antidiarrhoeal Antifungal Astringent Dysentery Febrifuge Haemostatic Laxative Leprosy Mouthwash Odontalgic Skin Stimulant Stomachic VermifugeThe plant is widely used in traditional medicine in parts of Africa, and a number of medicinally active constituents have been isolated. The principle constituent appears to be plumbagin, which has been shown to have antibiotic, anti-haemorrhagic and fungistatic properties. It is found in the root-bark to a concentration of 0.9% and but a trace in the leaves[332]. Tannin, saponin and a substance probably identical to scopolamine are also present[332]. There is a high fluoride content[332]. The leaves are astringent, febrifuge, haemostatic, mildly laxative, stimulant and vermifuge[332, 774]. Such reliance is placed on this drug-plant that it is usually prescribed alone[332]. An infusion is used in the treatment of a range of conditions - it is very effective in the treatment of fevers and infectious fevers; and is also used for dysentery; pneumonia; syphilis; leprosy and yaws[332, 774]. A decoction of leafy twigs is taken in draught as a poison-antidote[332]. The leaves and fruit are used internally for treating menorrhoea and dysentery from diarrhoea[332]. Externally, they are used in the treatment of headaches, arthritis and dermal troubles[332]. The leaves and fruit are chewed or applied as an infusion for treating gingivitis, toothache, as a dressing for cuts and wounds, and to prevent infection[332]. The sap is instilled into the ear