

A HANDBOOK
OF
TROPICAL GARDENING AND PLANTING.

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OF
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AND PLANTING

WITH SPECIAL REFERENCE TO CEYLON.

BY

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ROYAL BOTANIC GARDENS, PERADENIYA," &c.

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P R E F A C E .

The need for a practical work of this nature, especially adapted for the Tropics, has apparently been long felt, judging by the demand for information on the subjects treated in this handbook. Of books on horticulture in temperate countries, there is no end, but they are generally of little guidance in tropical regions, where the conditions of climate, labour and methods of working are so different. A writer in the *Ceylon Observer* recently remarked: "How much more attractive and interesting our bungalow gardens and compounds might be made if the right sort of information regarding their care were available. Too often they are tended only by the garden-cooly, who has no pretensions to any knowledge of gardening, and things which grow, do so more by luck than good management." The aim of the author has been, therefore, to supply as concisely as possible and in a manner to suit the practical man in the field or garden, the kind of information which is most generally sought for, not only on horticultural matters, but also on general planting or agricultural subjects.

In practice there is no sharp line of distinction between Planting and Horticulture, and the main principles underlying both are the same. "Agriculture in the tropics," said Sir William Thiselton Dyer, "is essentially extended gardening; it has little relation to the agriculture of temperate countries, and its methods are those of horticulture." According to Liebig, "perfect agriculture is the foundation of all trade and industry, the foundation of the riches of state"; while "scientific horticulture," said Dr. Bailey, "joins hands with the plant biologists on the one hand, and with commerce on the other." For ladies, gardening has

special attractions ; the cultivation and arrangement of flowers is not only especially appropriate to them, but they are also frequently successful competitors with men in the art.

Gardening or horticulture is obviously advancing in Ceylon, as in other tropical countries, and it is being recognised, slowly but surely, that it plays an important part in home adornment and comfort, as well as in rural improvement and sanitation. Nowadays many planters, mercantile and professional men, manifest a keen interest in their garden, and in some cases become experts in the cultivation of certain classes of plants which claim their special attention. Superintendents of estates or plantations in lonely districts admit the exhilarating influence of the presence of choice flowering plants about their bungalow, and when such are absent it is usually due not so much to indifference on the part of the superintendent as to circumstances over which he has no control. In rubber districts especially, the depressing effect of long interminable stretches of sombre-looking rubber trees is well-known, and recently several Companies have shown a desire to have attractive flowering trees (as urged by the writer in a recent pamphlet) planted around the bungalows of their superintendents.

I leave it in the hands of readers to judge of the merits of this work, if it has any. The general arrangement of the plants or crops, useful or ornamental, into sections according to the elevation and purpose for which they are especially suited, will, I trust, be appreciated. To facilitate reference and save the time of readers, considerable use has been made of tabular forms which contain only the most essential particulars. The planting products in Chapters XXII and XXIII are considered in accordance with their importance in Ceylon. Though, however, a botanical arrangement has been avoided in preference to an economic or practical one, the botanical name and Natural Order or family of each plant or product are invariably given. Most people nowadays know the meaning of plant affinity, and to these a knowledge of a plant's scientific name and family often conveys some idea as to its general character or utility. The common or vernacular names, when sufficiently popular or well-known, are given in English, Sinhalese, and Tamil.

My thanks are due to several gentlemen as well as ladies who have kindly supplied me with valuable suggestions and information. Lady Blake has favoured me with useful notes on various ornamental plants, and Mrs. Westland and other ladies have contributed recipes for jams, jellies, preserves, &c. I am especially indebted to Mr. E. E. Green, F.E.S., F.Z.S., Government Entomologist, and Mr. T. Petch, B.A., B.Sc., Government Mycologist, who obligingly furnished me with much of the information in the chapters on *Insect Pests* and *Fungus Diseases* respectively; to Dr. R. H. Lock, M.A., sc.D., Assistant Director, Royal Botanic Gardens, for guidance and encouragement; to Mr. M. Kelway Bamber, M.R.A.C., F.I.C., &c., Government Chemist, who has read, and contributed to, the chapters on *Soils* and *Manures*; to Mr. J. K. Nock,* Curator of Hakgala Gardens, for much information on Up-country fruits, vegetables, &c.; to Mr. C. Driberg, B.A., F.H.A.S., Secretary of the "Ceylon Agricultural Society" and Superintendent of School Gardens, who has written the Calendar for the Low-country and afforded assistance in other ways; and to the Hon'ble the Principal Collector of Customs, Colombo, who has courteously obliged me with statistics of exports. I regret that owing to the absence, on leave, of Dr. Willis, sc.D., F.L.S., Director, Royal Botanic Gardens, I have unfortunately not had the advantage of his guidance. Finally I desire to acknowledge the constant courtesy of Messrs. H. W. Cave & Co., the printers, whose work I think speaks for itself.

For the loan of several excellent half-tone and electro blocks, I have to thank *The Agricultural Economist & Horticultural Review*, *The Gardeners' Chronicle*, *The Ceylon Agricultural Society*; also Messrs. Plâté & Co., Messrs. Walker, Sons & Co., and Messrs. Brown & Co. My thanks are likewise due to Mr. H. W. Cave, M.A., Messrs. F. Skeen & Co., The Colombo Apothecaries Coy., and Mr. T. Petch for permission to use certain photographs. With the exception of these, the photographs for all the illustrations have been taken by myself.

Among useful works of reference which I have consulted, I would especially mention the following:—Watt's *Dictionary of*

*Whose lamented death has since occurred.

Economic Products of India, Cameron's revised edition of *Firminger's Manual of Gardening for India*, Woodrow's *Gardening in India*, Nicholl's *Tropical Agriculture*, Mukerji's *Indian Agriculture*, Haldane's *Sub-tropical Cultivations and Climates*, Nicholson's *Encyclopædia of Gardening*, Watson's revised edition of *Thomson's Gardeners' Assistant*, Ferguson's *Ceylon Handbook and Directory*, Freeman and Chandler's *The World's Commercial Products*, Bailey's *Pruning Book*, Maxwell-Lefroy's *Indian Insect Pests*, Pearson's *Book of Garden Pests*, Soraur's *Physiology of Plants*, Willis' *Agriculture in the Tropics*, Trimen's *Flora of Ceylon*, and Wright's *Hevea brasiliensis*.

H. F. M.



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CHAPTER I.

CLIMATE AND SOILS.

Climate.—Climate is the principal factor which controls the growth of plants, and constitutes the conditions which render a country suitable for the abode of man and animals. One of the first questions the gardener or planter in the tropics has to consider is whether the climate is suitable for the cultivation he intends to take up. Climate mainly depends upon latitude and altitude ; it is usually hottest at the equator at sea-level, and coldest the furthest away from it and the highest above sea-level. It is also, however, materially affected by the distance from the sea, form and slope of the land surface, the nature of the soil and its vegetation, and other circumstances. The influence of altitude is especially noticeable in the tropics, the temperature becoming appreciably cooler as one ascends in the hills. Thus, while at Colombo it is hot and tropical, it is cool and temperate at Nuwara Eliya, 6,000 feet above the level of the sea. For about every 300 feet of elevation there is a reduction of one degree in the temperature, and it is estimated that an elevation of 270 ft. is equivalent in its effect on temperature to receding a degree from the equator. Thus, Kandy being about 1,500 feet above sea-level, its average shade temperature is about 5 degrees cooler than that of Colombo. At Nuwara Eliya the difference is even more marked, so that if Pidurutalagala, our highest mountain

(8,296 ft.), were about 8,000 feet higher still, it would probably be covered with perpetual snow. The cooler climate of the Hills not only renders possible the cultivation of certain plants or crops which are indigenous to temperate regions, but also affords residents and visitors a very grateful substitute for the more bracing climate of a temperate country. The flat northern and eastern portion of Ceylon are characterized by a dry arid climate, to which typical forms of thorny vegetation or scrub are indigenous. Here, however, certain crops are more adapted for cultivation than in the wet zone, as for example the useful Palmyra palm, which in the dry zone luxuriates and forms a valuable product.

In Ceylon there thus occur four distinct types of climatic zones, viz :— (1) the *hot and moist zone*, from sea-level to about 1,000 feet elevation with a well distributed rainfall of 70 to 120 or more inches, and a mean shade temperature of about 80° Fah. ; this is confined to the south-western part of the island ; (2) the *hot and dry zone*, formed by the flat country of the northern and eastern part of the Island, with a rainfall confined to only a few months of the year ; (3) the *intermediate zone*, from 1,000 to 4,000 feet, with a rainfall of 70 to 150 inches ; (4) the *montane or cool zone*, from about 4,000 feet to the highest altitude (8,296 feet), with an evenly distributed rainfall of 70 to 130 or more inches. In the months of January and February, cool night temperatures are usually experienced in the low-country ; thus at Colombo a night temperature of 65° F. and at Kandy of 50° F. have been recorded ; whilst at Nuwara Eliya a slight frost frequently occurs in the period named. Such a diversified climate allows of the successful cultivation of a large variety of plants or crops from different latitudes, and within a comparatively small area. Consequently there may be seen in Ceylon a considerable number of acclimatised plants from Brazil, Mexico, Pacific Islands, Malay, Tropical Africa, India, &c. luxuriating in the low-country ; whilst at the higher elevations many species from cooler regions, as Europe, South Africa, Australia, Peru, &c. are perfectly at home, many having become naturalised.

Seasons.—Sir Emerson Tennant said: "The line is faint that divides the seasons in Ceylon. No period of the year is divested of its seed-time and its harvest in some part of the Island, and the ripe fruit hangs on the same branches that are garlanded with open buds." Thus there are no seasons in Ceylon in the sense the word is used in temperate countries. The uniform moist climate of the

south-west districts is only varied by a period of comparatively short rainfall between January and March, known as the "dry season." No "cold season" occurs here as in India, though during the "dry season" named, as well as the hotter months (March to May), most people prefer to enjoy the more bracing air of the Hills, which is then dry and crisp. So that the only variety in the climate is afforded by the two annually recurring monsoons, viz. the south-west monsoon, commencing at the end of May and lasting till October, and the north-east monsoon, lasting from October to May. The rainfall of the former monsoon is more or less confined to the south-west of the Island, while the eastern side of the country receives its most copious rain from the north-east monsoon, chiefly in November and December, its driest season being from June to September. In the Northern part of Ceylon, the rainy season is mostly confined to the three months of October to December, very little rain falling from April to September. The hottest period of the year, all over Ceylon, is from March to May.

LOCAL INFLUENCES ON CLIMATE.

Forests.—These constitute one of the most important conditions affecting climate. The presence of forests prevents erosion of the soil, retards the evaporation of moisture, enables the soil to retain a large proportion of rain water, and tempers the atmosphere both by cool vapours from the soil and by preventing the sun's rays from reaching the earth. When the forest is cleared away, radiation from the land is increased, the soil is less retentive of moisture, and the air, as well as the soil, becomes drier and warmer. A similar effect takes place when swampy and marshy land is drained and brought into cultivation. The climate of islands and maritime districts is usually much more equable than that in the interior of continents, the atmosphere in the former being frequently loaded with clouds and vapours. Lakes, marshes and rivers have usually an unfavourable effect on climate, as they give rise to fogs, especially at night, which chill the ground and render the vicinity unhealthy.

Aspect.—This also has an important influence on climate, a northern and an eastern aspect being, as a rule, cooler and moister than southerly and westerly ones; in a north verandah, for example, plants which require a cool temperature thrive much better than in a verandah facing south. In a mountainous country, aspect is, of course, often affected by the lay of the land, and

ridges, alternating with valleys or ravines, often cause a considerable difference in the climate of places near to each other. Similarly in a narrow valley, while one side, being partially shaded, may be cool and damp, the other side is warm and dry; so that plant-life would differ materially on either slope.

Wind-belts.—The climate may be considerably improved locally by the planting of shade and wind-belt trees, for these not only break the force of the winds, but also tend to lessen the excessive evaporation of moisture, and temper the sun's rays. Exposed and windy situations have a different climate from sheltered places, although the soil, rainfall and aspect may be about the same.

Soil formation.—Climate is also affected by the nature of the soil. There is a greater radiation of heat from sand than clay soils, so that districts with sandy soils invariably have the highest temperature. This largely accounts for the intense heat in parts of Egypt, Bengal, Arabia, &c. during certain seasons of the year.

Irrigation, it is admitted, has a marked beneficial effect on climate; thus the enormous lake-like dams or reservoirs, like that at Assouan in Egypt for accumulalating the Nile waters, and others in India and Ceylon, must have an important influence in cooling the surrounding atmosphere.



Table showing Elevation, Average Rainfall, and Mean Temperature
at the Principal Towns or Stations in Ceylon.

STATION.	Eleva- tion in feet.	AVERAGE RAINFALL.		Mean Temperature, in Fahr. degrees.
		Inches.	Days.	
Colombo ...	40	87	174	81
Galle ...	48	92	200	80
Matara ...	15	71	117	80 approximate
Hambantota ...	50	37	88	80
Batticaloa ...	26	59	101	80
Trincomalee ...	12	63	108	81
Jaffna ...	11	47	71	82
Mannar ...	12	38	65	82
Puttalam ...	27	47	81	81
Chilaw ...	10	55	90	81 approximate
Negombo ...	6	69	100	81 do.
Ratnapura ...	84	151	213	79
Kegalle (Ambanpitiya ... about 3 miles west of K'galle)	729	122	163	79 approximate
Kurunegala ...	381	81	155	80
Anuradhapura ...	295	54	102	80
Matale ...	1,400	84	164	76 approximate
Badulla ...	2,225	75	122	73
Bandarawela ...	4,036	62	132	67
Kandy ...	1,654	81	191	76
Nawalapitiya ...	2,400	154	175	74 approximate
Deltota ...	3,500	109	199	73 do.
Hatton ...	4,141	152	215	69 do.
Bogawantalawa ...	4,300	111	227	65
Agrapatana ...	5,200	87	196	60 approximate
Nuwara Eliya ...	6,240	94	204	58

SOILS.

Soils are formed by the gradual decomposition or wearing away of rocks, under the influence of weather, glacial or volcanic action, assisted by the presence of plant-life. Variations of temperature have an important effect on the formation of soils, for rocks expand by heat and contract by cold. Thus in the hot tropical sunshine, the surfaces of the rocks expand and are again contracted by the cool air of the nights; this causes them to crack, and particles crumble off, thereby giving rise to a small but constant addition to the soil. Plant-life assists in the formation of soils in two ways, *i.e.*, mechanically and chemically. The roots enter crevices of rocks, and by their gradual increase in bulk act like wedges in forcing the two sides apart; the force thus exerted, even by the roots of very small plants, is considerable, being sometimes sufficient to break through concrete, or lift stone pavements. Roots also, by means of their acid sap, have a solvent action on rocks, and thus assist in their decomposition. Vegetation further contributes to the formation of soil by depositing dead leaves and stems on the surface in the form of humus, to the presence of which is due the black colour of garden soils.

Other important factors in the formation of soils are rivers and streams, the sea, and, in some cases, wind. Rivers grind down rocks and stones, and carry particles of rock or gravel to the plains or valleys, depositing it in the form of mud, which is known as *Alluvial soil*. Such deposits are usually rich in plant-food. The wind occasionally adds fertile matter to soils by carrying sand, dust, straw, leaves, &c. and depositing them in hollows.

All soils may be classed as either *transported*, when they are carried from a distance, as by any of the agencies named above; or *sedentary, local, or indigenous* when they remain where formed. To the latter belong by far the greater portion of Ceylon soils. In some cases the surface soil is transported, while the sub-soil is sedentary, or vice versa. Transported deposits, as alluvial soils, are usually characterised by greater fertility than those which are sedentary.

CONSTITUENTS OF SOIL.

The five substances of which all soils may be said to be composed of are: sand, clay, lime, vegetable matter or humus, and stones.

Sand.—This is principally composed of quartz, flint, or silica. It imparts a loose porous consistency to the soil, assists the air and water in finding their way through the land, and aids the roots of

plants in their efforts to penetrate in all directions. In agricultural and horticultural practices, sand is frequently added to the soil so as to render it porous and "sweet." In potting composts, sand is usually a necessary constituent.

Clay is composed of two chemical bodies, known as silica and alumina, in combination with water. When wet, it is sticky and plastic, but when burnt it loses its plastic property and becomes brittle. There are various kinds of clay, some quite white, from which china-ware is made; others yellow, from which are made bricks, pots, chatties and other earthenware articles. Clay is colder, and retains much more moisture, than sand.

Lime.—This usually occurs in soils combined with carbonic acid as a carbonate of lime in various forms, as chalk, lime-stone, and coral. It is present in large quantities in the shells of land-snails and some marine animals, besides coral. Ceylon soils generally are lacking in lime, which when present usually occurs in the form of dolomite.

Humus or vegetable-mould is formed by decayed vegetable matter, such as leaves, roots, stems, etc., and exists to some extent in all cultivated soils as a dark brown substance. It often occurs abundantly on the surface of the ground in forests. Humus may be said to be the most important constituent of all soils for the planter or gardener. It has a great influence on the capacity of soils for retaining moisture, renders their cultivation easier, and encourages the activity of soil bacteria. Soils which are deficient in humus are liable to cake, and quickly lose their heat in cool weather. See under *Manures*.

Leaf-mould may be distinguished from humus as being composed almost entirely of decayed leaves; it is a valuable ingredient in composts for pot-plants, tender seedlings, &c.

Stones are simply particles of the original rock from which the soil was formed. If they do not exist in too great a number (10% of small stones not being considered harmful) they serve a useful purpose in the soil, as they render it lighter in character, affording porosity and assisting in the retention of moisture. The stones are weathered by the atmosphere and other agencies, in the same way as the rocks from which the soil was made, so that their gradual wasting away adds material to the soil.

CLASSIFICATION OF SOILS.

Soils are classified in accordance with their physical or chemical composition, and are divided into classes, sub-classes, &c.,

according to the proportion of clay, sand, lime and humus they contain. The principal classes are:—

Clay or argillaceous soils.—These contain over 50 per cent. of clay. They are heavy and dense, very retentive of water, are cold and difficult to work, and require to be well-drained in order to be properly cultivated. In periods of drought, plants on clay soils are apt to suffer, as the roots cannot penetrate into stiff clays, or obtain water from the subsoil. Though such soils may contain an abundance of mineral food for plants, it is often rendered unavailable by their stiff texture. This may, however, be corrected by the addition of sand, lime, or suitable manures, and by drainage. Clay soils of suitable texture have very important advantages in the tropics, owing to their power of retaining soluble manures and moisture.

Loamy soils are composed of 30 to 50 per cent. of clay, under 5 per cent. (if any) of lime, and the remainder of sand and vegetable mould.

Sandy loams contain from 20 to 30 per cent. of clay, and may be with or without lime.

Loamy sands. 10 to 20 per cent. of clay; lime may be present or absent.

Sandy soils.—These contain not less than 70 per cent. of quartz sand; they have little cohesion, are very porous, and contain little nourishment for plants. Such soils can be improved by the addition of clay, marl or chalk.

Marly soils.—These contain from 5 to 20 per cent. of lime, and may partake of the characters of the first four classes, or of the eighth.

Calcareous soils contain over 20 per cent. of lime, and may partake of the characters of a loamy soil with 30 to 50 per cent. of clay, or sandy soil with over 70 per cent. of sand. On the authority of Mr. Bamber, the Government Chemist, neither marly nor calcareous soils occur in Ceylon.

Gravelly soil is a term applied to the presence of gravel or stones in soils, without reference to their composition; such soils may partake of the characters of the sandy, clayey or calcareous classes.

Vegetable mould.—This applies to soils which contain not less than 5 per cent. of humus or vegetable matter; they may in their turn partake of the character of clayey, loamy or sandy soils; or they may be composed almost entirely of vegetable matter, as in the case of peat.

Peat is a black soil formed by the decay of marsh plants and bog mosses, as *Sphagnum*. A black plastic peat-like soil occurs on mountain plains in Ceylon at elevations above 5,000 feet, usually forming a flat barren area, but it no way forms a substitute for peat. Peat bogs are not adapted for cultivation in their natural condition, although they are the favourite resort of certain plants. *Rhododendrons* and allied plants thrive best on well-drained peaty soils. To render peat-bogs fertile, the excess of water must be drained off, and lime and sand added. The effect of this treatment is to aerate the soil, destroying the injurious acids present, and preventing the stagnation of water.

Surface soil and sub-soil.—These are convenient terms, the former to distinguish the top layer of soil, which is usually distinct by its darker colour (owing to the presence of humus) and looser texture than that underneath, *i.e.*, the sub-soil. The latter, though usually more compact and of a lighter colour, varies considerably in character. It may consist mainly of sand, or of gravel or clay, or even resemble the surface-soil. The surface-soil varies in thickness according to locality and surrounding influences; in forests and highly cultivated lands it is usually deep, but on steep hill-sides and in dry places it is shallow.

Heavy and light soils.—Although sandy soils are heavier than clay ones, agriculturists and horticulturists call a clay soil “heavy” and a sandy soil “light.” These terms, however, refer to the facility with which the soils are worked, and not to their relative weights.

Cold or warm soils.—Clay soils retain much more moisture than sandy soils, and this causes a great difference in regard to their temperature. The former are therefore sometimes spoken of as *cold*, and sandy soils as *warm*. As a certain amount of warmth in the soil is necessary for plant-life, this indicates the importance of draining low-lying, cold clayey land.

Volcanic soils.—These are formed by lavas which have flowed over the surface of volcanoes, and subsequently become subjected to the action of the atmosphere. Soils of volcanic origin, as those of certain islands, are usually very fertile. Such soils may practically be said not to exist in Ceylon.

Submarine or coral soils are found in certain islands which, by volcanic or other agencies, have been lifted up above the sea.

Chemical composition of soils.—All soils are composed of *organic* and *inorganic elements*. The former elements are oxygen, hydrogen, nitrogen and carbon, which disappear as vapour or

smoke when an organised body is burnt in the air. The first three are gases, and the last is a substance, one form of which, charcoal, is familiar to every one. Besides these, there are two other substances, namely, *sulphur* and *phosphorus*, which are sometimes called *secondary organic* elements, because they are frequently, but not always, found in organised bodies. The inorganic elements which are always to be found in combination with other elements in lands suitable for cultivation are *potassium*, *sodium*, *magnesium*, *calcium* and *iron*. With the exception of magnesium, calcium and iron, all these are essential constituents of plant-food.

Examination of soils.—The following simple mechanical tests are given by Dr. Nicholls as a ready means of ascertaining approximately the condition of a given soil:—"Weigh out a quarter of a pound of the earth after it has been well dried, boil it for a short time in a pint of water, and then pour it into a glass vessel. A piece of blue litmus paper should then be put in, and if the paper turn to a red colour, it shows that acid humus is present in the soil, and that lime is necessary to counteract the acidity. Then add more water, stir well, and pour off carefully the muddy water into a large vessel, care being taken that none of the sand which settles to the bottom is lost. The sand is then to be stirred up with fresh water, which is again poured off into the larger vessel. This is to be done several times until the sand becomes clean and free from mud. The contents of the larger vessel are to be allowed to remain for several hours until the fine mud settles to the bottom, when the clear water is to be carefully poured off. The sand and the mud should then be dried and weighed separately, when, by comparing their bulk or weight, the proportion of sand and earthy matter in the soil can be ascertained."

To discover the presence or absence of lime in a soil.—Besides the blue litmus paper test for lime, as described above, the presence of lime may be ascertained thus: "Pour a little hydrochloric acid upon a portion of soil; if lime be present an effervescence is considered to give to an experienced observer a rough indication of the quantity of lime present."

To ascertain proportion of humus in the soil.—Heat for an hour to a red-heat, a given quantity of thoroughly dry earth in an iron or clay vessel; the soil rapidly blackens if much humus is present, and then turns red or yellow, the vegetable matter being burnt off; when cool, weigh the earth, and the loss in weight will give the proportion of humus in the soil.

The capacity of soils for holding moisture.—This power of soils is mainly dependent on the mechanical texture or porosity of the soil material. In a soil consisting of solid particles of fairly uniform size, the interspaces are about 40 per cent. of the volume, whether the particles are large or small; but if the particles are a mixture of large and small (as gravel and sand), the volume of the interspaces is much diminished. On the other hand, if the particles themselves are porous, as in the case of chalk, loam, and especially humus, the volume of the interspaces is much increased. It is this volume of the interspaces that determines the amount of water which a soil will hold when perfectly saturated, or the amount of air which it will contain when dry. The influence of humus on the capacity of a soil for holding moisture is remarkable. Schübler found that after 72 hours exposure to moist air, humus had taken up nearly $2\frac{1}{2}$ times as much water as clay, and 40 times more than sand, which, under the same circumstances, took up 16 times less than clay. A simple way of ascertaining the power of any soil to hold water is given thus: Fill a flower-pot nearly to the top with dry soil, and then weigh it (the weight of the pot, both wet and dry, must, of course, be known). Then gradually pour water on the soil until it begins to drop from the bottom. As soon as the dropping has ceased, weigh the whole; the difference in weight will approximately show the proportion of water held by the soil. The power of a soil to hold water obviously tends to retard evaporation from the soil.

Capillary action of soils.—The power of soils for drawing up water from the lower strata towards the surface, is one of the greatest importance from the cultivator's point of view. It is possessed in a greater or less degree by all soils, being greater in proportion as their pores are finer. Sand possesses this power to the least extent, and clay to the greatest; thus a clayey soil is always wetter than sandy soil placed under the same influences. There is, however, a limit to the fineness of particles which favours capillarity, and when this limit is passed, fineness is disadvantageous to it, since the minute particles of earth are then apt to cohere together so closely that few, if any, spaces are left between them for the admission of water. Thus, too open a tilth is not desirable, especially for light soils; therefore these should be rolled after ploughing and harrowing. When the surface soil is left undisturbed and becomes hard, much of its moisture passes off by evaporation. A mulch or any dry covering that can be placed between the atmosphere and the damp soil will check this

evaporation. Tillage also disturbs capillary action by forming a nonconducting surface, which acts as a mulch and retains the moisture in the soil within reach of the plants. The process of soil capillarity may be illustrated by taking a lump of loaf-sugar to represent the hard-caked soil: hold one end of the lump so that it touches the surface of a cup of water, when instantly the whole lump is moistened: then take about the same quantity of granulated sugar (equalling in height the thickness of the loaf sugar), and hold on a screen so that the lower surface of the sugar just touches the water; in this it will be found that the water rises very slowly, and not until some of the sugar is dissolved will it reach the top. King calculated that 6.24 tons of water a day evaporated from 1 acre unstirred soil, while when the surface was raked or harrowed, only 4.52 tons evaporated.

Fertility of soils.—The fertility of a soil depends, said Liebig, “on the bulk and composition of the previous crop residues, and the extent to which these have been subsequently destroyed.” Evidently, therefore, the crop which leaves behind the largest amount of roots, foliage, &c. will best maintain or increase the organic capital of the soil. Fertility of soils has been summarised as being dependent on the following conditions, viz.—(1) a sufficiency of available plant-food; (2) a suitable texture or mechanical state of the soil; (3) absence of injurious compounds; (4) a healthy percolative subsoil; (5) a suitable climate, season, and aspect. The absence of any of these conditions will, to some extent, render a soil infertile. Needless to say, one of the most essential factors that control soil fertility is the amount of moisture available to the roots of the plants.

Exhaustion of soils.—This term is based on money values rather than on scientific conceptions, and has no precise definition. Strictly speaking a soil is exhausted, as regards any particular crop, whenever the cost of cultivation comes to as much as the crop is worth. Thus the word “exhaustion” refers to the available character of the plant-food present in the soil. Most cultivated soils contain a store of plant-food which it would take many crops to exhaust; but a large part of the elements of this food is present in such a form that plants are unable to make use of it. Thus an acre of land may contain many thousand pounds of phosphoric acid, potash, or nitrogen, and yet be in a “poor condition”; while an application of a suitable fertiliser, supplying 50 pounds of readily available phosphate or nitrogen, may greatly increase its productiveness.

Theory of toxic substances in the soil.—According to a recent theory, infertility in a soil, *i. e.*, inability to produce good crops, can be traced, not necessarily to the absence of plant-food, but to the presence of compounds injurious to plant-growth. These compounds are traced to decomposition products of plant-tissue, excretions of growing roots and of germinating seeds, &c. Crops are thus supposed to form toxic substances in the soil which are deleterious to the crop following. The presence of excessive quantities of organic matter in the soil, as applied in the form of organic manures, is also considered capable of producing similar toxic effects, and the action of suitable artificial manures, proper rotation of crops, good drainage, &c. is to neutralise or destroy these. A special advantage of crop rotation is that, while the excreta of one kind of crop may not be harmful to another, different species assist, it is considered, in the destruction and removal of the excretions of others.

Ceylon soils, as a rule, are poor and shallow, and their character in general may be summed up thus: (1) *Sea-coast*, soils loose and gravelly or sandy, often with a large proportion of laterite (cabook); these are usually of a deep reddish colour, and in some localities a deposit of white silvery sand occurs on the surface; in such soils, however, Cinnamon and the Coconut palm flourish, provided the rainfall is sufficient. (2) *Inland*, up to medium elevations in Southern and Central Provinces, soils of a reddish clay, often with a proportion of laterite, and containing a small percentage of humus. (3) *Up-country*, soils more of a loamy character, usually with a larger amount of humus; rich loamy soils occur only in certain limited areas. Black peaty clays occur in valleys or swamps at the higher elevations. (4) *North Central Province*, soil variable, in some places hard and poor; in others it is deep and black, free from stones and easily worked, as at the Maha-illuppalama Cotton Experiment Station. (5) *Jaffna Peninsula*, soil described generally as of a hard clayey nature.

CHAPTER II.

PLANT LIFE.

Most plants consist of two primary divisions, the one ascending, seeking the light, bearing branches, leaves, flowers and fruits, called the *Stem*; the other descending, avoiding the light, called the *Root*; the part at which the two diverge is termed the central axis, and is popularly known as the "collar." Some plants have one or more of these parts wanting, but it is unnecessary to consider these here.

The roots (descending axis) fix the plant in the soil or other medium; they absorb nutriment in a fluid state from the soil, and in many cases act as reservoirs of food stored for the growth of a succeeding season, e.g., Carrot, Dahlia and other tuberous-rooted plants. To enable the roots to penetrate the soil without injury, their delicate tips are protected by *root-caps*. In most plants these are very minute, but in some they are large and plainly seen; in the thick, hanging, *acrial roots* of the Screw-pines (*Pandanus*) the root-caps are very large, and can be pulled off by hand. Towards the ends of the roots *root-hairs* are produced; these apply themselves to the particles of the soil, and by means of the acid fluid permeating their thin cell walls, they dissolve ingredients which they absorb and are then used in the nourishment of the plant.

The stem (ascending axis), generally speaking, rises above the surface of the ground, exposing the leaves and other appendages to the full action of light and air, conducting the necessary mineral substances from the roots to the leaves, and also the food supply from the leaves to the roots. Stems are *erect* (as in trees), *climbing* by hooked spines, tendrils, etc. (as in Calamus and Vines), *twining* (as in Ipomœa), *creeping* (as in Sweet-potato, Pepper, Vanilla, etc.), or *underground* (as in Ginger). They usually branch, and the ultimate divisions are called *twigs*. Underground stems superficially resemble roots, but can be distinguished by their possessing buds or rudiments of shoots and leaves,—the latter being represented by scales. Ordinary stems are of two types. In the

case of the majority of trees, shrubs and annual plants, there is a soft central cylinder of *pith*, surrounded completely by *wood*, and outside all is the *bark*. Between the two latter, which are usually separable, is a thin, watery or viscid layer, called the *cambium* or formative tissue. In plants of this type which exist for more than two years, new layers of wood and bark are successively formed from the cambium. In the second type of stem, as occurs in palms, bamboos and grasses, the pith occupies the whole of the stem, the wood being scattered throughout in strands (*vascular bundles*) instead of being continuous and solid; there is no separable bark, that being represented by a hard layer called *rind*; the stems are hardest externally (whilst in the first type the hardest parts of the stem are internal), there is no cambium, therefore the stems do not normally increase in thickness.

The functions of stems are to bear leaves, flowers and other appendages, and to act as a channel of communication between the roots and the leaves.

The leaves are usually composed of a thin layer of vegetable tissue called *parenchyma*, held together by a framework of ribs, known as *veins*. The surfaces are protected by a cuticle or *epidermis*. In the lower surface of ordinary leaves are microscopic openings, called *stomata*, leading into the substance of the leaf; through these the inhalation and expulsion of air and moisture are conducted. In a few exceptions the leaves are placed edgewise towards the source of light, as are those of Eucalyptus, Loranthus, etc., the stomata in these being equally distributed over both surfaces of the leaf; in floating leaves, as in Water-lily, the stomata are on the upper surface. The functions of leaves are compared to those of the stomach and lungs of animals.

The roots, stems and leaves being concerned in the supply of food, are called *Organs of Nutrition*, while flowers and their ultimate products, fruits and seeds, are called *Organs of Reproduction*.

Flowers.—A typical flower consists of four distinct series or circles of parts, the outer of which is composed of small green, leaf-like organs called *sepals* and forming the *calyx*; the next inwards, a circle of brightly coloured and sometimes scented leaves, called *petals*, forming the *corolla*; when both sepals and petals are similar in appearance and colour, as in Lilies, they are known collectively as a *perianth*; this term is also used when one of the circles is absent, as in the Croton flower. The third series consists as a rule of a few or many thin stalks, bearing swollen bodies at their tops; these are the *stamens*,

the stalks are the *filaments*, and the swollen bodies the *anthers*, which contain the *pollen*. The fourth and innermost circle consists of the *pistil*, the lower inflated part of which is the ovary, containing the *ovules*, which when fertilised become the *seeds*. At or near the apex of the pistil is the *stigma*, through which the pollen tubes penetrate to fertilise the ovules. The intervening part, when present, is called the *style*. Flowers are *pollinated* when the pollen from the anthers is transmitted to the stigma, the action of the pollen on the ovules, through the tissues of the stigma, being known as *fertilisation*. The exterior circles, calyx and corolla, may be considered as protective; while the stamens and ovary are essential for reproduction. These latter may be present in the same flower (*hermaphrodite*), or they may exist in separate flowers (*unisexual*). Flowers which possess stamens and not a pistil are called *staminate* or *male* flowers; *female* or *pistillate* flowers are those in which the stamens are absent. Some plants bear both kinds of flower and are called *diœcious*; others bear only unisexual flowers, as the Nutmeg tree, these being known as *monœcious*.

Seeds.—Every perfect seed contains an *embryo*, which is the future plant in a rudimentary condition. If the shell be taken off a bean seed, for example, the following parts can be easily distinguished; first, two fleshy bodies placed face to face, called *cotyledons* or seed-leaves, known also as nursing leaves; second, a minute projection at their base pointing upwards, called the *plumule* or future stem; third, a longer projection, also at their base, but pointing downwards, called the *radicle* or future root. In germination the radicle grows downwards, the cotyledons separate, and the plumule develops upwards, the whole seedling living and increasing on the reserve food stored in the nursing leaves until the roots are functionally active, and the young parts and leaves above ground assume their green colour.

NUTRITION OF PLANTS.

In the youngest stages of its life, the plant is supplied with nourishment from the food stored up in the seed for that purpose. By the time the roots and leaves have been formed, this supply becomes exhausted, and the plant must now obtain its food from the soil and the air. Through their delicate root-hairs the roots absorb from the soil various chemical substances in solution, which are transported upwards through the stem and distributed to the leaves. This absorption takes place by the process of *osmosis*, *i.e.*, by diffusion of liquids through the permeable cell-wall of the root-hairs,

the acid sap of the latter together with the moisture in the soil exercising a dissolving action on the materials with which they come in contact. The leaves imbibe from the atmosphere, through their *stomata*, carbonic acid gas, which enters into combination with the substances absorbed by the roots to form starch. The starch, after formation, circulates in solution throughout the whole plant, nourishing, repairing and adding to its substance. The process of forming starch by the agency of *chlorophyll* (the green colouring matter in the leaves and green parts of plants) is called *assimilation*, which can only take place under the influences of sunlight and air. During the day there is continually proceeding from the stomata of the leaves an exhalation of air deprived of its carbonic acid gas and of water-vapour: this process is known as *transpiration*. In darkness no formation of starch can go on, and a process of *respiration* then takes place, during which small quantities of carbonic acid gas are evolved.

Food of plants.—Speaking broadly, the main necessary food of plants may be said to consist of hydrogen, oxygen, carbon, nitrogen, potash, and phosphoric acid, and to a less degree lime and magnesia. The supply of the first three elements is provided for by means of rain and atmosphere; nitrogen, potash and phosphoric acid, which may be considered the three most important elements of plant-food, are obtained from the soil. Nitrogen is of the greatest importance, being an essential constituent of every organic body. It constitutes the chief bulk of our atmosphere, but plants (other than Leguminous plants) are unable to assimilate it in a free state, that is, unless it is first chemically combined with another element. Therefore, although surrounded by an inexhaustible supply of this necessary food, vegetation (with the exception named) will languish and die, unless by some means it is rendered available. This is generally accomplished by the chemical combination of nitrogen with hydrogen in the form of ammonia, or with potash of soda in the form of one of the well-known “nitrates,” so largely employed as artificial fertilisers.

Soil bacteria and Nitrification.—It is now known that the appropriation of nitrogen by plants is due to the agency of bacteria, which exist in all fertile soils. Dr. Nicholls states that “the presence of active bacteria in the soil is as necessary to plants as the working of the yeast plant is to the brewer.” These microscopic organisms, or ferments as they are called, perform the useful function of converting the nitrogenous organic matter in the soil into *nitrates*, or soluble plant-food. The process is accomplished

by the action of two separate groups of bacteria, and is termed *nitrification*; one group of these organisms convert ammonia into *nitrites*, and the other convert nitrites into *nitrates*. Although both organisms are always present in fertile soils, the one cannot perform the work of the other. A favourable degree of warmth and moisture are essential to the active operations of these bacteria; at low temperatures their work is retarded, and at a certain degree of coldness it practically ceases. Hence an open porous soil, as well as tillage and mulching, encourage their activity and thereby tend to promote oxidation of the organic matter in the soil.

Nitrogen-collecting Bacteria.—It is well known that on the roots of certain Leguminous plants there usually occur nodules or tubercles, which vary in size from that of a pin's head to a pea. These nodules are cells, which contain a species of bacteria that abstracts and stores up the free nitrogen of the air. The nitrogen thus becomes stored up in the roots and stems of such Leguminous plants, and when the roots of these are left in the ground, or the whole crop dug in as green-manure, the soil is considerably enriched thereby with nitrogen. Only Leguminous plants (chiefly those of the sub-tribe Papilionaceae) obtain their nitrogen in this way, all other plants depending for their supply on nitrates formed by the soil bacteria from organic substances in the soil. This property of Leguminous plants has long been recognised in agriculture, and Leguminous crops are therefore esteemed an important factor in the rotation of crops.

Nitro-bacterine, Nitragin, or Bacteria culture.—The nitrogen-gathering bacteria of Leguminosæ have in recent years been isolated, and cultures of them are placed on the market as a commercial product, in different forms known under the names of *nitragin*, *nitro-culture*, and *nitro-bacterinc*. The last named has comparatively recently been devised by Professor Bottomley, of King's College, London. Certain soils are said to be practically devoid of the right kind of bacteria, or only contain them in an inactive state, and unless some means of introducing the germs be resorted to, they will not produce a healthy Leguminous crop. This deficiency is claimed to be met by applying artificial cultures of the necessary organisms, as those named.

Bacteria inoculation.—The means of applying these bacteria cultures is either by inoculation of the seed, or of the soil into which the latter are to be sown. Inoculation of the soil deficient in bacteria was the first method suggested, portions of the soil so inoculated being afterwards transferred to the larger fields for the

purpose of inoculating the latter. This method, however, involves certain disadvantages, viz., excessive cost of transport and labour, and the danger of introducing insect or fungoid pests and objectionable weeds. These difficulties are obviated by inoculating the seeds, which is effected by thoroughly moistening the latter with a liquid solution of the culture, and then drying them in the shade. So far, however, opinions are divided as to the merits of bacteria culture and inoculation.

Water in its relation to plant-food.—Water is an essential factor in the life of a plant; it enters very largely in its composition, enabling it to retain rigidity, and carrying nutritive substances in solution through its body. Water constitutes by far the greater bulk of fresh vegetable substances, and also forms a large percentage of ordinary cultivated soils. The solution of mineral substances and gases for absorption by plants as food is dependent on the presence of water. When the amount of water at the root is deficient the plant wilts, and this has the mechanical effect of closing the stomata, which remain closed and the plant dies, unless a timely supply of water is restored to the roots.

Waters differ in several respects according as the source of their supply is rain, pond, stream, spring or well. Rain-water usually contains a small percentage of ammonia which it obtains from the atmosphere; it also contains carbonic acid gas, so that it is able to dissolve carbonate of lime in the soil. Rain-water is thus said to be "soft," and is preferred for watering plants or crops. Spring or well-water usually contains varying quantities of carbonate of lime and other minerals; in some cases it contains also large quantities of iron oxides, and these form encrustations on bodies placed in the water; this is often characteristic of well-water in the northern part of Ceylon, which consequently is injurious in that condition to plant or animal life. Such water should always be exposed for some time to the sun before use. Running-water also contains in the form of sediment different mineral substances, varying in quantity according to the source of the water and the course through which it runs. Irrigation waters in their passage through the soil remove large quantities of nitrogen and other valuable ingredients from the soil. It has been established by experts that the quantity so removed is in some cases so great that if the water could be supplied to crops in sufficient quantity, it would supply the place of manure.

SCARCITY OF PLANT FOOD.

Professors Wilfarth and Wimmer have found that the appearance of plants will sometimes afford an indication of what food they are most in need of. Thus :—

Nitrogen.—When the plants want nitrogen the leaves are said to lose their normal green colour and take on a clear green or a yellowish tint, and to dry finally with a clear brownish yellow colour.

Phosphoric Acid.—When phosphoric acid is deficient, the leaves become a deep clear green, almost blue-green colour. With a greater scarcity there appear on the leaves (first at the margin, and later on the whole leaf) dark-spots, and the leaf dries with a dark-brown to a black-green colour.

Potash.—A scarcity of potash is said to be coincident with spotted leaves, the spots appearing in the margin, and later becoming distributed over the whole leaf, the stalk, mid-rib and veins retaining their green colour. The leaf also curves or curls, with its convex side upwards, and finally dries up.



CHAPTER III.

MANURES.

The use of manures is, briefly, to supply nutritive matter for encouraging and sustaining plant-growth. They restore the fertility of an exhausted soil, and enrich a naturally poor soil. Any substance, therefore, added to the soil which has the power, either directly or indirectly, of increasing its fertility may be considered as a manure. It may contribute directly by supplying what is required or indirectly by its chemical action on dormant substances already present, but not in a suitable state for being absorbed by the plants. Manures, more especially farmyard or pen manures, also improve the physical condition of the soil, rendering heavy clay land lighter and more porous, and sandy soils denser and more retentive of moisture. Growth in plants cannot take place without the main constituent parts of which they are composed being extracted from the earth. The continued production of crops, therefore, necessitates the withdrawal of an enormous supply of certain elements from the soil, and it is evident that if no means be taken to restore the substances thus removed, the soil becomes gradually "exhausted" (see under *Soils*). According to Liebig "the best fertiliser for any particular crop is that which contains the amount of nitrogen, phosphoric acid, potash, &c., which are removed from the soil by a typical good yield of the plant in question."

The immediate effect of a manure depends, (1) on its solubility, and (2) on the suitability of the plant-food which it contains for the use of the crop or plant it is applied to. Suitable mixtures, made up according to the special need of different crops, usually afford most satisfaction. Manures may be divided into two classes, viz.—(1) *Organic manures*, or those composed of vegetable or animal substances; and (2) *Inorganic manures*, which are of mineral origin. While most manures act directly by supplying the three chief elements of plant-food (nitrogen, potash and phosphoric acid), other substances are, however, of value chiefly on account of their

properties of liberating the plant-food in the soil, or of correcting soil acidity, fixing ammonia, or destroying various pests. Such substances are known as *Indirect fertilisers*, and include lime, marl, gypsum, charcoal, &c.

ORGANIC MANURES.

Farmyard or natural manure.—By this is generally understood the manure produced by horses, cows, or other cattle kept on the estate. The excrements of different animals possess special fertilising properties, but for ordinary purposes farmyard manures are best mixed together, both solid and liquid. The liquid portion should be soaked up by the litter, so that the latter may have moisture enough to allow of its decomposition, instead of being dried, when it is rendered almost useless. Farmyard manure deteriorates by violent heating, but partial decomposition by slight fermentation before adding it to the soil will render its constituents more soluble. For improving the permanent fertility of soils, farmyard manure is the most important of all fertilisers. In addition to its manurial properties, it has valuable physical effects upon the texture and water-holding powers of the soil, and in dry seasons these may count for more than fertilisers towards ensuring good crops. It restores humus in the soil, gives cohesion to sandy soils, and renders clayey soils more porous and workable.

Horse manure.—This is called a hot "manure" because, owing to its loose texture, it easily undergoes decomposition or fermentation, producing a high degree of heat. On this account it is very liable to lose more or less of its nitrogen in the form of ammonia.

Goats' dung.—This is sometimes procurable in the neighbourhood of cooly-lines. It is a good manure, though its action seems to be comparatively slow. Firminger, in India, stated:—"I have often used it for a manure; but not, as it seems to me, with any marked advantage. Sheep's dung, being similar, would probably give like results."

Poultry dung.—The dung of fowls is somewhat similar to guano, though far less valuable than that material, weight for weight. The difference in quality is largely due to the fact that the food of fowls is very different from the fish diet of the seabirds which produce guano. Fowl manure usually contains about 2 to 4 per cent. of nitrogen, while good Peruvian guano may contain as much as 20 per cent.

Night soil.—It has often been stated that there is no manure equal in fertilising value to night-soil. The late Dr. Bonavia, of

Lucknow, confirmed this opinion, and found that night-soil produced special "richness of colour in flowers, and vigour and succulence in vegetables." On the Continent of Europe also, night-soil is highly valued as a manure.

Poudrette.—In some large European and American towns, night-soil is dried and made into a transportable form, which is sold under the name of poudrette; but as it is prepared by adding largely such materials as gypsum, ashes, earth, sawdust, &c., the mixture is considered to form but a poor fertiliser.

Blood meal.—This is usually considered an excellent manure, being rich in nitrogen (12 to 15%). Firminger, however, in speaking of his experience of it in India, said: "I discovered no advantage whatever in the use of such a manure over that of decayed cowdung, while the unforeseen nuisances attending it determined me never to use it again." Bamber thinks it "a useful source of nitrogen." Owing to its concentrated form, it is easy of transport where long and difficult journeys are concerned. It may be applied to general crops at the rate of about 200 lb. per acre.

Fish guano.—Fish manures form very valuable fertilisers, containing as they do a high percentage of ammonia, combined with a fair proportion of phosphate. Their decomposition is very rapid, and the quantity applied to the land must be limited owing to their considerable strength. Fish manures are more safely used if mixed in a compost of soil and refuse, so that their powerful fertilising properties can be more evenly distributed. In Ceylon, fish guano is used with good effect for coconuts and other cultivations near the sea-coast, being applied at the rate of about 500 lb. per acre; it is also largely used in manure mixtures for Tea, on the growth of which it has a marked effect. It should not however be applied to soils above any water supply, as by polluting the latter it has been known to be a cause of dysentery, &c.

Bones.—Both for field and garden crops, for fruit and other trees, bones in some form or other are extensively employed as a manure. When used in merely a crushed state their decomposition is slow, consequently their fertilising properties are lasting; reduced to a powder or meal, and applied as a manure, the results are observable in a much shorter time. The usual commercial forms in which bones are applied to the soil are: $\frac{1}{4}$ inch bones, bone-meal, and bone-dust. Bones are considered to have the best effects on soils that are deficient in lime; they are commonly used as a manure for rice-fields in Ceylon, and yield good results,

Soils rich in decomposing organic matters, such as leaf-moulds, are greatly enhanced in fertility by an application of bone-meal.

Guano.—This valuable manure, obtained principally from islands off the coast of Peru, and various other places on the coast of South America, is usually the excrement of sea-birds. It has been deposited there during the course of centuries and varies in quality, that found in the regions which are liable to heavy rainfall or shifting sands being much affected in value. The best guano is supposed to be that which comes from Chincha Islands, where the supply is said to have now become greatly diminished. The guanos of commerce may be classified under two heads:—(1) nitrogenous guano, of which the "Peruvian" is a type; (2) Phosphatic guano, of which the "Bolivian" is an example. The chief fertilising properties of guano having been ascertained by analysis, various artificial manures are now prepared as substitutes for it. Sometimes sulphate of ammonia is added to nitrogenous guano, the mixture being then known as "Fortified Peruvian Guano." Guano should always be mixed with about six times its bulk of fine earth, loam, or ashes; the mixture may be applied at the rate of about 4 or 5 cwts. per acre, according to the nature of the crop. For pot-plants, guano may very advantageously be dissolved in water and applied, the proportion varying according to the size and variety of plant for which it is required. About 1 oz. to two gallons of water may generally be used with safety.

Leaf-mould.—Leaves, when thoroughly decayed and reduced to a state of mould, form a sort of manure known as leaf-mould. This contains a considerable proportion of potash and nitrogen, and is a most valuable growing medium, either alone or mixed with other substances, being eminently suited to the growth of most plants. All fallen leaves and vegetable refuse in a garden should be collected and thrown into a deep pit or trench, dug in some obscure corner. In dry weather, water should be supplied to the pit, so as to give its contents a thorough soaking, thus hastening decomposition. Leaf-mould is particularly suited for the cultivation of pot-plants, especially palms, ferns, and such fine foliage plants as naturally grow under shade in the jungle. (See under *Soils*).

Castor, Ground-nut, or Poonac-cake, &c.—These are the residue of castor-oil seeds, ground-nuts, coconuts, &c., after the oil has been extracted. They are esteemed as manures, being usually rapid in action, and are somewhat largely used on up-country estates in Ceylon. Bamber says that castor-cake is "one of the most useful

manures for Tea, and an excellent basis for other mixtures, the percentage of nitrogen in the best castor cake being about 6%, though often only 5% in some grades." On all garden crops, and especially Roses, castor-cake is considered to have excellent results. Rape and cotton-seed cake are also valuable manures.

Jadoo, or Jadoo-fibre.—This "potting material," or "growing medium," as it is called, has been patented some years ago by Col. Thompson, in England. It has for its foundation peat-moss, which is of an exceedingly spongy and absorbing character, not unlike fine coconut fibre in appearance. This is said to be boiled, impregnated with nitrate of potash, bone-meal, gypsum, soot, &c., and then fermented. When the substance is ready for use it is almost free from any smell, and is a clean and light material to handle. It is especially adapted for such plants as are required for growing in-doors. As a propagating medium too, especially for germinating seeds in, it has been highly spoken of. It used to be imported by a firm in Colombo, but apparently its cost prevented it from becoming popular.

Sea-weeds.—Along the Ceylon coasts, and particularly the northern one, sea-weeds are frequently used as a manure, being applied in the fresh state, either for digging in the ground or for forming a mulch on the surface. The percentage of nitrogen, potash, and phosphoric acid which sea-weeds contain is, however, considered small, so that their effect on crops is not a lasting one.

Town sweepings sometimes form a useful manure. Though in some cases they consist largely of sand, in others they contain large quantities of organic matter. The refuse from the neighbourhood of markets are especially useful as a manure, while scrapings from side-drains often contain a large amount of mould and other manurial substances; their liability to convey troublesome weeds is, however, an objection to their use on field crops.

Coir-dust.—This decomposes so slowly that it can hardly be said to be of much value as a fertiliser. It has however a beneficial mechanical effect on certain soils, especially such as are deficient in humus. It may with advantage be used to give "body" to potting soils, more particularly if humus is lacking; but it should always be well leached in the open air and rain before use.

Woollen refuse and shoddy.—These are waste materials from woollen and cloth mills, and are used in Europe to some extent in the manufacture of manures. It is said that they usually contain from 5 to 10 per cent. of nitrogen, and that their manurial effects extend over two or three years. The more finely divided the

material, the more readily will it decompose in the soil, and the more evenly can it be distributed. This form of manure is commonly used in the cultivation of Hops in England.

INORGANIC MANURES.

Lime.—Lime is a necessary element of the food of plants, and enters into the composition of every form of vegetable life ; few soils that do not contain it in some form. But as a manure in itself, lime rarely needs to be added to the soil ; as an indirect fertilising agent, however, it is of the greatest importance. It being necessary for all organic or vegetable matter in the soil to undergo decomposition before the contained elements are rendered available for use as plant-food, lime in its hot or caustic condition is one of the most powerful agents for effecting such decomposition. Thus an application of lime to *acid* or *sour* land, often has most beneficial results ; whilst its action on heavy or inert soils is an important aid to fertility, causing the soil to become friable, and thereby giving free access to air and water, which encourage the growth of soil bacteria. Lime is valuable for pasture land, as well as for field and garden crops, whilst its effect as a preventive against fungoid diseases (*e.g.*, club-root) and insects in the soil is well-known. The quantity of lime that should be applied varies according to the nature of the soil. In hot countries the soil requires less lime than in cool or temperate regions, owing partly to the more rapid rate of decomposition that naturally takes place in the former. In Ceylon, an application of 2 to 3 cwt. per acre is usually considered sufficient, and this in the case of Tea is generally applied with buried prunings. Clayey soils require more lime than light loams or sands. In the case of land which contains but little humus, lime should only be applied in very small quantities, otherwise exhaustion will be the result. Ground that is frequently manured, as an old vegetable garden, will be much improved by small applications of lime, this acting as a corrective of inertness resulting from liberal manuring. It should be remembered that lime will not supply the place of organic manure, that it merely renders this available for the nourishment of plants, and that in some cases its application to the soil may even be injurious. An old axiom of farmers is that—

Lime and lime without manure,

Makes both farm and farmer poor.

The exhausting effect of continued liming of the soil, whilst adding insufficient organic matter to the latter, is also aptly put in the saying :—“Lime pays the father, but ruins the son.”

Coral lime, which is almost a pure carbonate of lime, is what is usually employed for manurial purposes in Ceylon. It is imported from India and the Maldivé Islands in hard lumps, and is either ground to a fine state and sold as *ground-coral*, or burned in kilns, when it is supplied as burnt or *quick-lime*.

Chalk acts both mechanically and chemically when applied to the soil. It renders soils which are light and incapable of holding sufficient moisture more compact and retentive, a quality which prevents the rain washing away the soluble substances necessary for the support of plant life. Chalk is a variety of carbonate of lime, and besides this substance it contains to a varying extent clay, sand, potash, soda, oxide of iron, phosphoric and sulphuric acids.

Gypsum, or Sulphate of lime, is a combination of lime, sulphuric acid and water ; it belongs to the class of *indirect manures*, and exists to a large extent in ordinary superphosphates. Though opinions regarding its fertilising action are divided, its use is often attended with much success. It may be applied at the rate of 3 to 5 cwt. per acre, and is found to produce the best results when used in wet weather. It is considered best adapted to light sandy soils, though it is also sometimes successfully employed on heavy clays.

Ashes.—Wood-ashes contain potash and soda, besides other inorganic elements of plant-food, and therefore form a valuable manure. They are suitable for applying by themselves, or for intermixing with dung or other manures. The charcoal which the ashes usually contain in small pieces has the important property of absorbing ammonia and other gases, and again giving them off for the nourishment of plants. Wood-ashes are on this account valuable as a deodoriser. *Coal-ashes* are useful as manure in some cases, especially on stiff clayey soils, owing to the sulphate of lime or gypsum they contain, and have been found to encourage the growth of leguminous vegetables. (See *Peat*, under *Soils*).

Magnesia is essential to the growth of plants, it being always present in their ashes in variable proportions. It is considered that magnesia, applied as a manure, may act directly by serving as food for the plant, or indirectly by uniting with insoluble mineral substances, and rendering them available as plant-food. "Japanese experts show that the ratio of lime to magnesia in soils has an important bearing on many crops." (*Bamber*).

Ammonia.—Ammonia is one of the most important components of manures, and one which has a powerful stimulating action

on the growth of plants, usually producing a luxuriance of dark green foliage. It is formed by the decay of organic matter in the soil, and also in the air, and is the source from which plants derive their nitrogen. Ammonia is supplied to plants by the decomposition of organic manures capable of forming it, or by the use of some of the salts of ammonia. Of the latter the most commonly employed is—

Sulphate of ammonia.—For garden crops or pot-plants this may be dissolved in water ($\frac{1}{2}$ ounce to 1 gallon of water) and applied as a liquid manure, having in this way most beneficial effects on plant growth. Bamber recommends it as “a very useful ingredient in mixtures, as it supplies soluble nitrogen in a most concentrated form; the quantity so employed may be from 25 to 50 lb. or more per acre.” This and other salts of ammonia are very powerful in their action, and need to be used with caution.

Nitrate of soda (Chili saltpetre).—Of all the nitrogenous manures, nitrates are the most rapid in action, as the nitrogen they contain is actually in a condition in which the plant can take it up at once without change. Nitrates being easily washed out of the soil by rain or heavy artificial waterings, they should only be applied when the plants are established and are ready by their root-action to make full use of them. Nitrate of soda is obtained from Chili, and is sometimes called *Chili saltpetre*. Owing to its high percentage of nitrogen (about 15 %), it has very stimulating effects as a manure, and should be used in small dressings occasionally, rather than in one heavy application. It is particularly suitable for use in dry seasons, owing to its great solubility and the fact that it is already in a state in which it can be at once assimilated by the plants; and it is especially suited for root and grain crops. It is computed that 3 cwts. of nitrate of soda is equal in value as a fertiliser to 80 tons of farm-yard manure.

Calcium nitrate is manufactured in Norway, and is obtained on the principle that “at the extreme heat of 3,000 degrees Centigrade atmospheric nitrogen can be made to directly combine with oxygen.” The chemical combination, which is achieved by the use of the electric arc flame, produces nitric acid gas. The compound is afterwards passed through water and lime, and finally a solid nitrate of lime (calcium nitrate) is obtained.

Potash is an important part of the food of plants, being found in large quantities in their ashes, and is consequently a valuable

constituent of manures. It is of special value in fruit-culture, constituting as it does the most important ingredient in the ash of fruits. Potash is of special importance in the process of assimilation, in which starch is converted into sugar. It is rarely used as a manure by itself, being usually applied in conjunction with nitrogenous or phosphatic fertilisers. Sandy or gravel soils, which are naturally deficient in potash, stand most in need of this form of manure.

Nitrate of potash (sometimes called **Nitre or Saltpetre**) is a combination of potash and nitric acid. It is a powerful manure, containing both nitrogen and potash, and is especially adapted for fruit production. The frequent use of this is, however, considered to have the effect of exhausting soils of organic matter. It is recommended for broadcasting among Tea plants at the rate of about 100 lb. per acre.

Sulphate of potash usually contains about 50 % of potash, and is considered to be the cheapest and best form of applying potash to the soil. In orchards it may be applied at the rate of about 1 lb. per tree.

Kainit.—A compound of sulphate of potash and magnesia, now much used as a potash manure. It is imported from Germany, and usually contains 12 to 14 per cent. of potash, and 35 per cent. of common salt.

Muriate of potash.—Also a product of German potash mines, said to contain about 50 to 60 per cent. of actual potash.

Superphosphate.—This is perhaps the most important and universally used form of phosphatic manures. It is made by treating rock-phosphates, bones, &c., with sulphuric acid, and drying the product. As usually prepared, it should contain about 17 per cent. phosphoric acid soluble in water. A form known as "Concentrated Superphosphate" is imported which contains about 44 per cent. of soluble phosphoric acid.

Basic slag is a by-product obtained in the manufacture of steel. Iron ores contain irregular quantities of phosphorus, and the object of the steel-maker is to get rid of all the phosphorus in the iron. To effect this the iron is melted in contact with limestone, which extracts the phosphorus and forms a slag. This, when ground to a fine powder, is *basic slag*, which may vary very considerably in quality, though usually containing 30 to 40 per cent. of phosphate. Basic slag has grown in favour as a form of manure in Ceylon, more especially for applying with buried Tea prunings or green-manure; in this way it may be applied at the rate of about $2\frac{1}{2}$ cwt. per acre.

Phosphate of lime.—All organic manures, and some kinds of chalk and marl, contain phosphate of lime. This is also found in nearly all plants, and, on account of its supplying phosphoric acid, constitutes a valuable addition to soils. Phosphatic manures are noted for stimulating plants into vigorous growth, thereby rendering them better able to assimilate the potash contained in the soil.

"Chilinit"—is described as a new fertiliser, composed of the fertilising ingredients in the waste from sugar refineries. "Nitrifying bacteria are cultivated in a portion of the molasses, which is then mixed with lime and sand, and gently dried at a low heat. The product usually contains 3 to 4 per cent. of nitrogen and 8 to 9 per cent. of potash."

Calcium Cyanamide or "Nitrolim."—A new nitrogenous fertiliser, which is prepared from the atmosphere by the aid of a powerful electric furnace, and said to be now manufactured in different countries. The process of manufacture is stated to be "by heating lime and coke to a temperature of 2,500 degrees centigrade in electric furnaces of the resistance type. Calcium carbide is thus produced; the carbide is then heated in retorts, and at 1,100° C., atmospheric nitrogen is introduced and absorbed, the new compound being known as Calcium Cyanamide, or 'Nitrolim.' This is usually guaranteed to contain 20 per cent. of nitrogen."

Salt (Chloride of sodium).—Common salt, which contains soda, chlorine and other substances, has been used for manurial purposes from very early times, and in some countries is still so employed to some extent. Especially for such plants or crops as are indigenous to the sea-side, as Coconuts, Asparagus, Beetroot, &c., salt is considered by some to be very beneficial as a manure. Yet it is a disputed point whether it has any manurial value, direct or indirect, it being often asserted that it has none. The presence of sodium and chlorine in the ash of most plants is considered to be due to accident rather than necessity, the quantities present being very variable. On the other hand it is stated that even were salt a necessary plant-food, its presence in all soils is already sufficiently abundant to obviate any necessity for its application. It is, however, as an *indirect fertiliser* that the beneficial effect, if any, of salt chiefly lies. Dr. Aikman in his book on "*Manures and Manuring*" remarks that "the action of salt in decomposing the minerals containing lime, magnesia, potash, &c., is similar to the action of lime; it acts upon the double silicates and liberates these necessary plant-foods, also on the phosphoric and silicic acids, which it sets free." As a preventive of rankness of growth, the effect of salt is

generally admitted. It is also thought that, "having a great affinity for water, the application of salt is of benefit to crops by absorbing moisture from the subsoil as well as from the air." Salt is often recommended and used as a manure for Coconuts in Ceylon. Bamber considers its application beneficial in some cases, and recommends it for Coconuts at the rate of 1 lb. per tree. Whatever be the merits of salt as a manure, there seems to be much difficulty in regard to the proper amount to apply. When applied in excess its action is most deleterious, 2 % in a soil being considered sufficient to render the latter barren. Thus it was customary in ancient times, after the conquest of a hostile town, to "strew salt on the enemy's fields, for the purpose of rendering them barren and infertile." Bamber has found on analyses that the Ceylon rainfall yields from 28 to 112 lb. of common salt per acre per annum, according to the amount of rainfall and the proximity to the sea.

LIQUID MANURES.

Although this term is generally considered to imply the drainings of dung-heaps, stables, &c., yet almost any manure may be applied to the soil in a liquid state. Manure of this description, though most beneficial to vegetable and other crops, should only be used when the plants are in a healthy state of growth. It can also be very profitably applied to composts, so as to induce rapid fermentation of their organic matter, *i.e.*, the formation of plant-food. It is claimed that liquid manure has a great advantage over solid, being "stronger, quicker of action, and capable being more evenly diffused over the land." Most of the highly concentrated artificial manures are doubtless best applied in solution, but this is not always practicable. Liquid manure may be made by adding a small portion of some concentrated fertiliser to a can of water, and applied at once to the plants it is intended to stimulate. This is a ready and clean method of preparing it, but one which requires some caution in guarding against the dose being too strong. All chemical manures intended for use when dissolved in water should be tried first in a weak solution, and the strength increased gradually if results warrant it. Liquid manures, as already stated, are most effectually employed when the plants are in an active state, yet in want of a stimulant for assisting the development of their crops, or for sustaining their growth.

Soot, or Soot-water.—Soot is seldom obtainable in Ceylon, except perhaps at up-country bungalows. In countries where it is

available it is considered a valuable manure, as well as an insecticide, and is used either in a dry state mixed with other manurial substances, or dissolved in water, the latter form being best adapted for garden purposes. Soot-water is made by placing the soot in a canvas bag, along with a stone to sink it while dry, in a cask or tub of water: about a $\frac{1}{4}$ bushel of soot to 10 gallons of water is sufficiently strong. As the liquid is taken out, more water is added until the virtues of the soot are exhausted. It is claimed that the application of soot-water to the soil in which pot-plants grow increases the size and deepens the colour of flowers and foliage, and greatly enhances the general vigour of the plants. On cold soils especially it is considered useful, as the dark colour of the soot favours the absorption of heat from the sun, and thus tends to earlier crops being produced. A ton of average chimney soot in England contains about 3 lb. of nitrogen, 15 lb. of potash, and 17 lb. of phosphoric acid. Apart from its manurial properties, soot is said to materially assist in keeping down the larvæ of destructive insects.

Soap-suds.—"These," said Dr. Lindley, "have an undoubted value, because of their potash, irrespective of the organic matter they contain." For potted plants an occasional application of soap-suds is considered very beneficial. Firminger, in India, said: "I scarcely know of a better and more effective insecticide. By syringing and washing the leaves of potted plants with soap-suds, I have preserved them from the attacks of blight, mealy-bug, and other enemies of the gardener. Plants in a sickly condition have often been restored to health by merely washing their leaves with soap-suds. In fact if you wish to keep your plants in a luxuriant growth, wash and syringe them with soap-suds once or twice a week, especially those exposed to dust."

COMPOSTS AND MIXTURES.

Any mixture of different soils or manures, made up in varying proportions, either for potting plants or applying to field or garden crops, may be called a compost. While manure mixtures are important in agriculture, soil composts are equally indispensable in horticulture. Many manures, natural or artificial, of which only small quantities are necessary, require to be mixed with other substances in order to ensure their even distribution; others, again, (*e.g.*, guano) are so powerful, that in an unmixed state, instead of proving beneficial they would be actually destructive to plants; all such are, therefore, best applied as mixtures. For potting

plants, valuable composts are prepared by mixing loam or ordinary soil, leaf-mould, well-decomposed manures, and a small proportion of fine sand and charcoal; the proportions used should vary according to the nature of the plants for which they are intended.



CHAPTER IV.

GREEN MANURING AND MULCHING.

Green manuring consists in growing special crops, either alone or intermixed with others, for the purpose of digging or ploughing into the soil in a green state, when they have reached a suitable height, or before flowering. This mode of enriching the soil is considered to be one of the most economical as well as efficacious, the fresh vegetable matter being returned to the soil with greater advantage than when it has been decomposed, and much of its goodness has been lost in the process of rotting and fermentation. For improving the condition of light sandy soils especially, green-manuring is of the greatest value. Briefly, the following are the principal benefits derived from the application of green-manures, *viz* :—

- (1) The addition of humus or vegetable matter to the soil, which increases its capacity for retaining moisture.
- (2) The prevention of surface wash on steep land.
- (3) The improvement of the mechanical condition of the soil by the action of the roots of the green-manure plants.
- (4) The protection of the soil and roots of crops from the excessive heat of the sun.
- (5) The suppression or diminution of weeds, and therefore economy of labour.
- (6) The decomposition of the vegetable matter gives rise to acids, which act as solvents on the soil constituents, and thus render available more material for plant nutrition.
- (7) The fixation of atmospheric nitrogen in the soil by leguminous plants, especially those of the sub-order Papilionaceæ.

Whilst all plants, weeds included, are useful for adding organic matter to the soil, when dug into it in a green state, yet all are not equally valuable. However well the first six of the objects above named may be achieved by the use of non-leguminous plants as

green-manure, it is generally believed that only leguminous species have the power of utilising free nitrogen, which they effect through the agency of the bacteria nodules on their roots.

In selecting plants suitable for green-manuring, those which are more or less of a herbaceous character and rapid growth, capable of forming a good cover on the ground in a short space of time, should be chosen. Creepers or climbers are not usually so suitable as bushy herbaceous annuals, and, if used, care must be taken that they do not twine round the stems of the growing crop. The following are recommended for the purpose, all belonging to the family of Leguminosae :—

Aeschynomene indica. "Diya-siyambala," S. Annual, 1-2 ft. high. moist places in dry region.

Alysicarpus vaginalis. "Aswenna", S. 2-3 ft. high. Dry low-country.

Arachis hypogoea. Ground-nut. Herb, 12-16 in. high. Sea-level to 2,000 ft.

Cajanus indicus. Pigeon-pea or Dhall ; "Rata-tora", S. Shrub. Sea-level to 2,000 ft.

Canavallia ensiformis. "Wal-awara", S. "Koli-avarai," T. Perennial twiner. Low-country.

C.——— obtusifolia. "Mudu-awara", S. Creeper. Seaside.

Cassia mimosoides. "Bin-siyambala," S. An annual, 2-3 ft. high, common in low-country; leaves very sensitive. Up to 3,000 ft.

Cicer arietinum. Chick-pea ; "Kadala", S. Annual herb, 1 ft. high.

Crotalaria juncea. Sunn-hemp. "Hana", S. An erect annual. Semi-dry low-country.

C.——— retusa. "Kilukiluppai", T. "Kaka-andana-hiriya" S. Low-country shrub.

C.——— striata. A herbaceous shrub, 2-3 ft. high. Low-country, up to 3,000 ft.

C.——— Walkeri. (=C. semperflorens). Perennial herb, 2-3 ft. Montane zone.

Desmodium Wightii. A tall herb, 2-3 ft. high, Low-country.

Dolichos biflorus. "Kollu" S. Small climber.

D.——— Lablab. "Dambala," S. Small climber.

Glycine hispida. Soyá Bean. Small herb. 12-15 in. Up to 2,500 ft.

- Indigofera aspolathoides.** "Sivanaivembu," T.—"Rata-kohomba," S. Dry region.
- I** ————— **tinctoria.** Indigo. "Nil-awara", S.—A low shrub, common in the Low-country.
- I** ————— **viscosa.** Annual, 2-3 ft., common in dry region.
- Mucuna utilis.** Velvet-bean. Climber or creeper. Low-country, up to 3,000 ft.
- M.** ————— **pruriens.** "Achariya-pala" S.—Annual twiner. Dry and intermediate regions.
- Phaseolus lunatus.** "Bonchi," or "Dambala," S.—Herbaceous twiner. Up to 3,000 ft.
- P** ————— **semierectus.**—An erect annual, 2-3 ft. Low-country.
- Psoralea corylifolia.**—"Bodi," S. "Kavoti," T.—Annual, 1-3 ft., dry region.
- Sesbania aculeata.** "Dhaincha," S.—Annual, 1-3 ft. Low-country including dry region.
- Tephrosia purpurea.** "Kavalai," T. "Pila," S.—Perennial herb, 1-2 ft. Low-country.
- T.** ————— **candida.** "Boja Medelloa." Shrubby perennial, 3-4 ft. high.
- T.** ————— **tinctoria.** "Alu-pilla," S.—Perennial, 2-3 ft., thrives up to 3,000 ft.
- Vigna Catiang.** Gas Mê, S. Cow-pea.—Perennial twining herb. Low-country.

LEGUMINOUS TREES SUITABLE FOR LOPPING
FOR GREEN MANURE,
OR FOR PROVIDING LIGHT SHADE.

- Acacia decurrens. Tan-wattle.** } —Quick-growing trees ;
Acrocarpus fraxinifolius. — } 3,000 to 6,000 ft.
- Adenantha pavonina.** "Madatiya," S.—A tall tree of the Low-country.
- Albizzia moluccana** } —Large fast-growing trees. Thrive
A. ————— **stipulata.** } up to 4,000 ft.
- Erythrina lithosperma** —Dadap. Fast-growing, sappy tree. Low-country to 3,000 ft.
- E.** ————— **umbrosa.** "Bois Immortelle." Quick-grower; 1,000 to 3,000 ft.

- Pongamia glabra.** "Punku," T. "Magul-karanda," S.—
Large tree of the low-country.
- Tamarindus indicus.** Tamarind. "Siyambala," S.—
Large slow-growing tree. Dry region.

MULCHING OR SURFACE-DRESSING.

The practice of mulching or surface-dressing is of very considerable benefit to crops, and during dry weather its adoption is especially to be recommended. Mulching will prevent the surface soil forming a crust, and thus retard the evaporation of moisture; it provides humus in the soil; can be carried out at all seasons, and in many cases economises labour by doing away with the necessity for frequent watering. The mulch may consist of green vegetable matter, leaves, litter, stable or other refuse, which may be spread over the surface of the ground, and either lightly forked in to the soil, or merely left on the surface as a protective covering. Leaves, or any rapidly decaying organic matter that may be available, will answer the purpose of a mulch or surface covering, but certain plants contain a larger proportion of nitrogen or other food constituents than others, and these afford the best mulch. The following are some of the principal plants commonly used for mulching purposes in Ceylon.

Chester J.

FOR THE LOW-COUNTRY, INCLUDING THE DRY
REGION :—

- Adhatoda vasica.** "Adathodai," T.—A shrub, 4 to 6 ft.
- Azadirachta indica.** Margosa; "Kohanba," S.—A small tree; leaves used in Tobacco cultivation.
- Calotropis gigantea.** "Wara," S.—A large quick-growing shrub.
- Cassia auriculata.** "Ranawara," S.; "Avari," T. (Leguminosae).—A sea-coast annual.
- Coconut husks.**—Used largely on and in the neighbourhood of Coconut plantations.
- Croton lacciferum.** "Keppettiya," S.—A small tree, the leaves of which are commonly used as a mulch in Betel cultivation.
- Erythrina lithosperma.** "Dadap," (Leguminosae).—(See under *Green-manure*).

Ricinus communis. Castor-oil plant.—A quick-growing, tall annual.

Tabernaemontana dichotoma. “Divi-kaduru,” S.—A small tree; leaves used for mulching in low-country.

Tamarindus indica. Tamarind (Leguminosae).—A large tree, leaves commonly used for surface dressing for Tobacco in dry region.

Tephrosia purpurea. “Kavalai,” T. (Leguminosae).—Commonly employed as a mulch in the dry region.

Thalassia Hemprichii. Sea-weed. “Chatalai” or “Sathalai,” T.—Commonly used for Coconut and Rice plantations near the coast.

Thespesia populnea. “Suriya,”—A medium-sized tree.

FOR UP-COUNTRY :—

See under “Green Manuring,” also “Shade Trees for Crops.”

N=SINHALESE; =TAMIL.



CHAPTER V.

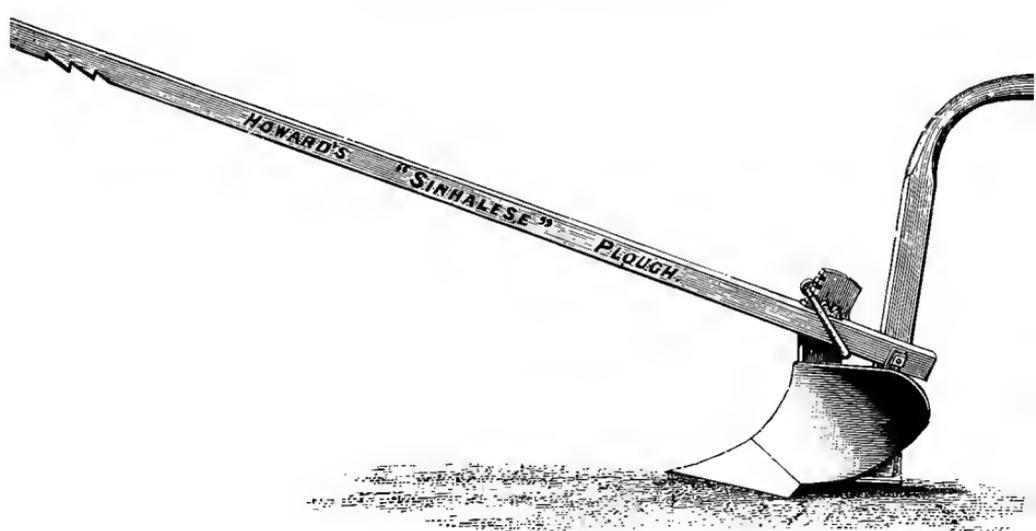
SOIL OPERATIONS.

Tillage.—The main objects of digging or ploughing are :—to loosen the soil so as to facilitate the absorption of rain and the admission of fresh air, and to enable the roots of plants to penetrate the soil more easily. Further, tillage maintains a proper supply of moisture in the soil, affords natural drainage, encourages the activity of soil bacteria, and generally suppresses the growth of weeds. Thorough tillage is often as essential, especially for root-crops, as manuring. Plants can only obtain the full benefit of manures when the land is maintained in a proper state of tilth. Deherain conducted experiments which showed that “trituration or pounding of the soil is a powerful method of causing active nitrification.”

“Tillage hinders 'vaporation.

Tillage works weed 'radication.

Tillage helps food 'laboration.”



A SINHALESE IMPROVED PLOWG.

Fallowing.—In the case of crops that are of short duration in the soil, fallowing is sometimes adopted for restoring fertility to the land. The cropping being stopped, a rest is provided for the soil, during which a new supply of plant-food becomes stored up in the soil, and this will be available for the succeeding crop. For the more permanent crops however, such as Tea, Cocoa, Coconuts, and Rubber, fallowing cannot be adopted, and manuring and tillage operations must be relied upon to meet the requirements of the plants. Leaving the ground fallow for a period is sometimes an effectual method of getting rid of fungi or insect pests.



A SOIL "AERATOR."

ROTATION OF CROPS.

Plants differ, as shown by their ashes, in the relative proportions of plant-food they require and obtain from the soil. Therefore when successive crops of one kind are grown on the same ground, those elements which are most consumed obviously become exhausted. Consequently the soil becomes unproductive, the crop weak and sickly, and even the application of costly manures does not satisfactorily restore fertility. The principle of cropping by rotation is to avoid this, by preventing two crops of the same

kind from succeeding each other. The advantage of the system is undoubted, and in some temperate countries its adoption is made a compulsory rule in farming. In the tropics, however, rotation is often impracticable, owing to the fact that many of the crops grown are of a permanent nature, and, once planted, last from a few to a great many years. But wherever possible, as in the case of garden or annual crops (root-crops, grains, pineapples, and vegetables) as well as flowering-plants, the principle of alternating crops should be practised. The question of a practical system of rotation to replace the wasteful method of chena cultivation in Ceylon (by which the land is allowed to run wild for a number of years, after having obtained a crop or two from it) has yet to be satisfactorily solved. Rotation of a kind is sometimes applied to Rice cultivation in the tropics, though seldom in Ceylon. Rotation also exerts a

beneficial mechanical effect on the soil, owing to the necessary and more or less different preparation of the land for the different crops, as well as by the quantity of roots, &c. left in the ground by successive crops. Certain roots enter the soil deeper than others ; these aerate the subsoil and, when the crop is removed, remain in the ground to rot. Proper rotation is also claimed to be an excellent preventive against fungoid diseases and insect pests, these dying of starvation when a crop intervenes that on which they live or feed. Weeds, too, are checked (sometimes exterminated) by means of rotation of crops. It will generally be noticed that when plants of one kind are growing together in great numbers and for many succeeding years, they are liable to be attacked by insect pests and fungoid diseases. Any system of rotation adopted must vary according to the variety of crops that are desirable to grow ; thus different systems are used in different countries. Dr. Willis recommends the following system for chena lands in Ceylon :

First Year.—Tobacco, Indian-corn or Maize, Cotton, Citronella or Lemon grass (these last may be left on for about three years) ; all fairly exhausting crops. Pen cattle on the land between crops, and dig in green manures, *e.g.*, Pila leaves, &c.

Second Year.—Root crops, *e.g.*, Cassava, Sweet-Potatoes, Yams, Arrowroot, Onions, Ginger, Turmeric, &c., Pen cattle, &c.

Third Year.—Dry grains, *e.g.*, Kurrakan, Chillies, Gingelly. Gourds, small fruits, Castor-oil plants, grasses for fodder, Mustard, Murunga. Pen cattle, &c.

Fourth Year.—Gram, Ground-nuts, Peas or Dhal, or other leguminous crop to enrich the soil in nitrogen.

Fifth Year.—As first year, and so on.

For Tobacco land, Mr. C. Driberg recommends a 3-course rotation, thus :—(1) Tobacco, (2) Leguminous crop, *e.g.*, beans, grams, ground-nuts, &c., (3) Grain crop, *e.g.*, paddy, kurrakan, amu, maize, &c.

For gardens the following rotation is recommended :—(1) Cabbages, (2) Carrots or Beet, (3) Peas, (4) Celery, (5) Potatoes.

IRRIGATION.

Irrigation is practised chiefly in dry countries, where, in many cases, the cultivation of crops and other plants is entirely dependent upon it, as in the northern part of Ceylon. In a moist climate, as in the south-west of Ceylon, irrigation is adopted only in the cultivation of Rice, or other water-plants. In countries

where the rainfall is limited, however, intermittent irrigation is also applied in the cultivation of fruits and other crops. The methods of accomplishing irrigation depends upon the facilities which the situation offers, the water being conveyed from natural sources or artificial reservoirs to the land by means of canals, streams (called "ellas" in Ceylon,) pipes, or spouts. In the Jaffna district, irrigation water is hauled up from deeply sunk wells by means of rope and pulley with buckets, and distributed along diverging and transverse channels. A general mode of raising water in parts of India is by means of a large bag made of bullock-hide ; the bag is suspended from a pulley over the well, and this is drawn up by a pair of bullocks as they are made to run down a declivity. The "Persian wheel" method of raising water is commonly adopted in Northern India. This consists of a large vertical wheel, fixed in the mouth of the well ; over this a looped chain of earthenware pots is suspended, the lower part of which reaches the water. As the wheel revolves, one length of the chain is continually rising with pots full of water, which discharges themselves into a trough fixed at the summit, and return empty to be filled again. By means of a horizontal wheel and a beam, bullocks are made to work the apparatus. Wind-mills also are sometimes employed very successfully for raising water.

Different systems of irrigation are adapted for different countries, according to circumstances. A simple system is to conduct water through the land by small canals, the soil obtaining its supply by the water percolating through the porous earth. The "catch-work" method of irrigation is adapted for sloping land, and consists of a series of transverse trenches or canals ; the water is conducted through the upper trench, runs along the surface and escapes through regular outlets into the next trench, and thence to the one below, and so on. Similar to this is the "terracing system," which is carried out extensively in rice cultivation on the hill-sides in Ceylon, where it forms a striking feature in the landscape. (See under *Ricc.*) Artesian wells and tube-wells are largely used in some countries, being especially suitable where the soil is loose and sandy. They are successfully employed in parts of India, but are not adapted to localities where the soil is of a clayey or hard laterite nature.

In some countries where large rivers run through low-lying land, as in the case of the Nile in Egypt, and the Ganges in India, the river itself is allowed to run over the land when in flood and

full of rich mud. The latter is deposited on the land, which is thus enormously increased in fertility. Sir W. Willcocks considers that one good deposit of slime or mud, brought down by the Nile from the detritus of volcanic rocks, could produce six excellent crops in succession. With the extensive irrigation works which have now been made in the countries named, irrigation becomes less dependent upon the fluctuating rises of the great rivers. Some of the larger irrigation tanks in Ceylon, for example, have an area over 4,200 acres, and resemble large and beautiful lakes. An important principle of irrigation is that the water supplied must neither be excessive, nor allowed to remain on the land so as to become stagnant. Therefore, provision must always be made for overflow and the free movement of the water.

DRAINAGE.

Proper drainage, whether natural or artificial, is essential to all cultivated soils. The objects of drainage are briefly to enable the rain to become absorbed by the soil and to pass through it; to render the soil porous, though maintaining a sufficiency of moisture for plant-life; to remove superfluous water, and prevent stagnant water remaining in the soil. A porous soil contains small spaces between its particles, and these are filled with air when not occupied by water. The presence of air warms the soil, conduces to bacterial activity and nitrification therein, and is essential to plant-growth. Some lands are naturally well-drained, which may be seen by the fact that rain when it falls on them percolates through without leaving the soil sodden or saturated. Soils which are not properly drained become impregnated with acids which are injurious to plant-life; in such cases the soil is cold, and causes the roots to rot off. A damp soil is always colder than a porous soil, for the reason that water is colder than air.

Surface drainage, *i.e.*, open trenches or ditches at intervals, are essential on steep lands, so as to prevent or check the washing away of the surface soil by torrential rains. This system of drainage is extensively employed throughout the Tea-planting districts, and is indispensable to the preservation of the soil. The drains are usually about 2 to 3 feet in depth, and vary in the distance apart according to the gradient and physical characteristics of the land. On very steep land, drains should not be more than 25 to 30 feet apart, while on gentle slopes they may be as many yards distant.

In gardens or ornamental grounds, however, open drains

would be unsightly if not impracticable, and for that reason they should be covered, notwithstanding the extra cost thus incurred. In making a covered drain, drainage tiles or stones should be placed in the bottom of the trench, large spaces and crevices being left in the bottom, and finishing with a layer of smaller pieces at the top. Brushwood, fibre, or straw may be placed over this, and the soil then filled in.



CHAPTER VI.

PROPAGATION.

Plants are propagated in various ways ; some which increase at a rapid rate by one method cannot be similarly raised by another, while in some cases all methods of propagation fail. The following are the principal modes of propagation in use :—

Propagation by Seed.—This is the most natural mode of increase, and is the one by which the vast majority of plants naturally spread and produce their species, the off-spring being more or less true according as the flowers are disposed to become influenced by foreign pollen affecting their fertilisation. The production of seed may be said to be the aim of the life of every plant in a state of nature. Where exact counterparts of plants cannot be ensured by raising from seed, propagation by vegetative means, as by cuttings, buds, grafts, &c., may be resorted to.

Selection and Saving of Seeds.—In the raising of seed of most kinds it is important that selected plants or trees should be set apart for the purpose and cultivated with special care. Every encouragement should be afforded the parent plants to produce perfect and well-nourished seed, and when these ripen, only the largest and best should be selected. Therefore, with this end in view, any inferior or imperfectly formed flowers or fruits should be removed where practicable. Vigour may also be concentrated in the seed by thinning out the flowers or fruits, retaining only the best. This not only applies to annuals which may be grown for ornament or use, but also to fruit-trees, Tea, Coconuts, Cacao, or other products. It is of importance that seeds should be perfectly ripe before gathered, as otherwise their germination and the vitality of the seedling will be affected.

Sowing seed.—Seeds vary in size and character so much that no hard and fast rule can be laid down for sowing them. Certain conditions are, however, essential in all cases. All seeds are best sown in fine, light soil, easily permeable to the young roots as well as to the plumule. The surface soil should be made

moderately firm and even ; this will ensure the seeds being sown at a uniform depth, and aid in maintaining a moist surface. The proper amount of soil for covering the seeds varies according to the size of the latter. A good general rule is to cover seeds to a depth equal to their smallest diameter. Large seeds should not be buried much below the surface, whilst small seeds may as a rule be covered one-tenth of an inch. Seeds sown in the field, plot, or nursery-bed require to be buried deeper than is necessary for germination, so as to protect them from vermin, &c., and to allow for wash by rains. Seeds which take long to germinate, as Nutmeg, palms, &c., should be sown about an inch below the surface. In all cases of garden or field crops, the seeds should, whenever practicable, be sown in rows, never broadcast if avoidable. Sowing in rows economises seed, and enables the seedlings being better attended to in regard to weeding, thinning out, &c.

Sowing at stake, which is sometimes adopted in the case of field crops, as Rubber, Tea, &c., consists in sowing the seeds in the position which the plants are to occupy when grown up ; holes are prepared in lines and filled in, the stake marking the position of each hole being replaced ; one to three seeds are sown close to the stake, the weaker seedlings being afterwards removed as required.

In sowing very small seeds, as those of some annuals and vegetables, one is very liable to sow too thickly. A good plan is to "bulk" very small seed by mixing finely sifted soil or sawdust with it, as this enables the seed to be sown more thinly and evenly. When seedlings are large enough to handle they should be carefully thinned out or regulated, retaining the stronger ones and discarding the weaker. Large seeds are in many cases affected in their germination by the position in which they are sown, although this is a matter not often taken into account by cultivators. Mr. Petch, the Ceylon Government Mycologist, has found that deformity in seedlings of Para-rubber is chiefly due to the faulty position of the seed in germination, the shoot or plumule in consequence becoming entangled with the stalk of the seed-leaves (cotyledons). Out of 50 seeds which were sown horizontally with the inner or flatter surface downwards (which is considered the proper position) 48 germinated normally, while from a similar number sown vertically with the micropyle upper-most, only 9 normal plants were obtained. In the case of Coconuts it is customary to sow the nuts on their side, with the stalk ends slightly raised.

Basket or Bamboo-plants.—For most trees or shrubs, an excellent plan is to sow the seed in plant-baskets or bamboo pots ;

in some cases two or three seeds may be sown together, the weaker seedlings being afterwards removed, leaving only one in each basket or bamboo. This method of raising plants not only facilitates transport, but also enables the plants, with their roots in the soil intact, being planted out in dry weather with comparative safety. In the case of Rubber, Tea, &c., the advantage of basket-plants over stumps or seedlings from nursery-beds is obvious, and is usually well worth the extra cost entailed in their propagation. Where baskets are not obtainable, sections of bamboo will answer the purpose, but these, unlike the plant-baskets, must be removed from the plants when the latter are being planted out. This is easily accomplished thus: Split the bamboo along two sides with a blow from a knife, lay the plant on its side and invert the two halves of bamboo, which enables these being easily removed when the plant is fixed in position and the soil is filled in around it.

Germination of Seeds.—The seed may be divided into three parts, *viz.*, the germ, the body, and the skin. The germ or life principle is the *embryo*, consisting of the miniature plant with the leaves and stem in an undeveloped state. The body or *endosperm* is the reserve food which nourishes the embryo in germination until the root is advanced enough to derive nutriment from the soil. The *skin* or *shell* of the seed is for the purpose of protection. The four conditions essential to successful germination are: (1) a certain amount of moisture, (2) a favourable degree of heat, (3) a continuous supply of fresh air, and (4) protection from strong light. In the absence of any of these conditions successful germination cannot take place. When the seed-coat or shell is hard and horny it precludes air and moisture from the embryo, and thus prevents germination until it has sufficiently decayed. Certain seeds with extremely hard shells or endosperm take a long time to germinate, varying from 2 or 3 months, as in the case of the Nutmeg, to almost as many years, as with certain species of palms. In many cases, however, germination may be assisted by either filing or rasping the horny shell, or subjecting them to repeated soakings in almost boiling water. The former method may be applied to seeds with a hard horny shell, as those of Ceara-rubber (*Manihot Glaziovii*), while the latter is adopted in the case of seeds whose hardness is due to the endosperm, as Indian-shot (*Canna*), Wattles (*Acacia*) and other leguminous sorts. The “rasping” or “filing” process is perhaps best carried out by holding the seed, when large enough to handle, for a few seconds against a revolving grindstone. A cooly with a seed in each hand, with another cooly turning the

handle, will thus soon get through a large number of seeds. Another method of facilitating the germination of very hard seeds, is to place them in a hot fermenting dung heap. Indian Shot (Canna), Ceara Rubber seeds and others have been successfully started in this way. In hastening the germination of old or hard seeds, camphor dissolved in water has been found to have a marked effect. Experiments have also shewn that treating seeds with chlorine water (2 drops chlorine to 60 C.C. of water), and then placing them in the sun will accelerate germination. Another aid to germination is to water the seeds with a weak solution of formic acid (1 in 5,000), or with alkaline substances, as ammonia, soda, &c.

Testing vitality of seeds.—A popular way of testing the vitality of seeds is to place them in water, when if they float they are presumed to be bad. This, however, is misleading, as some seeds when in their prime float, and sink when in a bad condition, or *vice versa*. Seeds will either sink or float according to their specific gravity. Those which sink when good are of doubtful character when they swim. A better test is to cut or break up a certain percentage of the seeds; if in good condition the interior of the seed will present its natural colour and cheesy consistency. The surest test of vitality, however, is to sow a small representative quantity under the most favourable circumstances, as in specially prepared pots or beds under shelter. The proportion of seeds which thus germinate bears to the number sown will afford proof of the quality of the seed. For testing small seeds, they may be placed between wet blotting paper or damp cloth. It is a good plan when seeds are of doubtful quality to soak them in hot water previous to sowing; very often this may add 20 to 30 per cent to the number of seedlings which would otherwise be obtained.

Acclimatized seed.—This term is applicable to seeds of any introduced and acclimatized plant, but in India it refers to European annuals and vegetables which thrive sufficiently well to produce good seed, capable of yielding satisfactory crops. In that country it has been found that in some cases such seeds give better results, at least for a time, than imported seeds. Though certain flowering annuals produce good seed in the Hill districts of Ceylon, no one, so far as I am aware, finds it worth while to save seed of European vegetables grown here. As a general rule cultivation in the tropics has a deteriorating effect on the quality of all flowering plants and vegetables from temperate climates. Therefore imported seeds and fresh strains usually give the best results, and these are easily procured fresh from England or Australia.

Seeds of Aquatic Plants (water-plants), such as *Nelumbium*, *Nymphaea*, *Victoria regia*, &c., should be sown in pots submerged in shallow water. The pots should be raised on bricks, or such-like supports, so as to bring them close to the water surface, thus securing greater warmth from the sun's rays than if placed deeper. Shallow still water is always the warmest.

Fern Spores should be sown upon fine sandy loam in well-drained pots or pans. The spores should be gathered before the spore-cases have burst, and be sown at once, the soil being well watered before the spores are scattered over the surface. The pans or pots should then be stood in saucers of water, and a pane of glass placed over the top until the spores have vegetated. Instead of separating the spores from their cases (*sporangiums*), fragments of matured fronds may be laid on the surface of the prepared soil, when the spores will fall out themselves. Neither covering of soil nor watering is required, it being sufficient to keep the vessel in which the pot is placed filled with water, as described above.

Orchid seed.—Experts in orchid-growing sow the seeds upon the surface of the material in which the orchid plants are growing, as owing to the presence of a symbiotic fungus it is supposed that the seed can best be grown in this way. Good results are, however, frequently obtained by sowing orchid seed on finely chopped moss or similar moist surface.

Propagation by Cuttings.—With the exception of seeds, this is the commonest method of propagation, and, as a rule, the most expeditious and satisfactory. Propagation by cuttings as compared with that by seed has special advantages. By the former the peculiarities of the parent are reproduced as if the cutting were still a part of it, whereas by seed the special characters of the parent are often not perpetuated. In the tropics a very large proportion of plants may be readily propagated by cuttings, especially if these are inserted in suitable soil during the rainy weather; some species, as the Dadap (*Erythrina lithosperma*), thus strike root so easily that if stems or branches are used as fence posts they will soon develop roots and sprout into leaf. In other cases, however, as with species characterised by hard wood or hollow stems, it is difficult, if not impossible, to induce cuttings to strike root. For successful propagation by cuttings, the following conditions are important, viz.: (1) firm and sufficiently ripened shoots from which the cuttings are taken; (2) a suitable rooting medium composed of a light porous sandy soil, or fine sand only; and (3) a higher temperature

with closer atmosphere than that in which the plants grow when established.

It is believed that most cuttings strike more readily if inserted in the ground sloping-wise instead of erect, and the natives invariably practise this when planting cuttings for the Cassava crop, or other plants to form hedges. The explanation probably is that the cuttings are thus more firmly fixed, and that there is less evaporation of moisture from the portion underground. In preparing cuttings, the end of the shoot to be in the ground should be cut across with a clean slanting cut, just below a leaf-bud. The lower leaves should be cut off, leaving 3 to 4 eyes or buds to be under the soil when planted; the upper leaves if of a large size may be reduced to half. As to what is the best size for the cutting, this depends upon the nature of the plant. In the case of soft-wooded species, it is necessary to take rather large cuttings with a certain amount of firm woodiness; cuttings of young succulent growth are liable to decay, especially if planted in the open ground. All cuttings succeed better at one season than another, and in many cases the most suitable period can only be found out by experiment. Generally speaking, however, cuttings will strike best at the commencement of the active growing season.

In taking cuttings of plants which are grown for their fruits or flowers, the upper shoots should be chosen; thus in the case of Pepper, Cubebs, &c., it is well-known that cuttings which are taken from the upper-most shoots are more productive and yield earlier crops than those obtained from the lower shoots. Similarly with flowering plants, cuttings taken from the extremity will flower early and in a comparatively small state. Thus, plants raised by cuttings from the flowering shoots of the climber *Camoensia maxima*, which usually takes several years to attain a flowering condition if raised from seed, have been found to blossom at Peradeniya in the nursery-bed when only about 16 inches high.

Although an open nursery is suitable for propagation by cuttings of most kinds of plants, many of the choicer sorts require to be struck in sand, under glass or other artificial covering. In glass-houses where artificial heat and moisture are under control, and bell-glasses for covering the cuttings are available, many kinds of plants may be raised by cuttings which would be impossible without these means. The bell-glass is of great advantage in preventing excessive evaporation and maintaining a warm and moist temperature around the cuttings. It is well-known that cuttings will strike better when placed against a porous substance, as the inside of a flower-pot half-full of sandy soil or sand

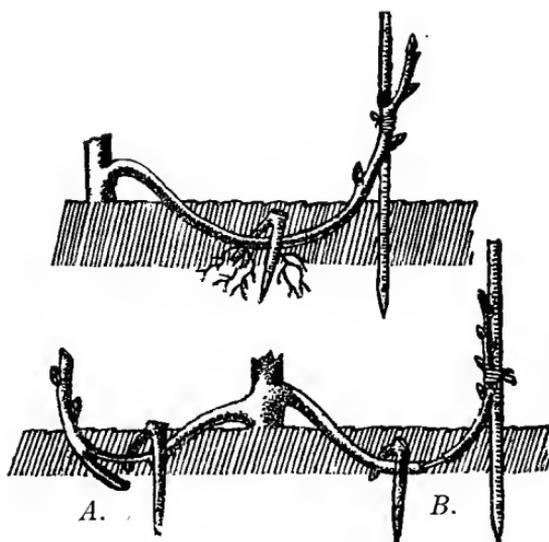
only. This fact has lately been taken advantage of in establishing a low hard-wooded plant, *Malpighia coccifera*, as an edging to the drives in Peradeniya Gardens. Edging tiles were first laid, and the *Malpighia* cuttings, being inserted against these, struck root readily and formed an excellent dwarf edging. A simple method of striking small cuttings is as follows: Fill a flower pot half-full of sand and soil; insert cuttings of a length sufficient to reach, within a little, the rim of the pot; sink the sink pot in the earth, and cover with a pane of glass. The glass should be turned each morning so as to dispose of the condensed moisture on the underneath side. Another excellent plan, practised in India, is thus described: "Procure a large flower-pot, and at the bottom of it place large loose pieces of brick, just so high that a small flower-pot placed inside upon them may have its rim on the same level as the rim of the large pot. Fill in the space between the pots with perfectly dry sand or earth. Fill the inner pot with pure sand, and insert the cuttings. Take another pot just of a size that when inverted it may fit in on the earth between the rims of the large and small pot. Break out its bottom, and lay over it a piece of window glass. Water the cuttings as they require it with tepid water, allowing none to fall on the earth between the pots. When condensation of moisture takes place on the pane of glass, merely turn it over."

Striking cuttings in water.—This method is sometimes practised with ornamental plants, and with but little trouble is usually successful. The points to be attended to as conducive to success are: (1) Cuttings to consist of the ends of young vigorous shoots; (2) capacious opaque or shaded bottles; (3) water to be changed often to avoid its becoming foul; (4) the water to be replaced with tepid water when changed; (5) the cuttings to be sheltered from wind and direct sun. Aquatics and most plants which like moisture can be readily multiplied by means of cuttings kept in water or in a moist condition.

Cuttings of Cacti.—Striking cuttings by drying them in the sun is effected in the case of Cactus and similar succulent plants. Sections of these being taken and placed on dry sand will, when become partially shrivelled, produce roots. If placed in soil in a freshly cut condition they are liable to decay.

Propagation by Layers.—A layer is a branch or shoot, part of which is introduced into the soil, and strikes root whilst fed by the parent plant, with which, however, its communication is generally partially interrupted by a cut, slit or ligature. When propagation by cuttings fails, layering may be resorted to, the latter,

though a slower process, being often a more certain method of multiplying plants. The operation is as follows : Select a branch of ripened wood of the plant to be layered that will bear being bent down to the earth without breaking. Cut the branch half through with a sharp knife just under one of the leaf-buds, towards its extremity, and then pass the knife upwards, so as to slit the branch about an inch or two up. The slit-piece, with the leaf-bud at its extremity, called the "tongue," should be kept open by inserting a small pebble or piece of brick. Bend the branch down, and where the tongue falls remove the earth to the depth of 2 or 3 inches ; the tongue part of the branch is secured in that position



LAYERING :—(A) TONGUEING ; (B) RINGING.

by a forked peg, and then covered over with a mixture of fine sand and leaf-mould. This must be kept shaded and moist, to facilitate which an inverted flower-pot may be placed over the spot where the slit is. There are various modifications of this method, and these may be varied to suit individual plants or trees or local circumstances. When the branch to be layered is too rigid to bend down, it may be made to pass through a broken flower-pot or other receptacle, the latter being filled with leaf-mould and sand, and placed on a support. A simple and successful method is to pass the branch longitudinally through two half-round tiles, the space between these being filled with suitable soil, and the ends filled

with moss to prevent the soil running out ; the tiles are then tied together, and the whole watered regularly.

Gootee layering.—This mode of propagation has been practised in India and China from early times. It is adopted in the case of trees which are difficult to raise by cuttings, or to which other methods of layering cannot be applied. The *modus operandi* is as follows : Select a firm healthy branch with well-ripened wood ; immediately under a leaf-bud or node, take off a small ring of bark, about one inch wide ; or make a slanting deep cut upwards, placing a small stone or a piece of stick in the groove



THE "GOOTEE" METHOD OF LAYERING.

to keep it slightly open. To this apply a ball of clayey soil, holding it securely together with coir fibre, tow, or moss, and bandaging all firmly round the branch. A little above this hang

an earthenware pot, and through the hole in the bottom of the latter draw from within a piece of thin rope; a knot tied on the end of the rope should fit tightly against the hole of the vessel above. The rope, secured by its knotted end within the pot, is carried on at full stretch and coiled round the gootee. By this means the water, with which the vessel is kept supplied, oozes slowly out, trickles down the rope, and so distributes itself over the whole gootee. In from three to four months, according to the plant in hand, young roots should be seen protruding through the gootee, when the branch may be cut from the parent tree, and planted where it is intended for it to remain. The operation should be carried out in the wet weather, commencing when active growth in the tree begins.

A modification of the "gootee" contrivance is a piece of thin tin plate, folded in the shape of a funnel, and fixed with clips round the branch. It is filled with moss or soil, which is kept moist by a drip from a bottle of water fixed above it, with the cork pierced so that the water can drip slowly on to the branch operated upon.

Propagation by Suckers.—A sucker is a stem or shoot which springs from a subterranean portion of a plant or tree. Two kinds of suckers may be distinguished, namely *root suckers*, which arise from adventitious buds on the roots, and *stem-suckers* which spring from the base of the stem below the surface of the soil. The former can be severed from the parent plant and removed with roots attached. Bananas or Plantains are a familiar example of this process of propagation. *Stem-suckers* spring from the base of the stem, at or below the surface of the soil, and their growth is at the expense of the part of the plant above them. Plants which have been heavily pruned or pollarded, often produce stem-suckers freely. The latter when required for propagation may be encouraged to produce roots by partly severing them with a knife from the stem and earthing them up with some good sandy mould, which should be kept moist. Stem-suckers are generally injurious to the plant producing them and, especially in the case of grafted or budded plants, should be cut away as fast as they appear, unless they spring from the scion and not from the stock. Pineapples are generally propagated by means of stem-suckers.

Propagation by Leaves.—Many succulent plants, as *Begonias*, *Glovinia*, *Bryophyllum*, &c., may be increased from leaves. The latter should be placed on a damp surface of a light sandy soil, and kept in position by being partly buried, or held down with small wooden pegs.



SHOWING AERIAL ROOTS OF *Ficus altissima* BECOMING ROOTED IN THE GROUND
AND FORMING INDEPENDENT STEMS.

Propagation by Eyes.—Many plants, especially those of a succulent nature, may be propagated readily by eyes or buds. The method is simply to take a plump shoot or stem on which there are buds not yet developed ; cut this in a slanting direction into short lengths, about $\frac{1}{3}$ inch above and below the bud. The pieces, having at least one eye or bud upon each, are planted firmly in a pan or box of fine sand and soil, with which they should be just covered. The sand or soil should be kept moist, and the eyes may be further encouraged to start into growth by a sheet of glass being kept over the surface.

Propagation by Roots.—In some cases plants may be readily increased by inserting pieces of roots in a sandy mixture of soil, and kept damp. Aerial roots, developed from the upper limbs or branches of species of *Ficus* and other trees, may sometimes be used as a means of increase. When these roots reach the ground they will at once fix themselves, and in a short time form stout independent columns or trunks. These latter will afford support to the parent tree and thus prolong its life, or in some cases the part which the newly formed stem supports may be entirely severed. Where "Gutta Rambong" (*Ficus elastica*) is systematically cultivated for rubber, these root-trunks are regularly tapped for their latex. The method adopted in Peradeniya Gardens for enabling the aerial roots of *Ficus* trees to reach the ground and strike root is as follows : Long bamboo stems (preferably the Giant-bamboo) are split into two, the transverse divisions cut out, and the two halves placed together round the aerial root, or at least the portion of it nearest the ground. The bamboo sections are tied together, securely fixed in the ground, and the top end tightly filled in with moss to prevent the ingress of rats or squirrels, which feed on the delicate young roots.

Division of Rootstock.—By this method plants which grow in clumps, or have fibrous or tuberous rootstock, as herbaceous perennials, are easily multiplied. "Division" consists in separating portions of the main plant, each portion bringing with it some of the roots ; if planted under suitable conditions either in pots or out in the field, these soon become established and form new clumps. To many plants of this nature the process of lifting, dividing and replanting each year is beneficial rather than otherwise, as if left undisturbed the soil becomes impoverished and the plant more or less "exhausted." Orchids and herbaceous perennials are generally multiplied by division.

Propagation by Bulbs, Corms and Tubers.—Bulbs or tubers may appear on plants either underground, or on the stem or branches above the ground. In some Yams (*Dioscorea*) both kinds of tuber are found on the same plant. A bulb is composed of either modified leaves in the form of scales, as in *Lilium*, or the bases of ordinary leaves folded round each other, as in *Crinum* ("Tolobo"). *Bulbils* is a term applied to small bulbs, but more generally to *aerial buds* when they assume the form of small bulbs; as in the case of some ferns, Sisal-hemp and allied plants. Sometimes such bulbils are produced in large numbers (*e.g.* Sisal-hemp), and take the place of seeds in the function of reproduction, the seeds being either abortive or infertile. These bulbils if planted in a nursery bed will in due course grow into large plants. A *corm* is a short, solid, conical tuber or underground stem, from which roots spring chiefly from below, but also on the sides and upper portion; buds also are scattered over the upper surface. Corms multiply usually by means of offsets. *Caladiums* and most other Aroids are propagated by planting either the whole corm, or only the "eyes" (buds) which are developed on the upper side of the latter. A *tuber* is a thickened rhizome or stem, bearing buds or node-like scars, examples of which are Yams, Sweet-potato and Artichoke. Propagation of these is effected simply by division. The fleshy subterranean growths of the *Dahlia* are not true tubers, but fleshy roots, as they do not bear buds.

Propagation by Runners and Rhizomes.—This natural mode of propagation is well seen in the Strawberry plant and in some running grasses. A slender branch is sent off from the base of the stem, it runs along the ground, and at its end produces a new plant. The branch withers and dies as soon as the new plant is rooted. Some plants also have creeping stems (*rhizomes*), which root along their under surface, and develop new plants from buds on the upper side. This is characteristic of the *Ginger* family and most grasses.

Grafting.—Grafting consists in placing together two cut surfaces of one or of different plants in such a way as to cause them to unite and grow together. The plant on which the graft is inserted is called the *stock*, and the part inserted the *scion*. The action of the one on the other is frequently marked and very important. Some fruit-trees, for instance, grow freely on a certain stock but will scarcely bear fruit, whilst on another stock they produce abundant crops, though they may not grow so vigorously. The possibilities of grafting are of the greatest importance in horticulture, more specially in fruit-growing industries, and through

its medium, trees and shrubs, &c., may be propagated when other reproductive means are of no avail. Among other advantages of grafting are: The good qualities of the scion are retained; seedling fruit-trees are brought more quickly into bearing by being grafted on fruit-bearing stocks; and in some cases the two sexes of monœcious plants may be brought together on one stock in order to ensure their reproduction by self-fertilisation. In Ceylon, however, as in most tropical countries, grafting is seldom practised.

Certain conditions are essential for successful grafting. The scion and stock should have a natural affinity to each other, either as varieties, species, or genera of the same natural order; also the natural vigour of the stock and scion should be somewhat similar. The operation should be carried out in the shade, and protected from the sun until the union is complete. In all cases it is necessary to exclude the air from the graft by covering it with grafting wax or clay, bound round with matting or fibre. A fundamental principle is the necessity of forming a direct communication between the layers of inner bark (*cambium*) in the scion and stock; the pithy or woody parts do not unite. There are various methods of grafting that may be practised, according to the size and variety of the subject it is intended to propagate or improve, and each method may be varied to some extent. The following are those most generally used:—

Whip or Tongue grafting.—This is one of the best methods and is extensively practised in cool countries. The stock is cut in a sloping direction, just above a node. The scion is then similarly cut through obliquely; a thin tongue is cut in this in an upward direction, and a corresponding cut made in the stock; the scion is fitted into the latter so that the inner barks of stock and scion come in contact with each other. The graft is then bound firmly to keep the parts in position, and covered with clay or grafting wax for excluding the air.



CLEFT-GRAFTING.

Cleft-grafting.—The stock is split open by a chisel, and the scion cut wedge-shaped, and fitted in the cleft, so that the inner barks may meet each other. This mode has obviously certain objections, and is chiefly adapted for plants with old stocks.

Saddle-grafting.—In this the stock and scion must be of nearly equal thickness, as the former is cut sloping on each side, like a

wedge, and the latter is split up the centre and thinned so as to allow of it fitting accurately on top of the stock. This method is suited to shrubs and young-wooded plants.

Wedge-grafting.—This is the same as the preceding plan, with the position of parts reversed.

Crown or Rind-grafting is applied to trees of considerable size. A scion, about 6 inches long, is selected; the lower half is cut in a sloping direction, and the notch or shoulder formed in cutting it is made to fit on top of the stock. It is then inserted between the bark and wood.

This can only be done at the commencement of the growing season, when the bark and wood easily separate.



SADDLE-
GRAFTING.



SIDE-GRAFTING.



CROWN
OR
RIND-
GRAFTING.

Side-grafting consists in inserting scions without cutting away the head of the stock. It is useful for supplying, where deficient, a branch or stem to any part of a tree. The scion being splice-cut and thinned out, is inserted under the bark, the union being bound up and covered with clay or wax.

Veneer-grafting is chiefly used for propagating trees and evergreen shrubs.

The scion is cut with an even splice-cut, about 1 in. long; a corresponding quantity of bark is taken off the side of the stock; both are then fitted together, without a cleft or incision being made in the wood.

Grafting by approach, or Inarching.—This is the best system of grafting known, and natural examples are frequently seen in trees growing together. It is specially suited to the tropics, and is successfully applied to Mangoes and other fruit trees. Nutmeg, Cacao, Coffee, &c., may also be propagated in this way. The scion in this case must be grown in a pot or bamboo, so as to be movable, or planted close to the stock. In the case of large trees which it is desired to increase in this way, a temporary platform



INARCHING.

may be erected near the tree upon which the scion-plants in pots are placed ; the shoots of the tree may thus be easily bent down to reach the scion. The mode of procedure for inarching is to remove a similar portion of the wood from both the parts intended for joining ; these must then be carefully fitted together and secured with tying material and a bandage. When the parts have united, dis sever the scion from the parent plant below the bandage. The grafted plant must be kept in a shaded place until it has commenced active growth, and stock and scion have become thoroughly incorporated.



HERBACEOUS-GRAFTING.

Herbaceous-grafting is applicable for increasing plants when still growing. It has been applied with success in growing the Melon on the Cucumber, the Tomato on the Potato, &c. The stock and scion being nearly similar in texture, the former is carefully split, and the scion prepared wedge-shaped and inserted rather deeply, allowing the barks to coincide, as in all other methods. Tie with worsted, cover the cut with grafting wax, and shade from the sun.

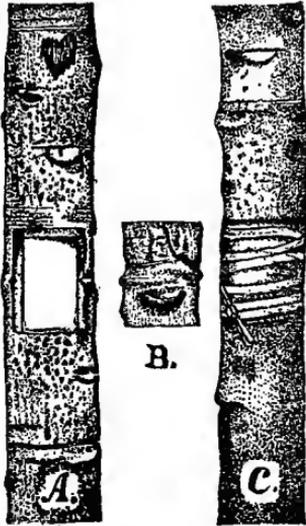
Budding.—This process, which is a species of grafting, consists of taking an “eye” or bud attached to a portion of the bark, and inserting it in the stem or branch of another plant. A condition necessary to success is that the sap is in active circulation, so that the bark may detach itself readily when gently lifted from the wood. This is found to take place best where very marked seasons of growth or “flushes” occur. In equatorial regions, where the seasons are not so marked as in temperate countries, the operation of budding is not always successful. There are various forms of budding, each adapted to particular circumstances, as *Shield* or *T-budding*, *Flute* or *Tube-budding*, and *Annular* or *Ring-budding*. The first-named form is the one chiefly practised



A BUDDING KNIFE.

for roses and fruit trees. The *modus operandi* is thus : Select a shoot well furnished with plump dormant buds from the plant desired to be increased ; cut off the leaves at half

the length of the leaf-stalks. Remove a bud from the shoot by entering a knife $\frac{1}{2}$ an inch below the bud, between the inner bark and the wood, sloping the knife outwards above the bud. The small portion of wood taken with the bud is carefully removed. In the bark of the young shoot in which the bud is to be inserted make an incision in the form of a "T." Raise the bark carefully,



RECTANGULAR PATCH-BUDDING
OF MANGO.

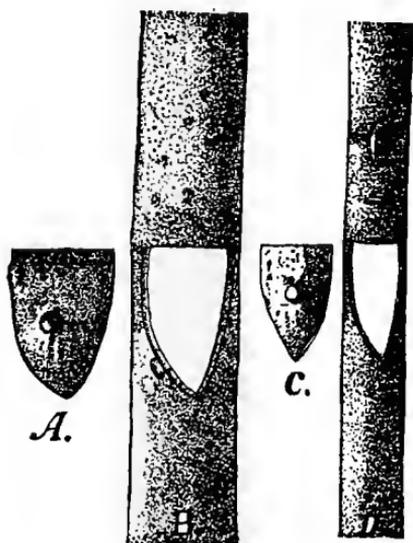
(AFTER *The Agricultural News*.)

push the bud gently into the opening, bind it securely to exclude air, leaving only the point of the bud exposed. Dull cloudy weather and morning or evening, are the best time for budding, and the operation must be performed as quickly as possible, as both bark and bud are injured if exposed to the air for any length of time. Special knives are supplied for the purpose, and an instrument known as the "bud-transplanter" is also employed.

Firminger said : "In the Upper Provinces of India budding is performed with great facility at two seasons of the year ; but, for some reason I am unable to explain, I have not found such to be the case in the vicinity of Calcutta, where budding can so seldom be performed with success that it is rarely or never attempted, inarching being uniformly adopted instead." Mr. Fawcett, retired Director of Botanic Gardens, Jamaica, recommends budding as a quick way of establishing a Mango orchard in that country. Mr. Harris of Jamaica has been successful in budding Cacao; and found that the Criollo and Calabacillo thus "gained enormously in vigour and productiveness." Budding is applicable to various kinds of fruit trees. In the West Indies it is claimed to have been "so successfully applied to the Nutmeg trees, the grafting of which has not proved practicable, that the sexes of these may now be brought under the control of the cultivator." In regard to budding Mangoes, the secret of success is said to lie "in taking the buds from about the middle of the growing shoot where they are well developed, and yet not too tender, at a time just prior to a vigorous stage of growth in the tree to be budded.

Bud-grafting.—In Queensland and the Southern United States this form of budding has of late been adopted with great success in the propagation of the Mango. It is considered to be much more rapid than “inarching” or “grafting by approach,” and does not, like the latter, involve the erection of a structure laden with pots around the tree which is to be multiplied. As applied to the Mango, the mode of procedure is thus described : Seedlings 2 to 3 years old, with stems about an inch in thickness, are selected for stocks. A rectangular piece of bark is removed from the stock, and in its place is inserted a piece similar in shape, with a bud in the centre, taken from the variety of Mango which it is desired to propagate. The bud-wood (*i.e.*, the shoot from which the bud is taken) should be not less than 2 years old. Precision in fitting the bud bark with the incision in the stock are important factors for success. A small quantity of grafting wax

should be smeared over the edges of contact, and the bark then tied firmly with strands of bast, as shown at C in the accompanying figure. After this, the graft (excepting the bud) should be covered with strips of cloth dipped in melted paraffin wax, as a further preventive against the admission of air and moisture between the cut surfaces of stock and scion. If unduly exposed to the sun, shade should be provided by means of strips of paper tied over the bud. After union of stock and scion has taken place (which should be in 2 to 3 weeks), the bandaging should be removed, and the stock pruned back.



BUD-GRAFTING OF MANGO AS
EMPLOYED IN FLORIDA.
(AFTER *The Agricultural News.*)

Grafting clay is a composition for covering the graft to exclude air and moisture until a union of the stock and scion is effected. It consists of two parts clay and one of cow-dung. These ingredients should be beaten together and thoroughly mixed until of the consistency of fresh putty, some time before being required.

Grafting wax.—This is employed in grafting small or delicate plants, where the use of clay is scarcely practicable, but may also be applied to large plants, if desired. It is of various forms, and may be purchased in boxes from seedsmen. To make grafting-wax, melt slowly together one part linseed oil or tallow, one of beeswax, and four of resin. For use, remelt in a glue-pot, and when the wax is of a consistency to work freely, apply with a small brush.

Nurseries.—A necessary part of the equipment of a garden or estate is a nursery for the propagation of plants. The essential points of a good nursery are shelter from wind, light, shade, a plentiful supply of water, and fine loose well-drained soil. On an estate a sheltered valley with a stream running through it provides the most suitable conditions for the purpose. The ground should be cleared of brushwood, rough stones, roots, &c., the soil trenched or deeply dug, and raised into beds of uniform level. The beds may be a few inches high and of any convenient size, but for facility of working they should not be wider than 3 or 4 feet, and an alley of 12 to 16 inches must be left between them. The surface soil must be brought to a fine tilth, especially for seed-beds. No stable or farmyard manure should be mixed with the soil unless it be in a thoroughly decomposed state; loamy soil, with a large proportion of leaf-mould and fine sand added, forms the best medium for germinating seeds as well as for striking cuttings, layering, &c. Temporary shade for the beds must be afforded. This is easily provided by fixing forked sticks, about 2 feet high, alongside the beds; light bamboos or other sticks are placed over these lengthwise and across, and cadjans or other material used for shade can be laid on the top and regulated or removed as required.

Nursery-, or Propagating-sheds. In the Hill districts some protection from wind and rain is usually indispensable. A serviceable shelter may be afforded by erecting a half-span roof of thatch, either over the beds where formed, or in a sheltered corner specially set apart for these. The roof should be about 2 feet off the ground at the back, $4\frac{1}{2}$ feet in front, and facing the morning sun. Such structures are also useful for the cultivation of Violets, Tomatoes, &c., which require protection.

CHAPTER VII.

CULTURAL OPERATIONS.

PLANTING.

Planting, or the transference of plants, trees, shrubs, &c. from their pots or nursery beds to places in the open ground where they are intended to remain, may usually be done in the tropics at any time except in the dry season (see under *Climate*), the most essential condition being that the soil be in a moist, though not excessively wet, state. In the low-country of Ceylon, planting operations may commence at the setting in of the monsoon rains, but should not as a rule be attempted during the months of January, February, and March. As regards the Hill districts, however, certain delicate annuals and exotic plants are liable to suffer from excessive rain, and these should not be planted out until the burst of the monsoon has somewhat abated. Except perhaps in very wet weather, a good watering should invariably be given to plants when either planted out or transplanted from one place to another. As annual crops should be sown in drills, so all shrubs or trees that are cultivated as crops should be planted in rows, the plants in each row alternating with those in that next to it.

Holing.—It is very important, especially in poor soils, that sufficiently large holes be made in the first place, for otherwise the plants are liable to languish and become stunted or irregular in growth. The proper size of the hole depends upon the nature of the tree to be planted and on the character of the soil. For moderate-sized shrubs, the holes should be about 2 feet in diameter and 18 inches deep; while for fruit and other trees they should be proportionately larger. The soil that is taken out should be mixed with some manure, or any well-decayed organic matter at hand, before filling it in again. It is important that the soil should be pressed firmly about the roots of the plant when the latter is placed in position. With most plants it is customary to fill in the soil so that when quite settled it is slightly higher on the surface than the surrounding level; this avoids the risk of stagnant

water accumulating round the young plant. With Coconuts, however, it is usual to only partially fill in the hole when planting the seedling, so that the crown of the latter is left several inches below the level of the ground. Not only is the young plant thus afforded beneficial shelter, but its roots obtain a deep and firm hold of the soil, and owing to the process of weeding and weathering, the hole becomes filled up in course of time.

Puddling roots.—An excellent practice, either in planting or transplanting, is to puddle the roots in mud immediately the plants are taken out of the ground. A mixture for puddling may be made simply by adding water to some mud, and stirring it until of the consistency of thick paint. If the soil be too porous for the purpose, it can be made adhesive by adding cowdung or clay. By dipping the roots in the mixture a coating adheres to them, which has the effect of excluding air from these, and thus to a certain extent keeping them moist. This method is especially beneficial to plants which have to be carried over long journeys, or are unavoidably out of the ground for a considerable time; while during a period of uncertain rainfall its adoption may be recommended for almost any class of plants.

Transplanting.—It is often necessary in gardens, and even on estates, to transplant shrubby plants or small trees, either to more suitable places, or for the purpose of filling vacancies or replacing weakly plants. In the cases of large bushes or spreading trees, it is advisable to cut these well back first, so as to reduce their foliage or transpiring surface, thus balancing the latter with the check received at the roots. Having well-soaked the ground with water, dig a trench round and under the tree or shrub so as to leave a good ball of earth attached to the roots. The ball with the roots must be kept intact, and if the soil be of a loose nature matting or sacking should be tied around it. By placing planks underneath, the tree or shrub may then be safely removed. This should be replanted exactly at the same depth as it was growing. After cutting off any injured portions of the roots, fill in the hole with good soil, pressing or ramming it firmly around the roots as you proceed. Finish by giving a thorough soaking of water, placing a layer of mulch on the surface; fix supports round the tree to prevent its being moved about by wind, and shade well until new leaves have developed.

Shading.—In the tropics it is absolutely necessary to protect young plants, on being first put out in the open ground, from the powerful rays of the sun by means of some temporary shade.

Even when well established, many plants are always liable to be injuriously affected by direct exposure to the sun during the hot dry season, and are greatly benefited by partial shade. For many quick-growing young plants, as Tobacco, Vegetables, &c., it is usually sufficient to shade them with any large leaves or fern fronds that may be at hand, these being fixed in the ground by their stalk and bent over the tender seedlings. Twigs or fern fronds which do not readily drop their leaves or leaflets when withered are the most suitable for the purpose. The pretty fern *Gleichenia* is, for this reason, one of the most useful, and its wiry fronds are especially suited for placing slanting-wise in the surface of nursery beds. As a temporary shade for newly planted seedlings or other young plants, an excellent means is afforded by the use of plaited palm leaves, especially those of the Coconut (cadjans); these are loosely woven into a basket-like shape, which is placed over the plant and held in position by means of 3 sticks fixed in the ground.

Watering.—Though it is always best to plant in rainy weather, it is often impossible to follow the progress of the elements, and as moisture as well as shade is usually a necessary condition for newly planted plants, watering by artificial means must be adopted when the rain fails.

Tree-guards and supports.—In public grounds protection of some sort is, without exception, indispensable to young plants which are intended to form useful or ornamental trees. A fence of the "solid" or male bamboo forms a substantial protection for a time, but the most effectual and durable barrier are iron tree-guards; those in which the uprights are pointed at the top and bent outwards are preferable. In windy situations it is often necessary to support plants individually, especially those with slender stems, by fastening them to firm stakes fixed in the ground. Care should be taken that the plant does not chafe against the stake.

TABLE OF PLANTING DISTANCES.

The following table shows the number of plants to the acre at distances of one to thirty feet apart, and the area in square feet available for each plant:—

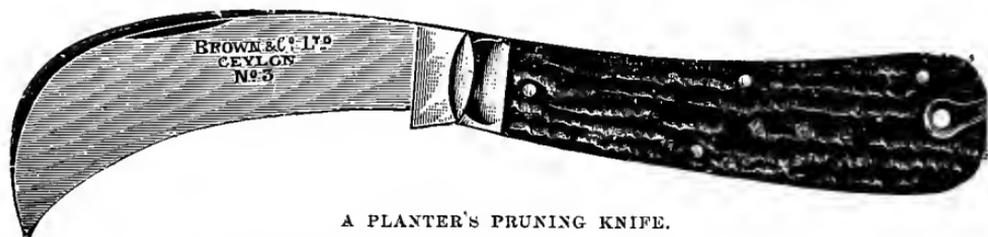
Distance apart in feet.	Area for each plant in square feet.	Number of plants to the acre.	Distance apart in feet.	Area for each plant in square feet.	Number of plants to the acre.
1 by 1	1	43,560	12 by 12	144	302
1½ by 1½	2½	19,360	13 by 13	169	257
2 by 2	4	10,890	14 by 14	196	222
2½ by 2½	6½	6,970	15 by 15	225	193

Distance apart in feet.	Area for each plant in square feet.	Number of plants to the acre.	Distance apart in feet.	Area for each plant in square feet.	Number of plants to the acre.
3 by 3	9	4,840	16 by 16	256	170
3½ by 3½	12½	3,556	17 by 17	289	150
4 by 4	16	2,722	18 by 18	324	134
5 by 7	35	1,742	19 by 19	361	120
6 by 7	42	1,210	20 by 20	400	108
7 by 7	49	889	22 by 22	484	90
8 by 8	64	680	24 by 24	576	75
9 by 9	81	537	26 by 26	676	64
10 by 10	100	435	28 by 28	784	55
11 by 11	121	360	30 by 30	900	48

For numbers not given in the above table take the square of the distance apart the trees are required to stand, in feet, into 43,560; the result is the number of plants required per acre.

PRUNING.

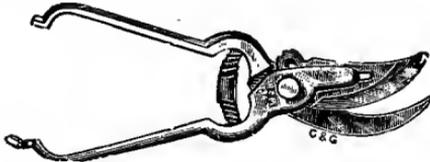
There are various modes of pruning, each class of plants requiring more or less different treatment, but the principle underlying all methods is the same. This may be briefly described as the concentration of vigour into certain parts of the plant by the cutting away of other portions, either of the stem, branches, roots or leaves. The object in view may be the production of a larger yield or better quality of fruits or flowers, straight clean trunks (as in timber and rubber-cultivation), twisted or bent stems (for furniture-making &c.), wide spreading branches (for shade), or an abundance of young shoots and foliage, as in Tea cultivation.



A PLANTER'S PRUNING KNIFE.

By means of pruning, trees or bushes may be induced to assume a form which not only adds to their productiveness, but also facilitates the harvesting or plucking of the crop. The plants should be encouraged when young to form an evenly balanced head, with the branches radiating regularly from the centre. The more upright and straight a shoot grows, the freer will be the

circulation of its sap, and therefore as a rule, the more active its vitality. The effect of pruning is analagous to that of manuring, and this fact is taken advantage of when hard pruning is applied to bushes which become stunted or "sick." Pruning may also be resorted to in order to rid plants of certain fungus diseases or insect pests.

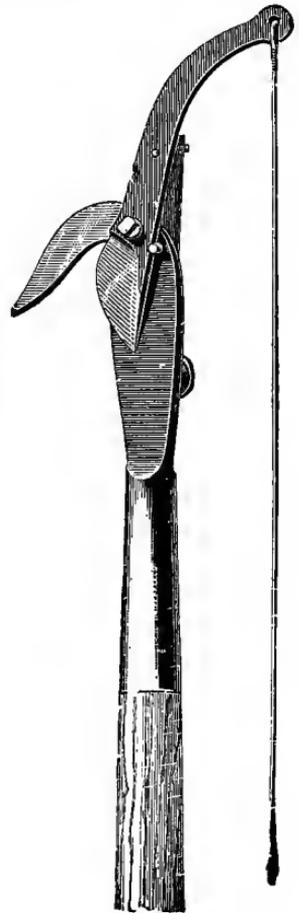


SECATEURS, OR PRUNING SHEARS.

absence of a resting period affects the question, there can be no doubt that some modified form of pruning to suit local circumstances should be adopted in order to maintain the trees in a productive condition, and to obtain the best quality of crop. In India a similar effect to that of pruning is sometimes produced by the crude practice of either stripping off the leaves, or subjecting the trees to a "good thrashing," as is done in the case of unfruitful Mango trees. The latter operation is effected by means of a long pliable bamboo, and although it is too crude to be recommended, yet its effect in retarding exuberant growth, and so tending to fruitfulness, is said to be sometimes conspicuous.

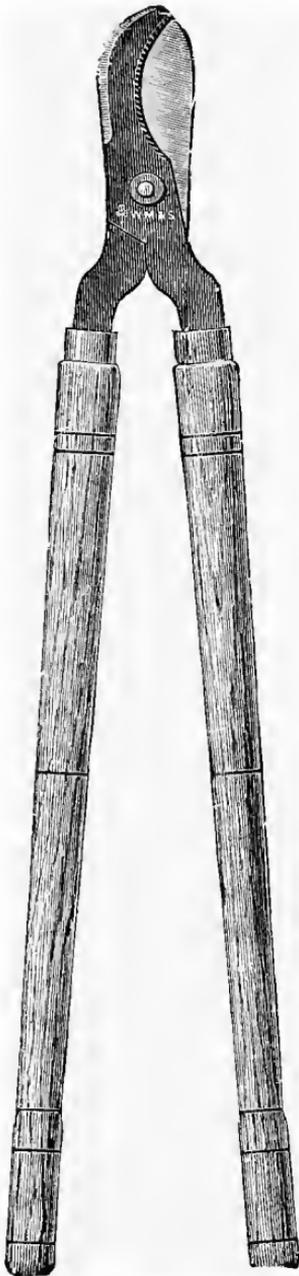
Pruning of Shade-or Flowering-trees.—The object in regard to the pruning of these should be to obtain a form which, while developing the natural beauty of the tree, will tend to prolong its life and usefulness. The longest lived trees are those with a straight, erect and undivided trunk. The formation of this should be encouraged when the tree is young, by shortening back shoots or branches which rival the leader, and so direct the vigour of the tree to the centre.

In Ceylon the pruning of fruit trees is seldom practised, with the exception of the Grape-vine in the Northern Province, and, to a small extent, European fruit-trees in the Hill districts. Although the



A TREE-PRUNER.

General principles of Pruning.—The following principles are of general application, whether for large or small trees:—



A BRANCH-PRUNER.

(1) For fruit trees thin out branches so as to allow free access of light and air. Remove all dead wood, snags, superfluous suckers and shoots.

(2) Always use a sharp knife or saw, and cut in such a way as to ensure quick healing.

(3) When cutting back lateral branches, always cut at a fork.

(4) In removing a large branch, saw it off roughly (cutting the under side first, and then the upper a few inches further from the stem) a foot from the trunk, and finally saw off the stump left.

(5) Smear coal-tar over the cut surface; otherwise the action of sunheat may crack the wound, allowing moisture to enter and thereby enabling parasitic fungi to obtain a footing.

(6) When cutting branches, especially large ones, avoid leaving stumps several inches long; always cut a branch in a line with the outside of the stem or branch from which it springs.

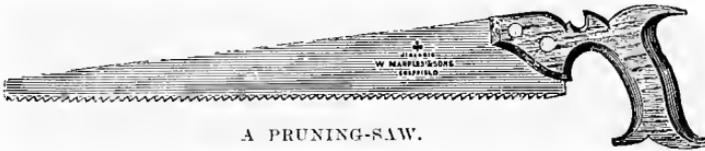
(7) The cut should always be made in a slanting or upright direction, so as to throw off the rain.

(8) In general, pruning should be performed when growth is least active.

Root pruning.—This is sometimes employed in the cultivation of fruit trees, its object being to counteract a too luxuriant woody growth, which results in paucity of fruit. The usual method of carrying it out is to cut a trench round the tree at a suitable distance from the stem, and as deep as the roots go. All the roots as they

are found are cleanly cut, and if a long tap-root is suspected of entering the sub-soil, it should be searched for by careful undermining, and severed. In Jaffna the practice in regard to the Grape-vine is to remove the soil from around the base of the stem, and cut away some of the smaller roots. After exposure for a week or two the trench is filled in with manure, which is covered over with the soil previously removed. Similar treatment is applied in India to the Mango and other fruit-trees. "This," said Firminger, "though apparently opposed to theory, is in fact most efficacious in practice. The trees treated thus bear prodigiously." In the cultivation of fruit generally, the object should be to encourage the growth of fibrous roots near the surface, and prevent the development of strong woody roots in the subsoil.

Cavities in Tree-trunks.—Very often when a tree has been long neglected, the trunk is seriously injured by cavities caused by the decay of dead or broken branches. It is not claimed that pruning can remove defects of this nature ; but it can, with proper application, arrest the progress of the evil. The edge of the cavity



A PRUNING-SAW.

should be cut smooth and even, and all decomposed matter in the interior carefully removed. A coating of coal-tar should be applied to the surface of the cavity, and the mouth plugged with a piece of well-seasoned hard wood, securely driven into place, the end of the plug being then carefully pared smooth and covered with coal-tar. To guard against the attacks of insects or fungi, it is sometimes advisable to nail a piece of zinc over the board, in such a way that the growth of the new wood may in time completely cover it.

Bark-, or Hide-bound-trees.—It is believed that in some cases cortical or bark pressure becomes so great as to retard the growth of the tree, preventing the formation of the normal amount of new wood. In temperate climates this unhealthy condition is considered to be indicated by the natural shedding of the leaves being impeded. The remedy adopted is to make longitudinal incisions in the bark, without



A CACAO PLUCKING OR PRUNING HOOK,

removing any tissues. This is believed to relieve the bark pressure, and is followed by a natural increase in thickness of the affected stem.

Ring-barking, or Ringing.—These are terms applied to the removal of a strip of bark, varying in breadth from a few inches to as much as two feet, according to the size of the tree, from near the base of trees which it is desired to kill by starvation. It is commonly adopted in some countries for killing large or other trees which would be costly to cut down. To be quite successful it must be performed during the period of greatest cambial activity, *i.e.*, when the “sap is up,” as it is popularly called, the bark being then most easily separated from the wood; the excised bark must be cut sufficiently deep to expose the cambium, that is, the *bast* layer or inner bark must be removed, otherwise the operation will be ineffectual. The chief effect of this is to cut off the downward flow of sap and food material between the leaves and the roots. Where the trees are required for their timber, the process of killing by ring-barking is considered to improve the quality of the latter. A form of *ringing* is sometimes adopted to hasten the ripening of fruits, and, as a last resource, to render unfruitful trees productive. The principle is also employed in different methods of propagation, as a means of inducing the formation of a *callus* on cuttings or layers.

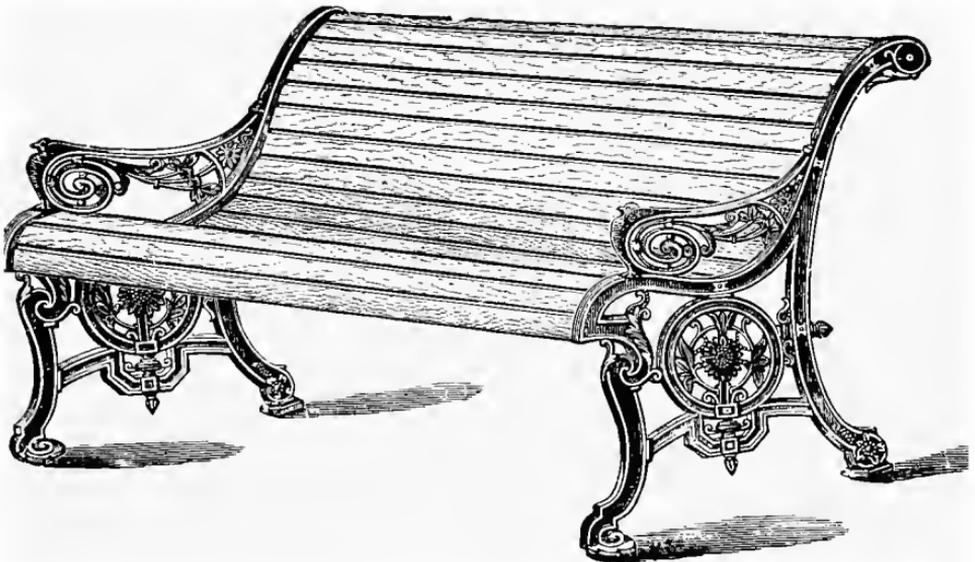
Pollarding or coppicing is a necessary process in the cultivation of certain tropical products, more particularly Cinnamon and Cinchona. In effect it is also applied to Tea, Coffee, Camphor, &c., since it consists of cutting back the main stem and branches so as to keep the trees dwarf, and induce productive young growth.



CHAPTER VIII.

GARDEN ADORNMENTS, LABELS, IMPLEMENTS, &c.

Seats.—These are always an essential part of the equipment of a garden, more especially in the tropics, and it is safe to say that much of the enjoyment of a garden depends upon them. Commanding views, overlooking terraces, spots of special interest or attraction—these are the kind of positions where seats should be placed. Usually seats are best appreciated, particularly in the low-country, when placed under the shade of trees, arbours, &c. The ground underneath the seat should be gravelled or paved, so as to avoid the discomforts of damp grass, as well as attacks by land-



A SERVICEABLE GARDEN SEAT.

leeches, ants, &c. The form of seat used may vary from a plain wooden bench to elaborate cast-iron designs. Rustic seats made of knotted branches, though sometimes much in favour, are most uncomfortable. The most satisfactory and economical seats used

in Peradeniya Gardens consist of wrought-iron ends, with thick and rather narrow strips of wood forming the seat and back. All seats, with perhaps the exception of the rustic ones, should be painted, and this requires to be done at least once a year. The most suitable colour, for the low-country at any rate, is a slate-grey. This does not become discoloured so rapidly as other tints, and in many cases it improves rather than deteriorate by exposure to the weather. Both green and chocolate paints very quickly become dark and dirty-looking.

Adornments.—Gardens in the tropics are as yet seldom embellished with such artificial adornments as statuary, beautiful vases, elaborate fountains, &c. Yet other and simpler devices in the form of arbours, arches, and trellis-covered walks on which ornamental creepers or climbers are trained, are often adopted, and with very pleasing effect. Any adornments used should as far as possible take a practical form and serve a useful purpose.

Pergolas.—A pergola consists of an archway, usually formed of rough stems and branches of trees, on which climbing roses or other suitable plants may ramble. Pergolas are especially agreeable in the tropics owing to the cool shade they afford; but here the framework, to be durable, should be of iron, not wood. A pergola in Peradeniya Gardens which is much admired comprises a number of bolt-iron arches, each arch being covered with a different species of *Aristolochia*, popularly known as the "Fly-catching" plants.

Arbours.—These may be of various designs to suit circumstances. A simple and cheap form may be made of iron framework, fixed in the ground by means of sections of bamboo, which are buried in the earth and then filled with concrete; wire-netting is fastened over the iron frame-work, and on this showy climbing plants are trained. Arbours made of wood-work, with the sides formed of rustic and knotted branches, and the roof covered with shingles, are very appropriate for the Hill districts. Some pretty examples of these may be seen in Hakgala Gardens and Nuwara-Eliya Park.

Visitors' shelters.—No public garden in the tropics should be without some structure that will provide shelter for visitors, and this should to some extent be made to combine ornament with utility. In Peradeniya Gardens memorial structures, erected to the memory of past directors, serve the purpose of useful shelters to the public.

Fountains are well adapted to gardens in the tropics, where, in the hot season especially, the spray or the rippling sound of water is particularly pleasant. The base of the fountain, while serving as a useful reservoir, may be turned to good effect by cultivating water-plants in it.

Vases for outdoor.—Very fair imitation of European vases are sometimes made in Ceylon of concrete, from a mould. Good specimens of these may be seen in the Gordon Garden, Colombo,



A KANDYAN MEMORIAL (THWAITES'), PERADENIYA GARDENS.

where they are very ornamental, especially when filled with well-grown and suitable plants. The Sinhalese potters make earthenware urns on elaborate hollow pedestals, which, though liked by some people, are very fragile, and only suited to a verandah or other position under cover.

POTS AND OTHER RECEPTACLES.

Pots.—The Sinhalese potters can sometimes turn out very satisfactory pots to a given pattern, but those which they make on their own initiative are usually ungainly and unsatisfactory, being either too deep and perpendicular, or bulging in the middle. Good pots should become gradually narrower from the top towards the bottom. If the sides are perpendicular, the plant with its ball of earth cannot be turned out without breaking the pot. Generally, pots of large sizes should not be so deep as they are wide at top; while, on the contrary, the depth of small-sized pots

should equal or exceed their top width. A very common mistake in this country is to use pots unnecessarily large; for these are both obtrusive and unsuitable for the growth of plants.

Hanging Pots.—These may be made in quite a variety of forms. The perforated kind, in which Maiden-hair ferns, Selaginella, &c., may be successfully grown, is perhaps the most effective. Those made of concrete and studded with pebbles are not desirable, being very heavy and devoid of porosity. Very effective are the bottle-shaped urns, around which a layer of loamy soil is held in position by means of close wire-netting; into this dainty ferns and suitable plants are dibbled, and these obtain a constant and regular supply of moisture by absorption through the urn, which is kept full of water.

Bamboo-pots.—Sections of bamboo, which may be obtained of various sizes, with the division left in one end and a hole punched through it, make very useful pots. They are extensively used in Peradeniya Gardens for propagating work, and to some extent for growing orchids. For the latter purpose small sections resembling shallow pans are employed, several holes being made in the sides and bottom for drainage.

Bamboo sections as hanging-pots and other devices.—Sections of the Giant-bamboo can be utilised in various ways for the purpose of growing ornamental plants. Their chief fault is that they are not durable, as even under cover they soon split and decay, owing to their being kept in a constantly damp condition. As hanging "pots" of a temporary nature, single joints of any large bamboo can be used very effectively. For this purpose leave the division in each end intact, cut out the side to about one-third its diameter, and fasten a wire at each end for hanging by; a few holes should be made in the bottom for drainage.

Tubs.—Wooden tubs, either made for the purpose, or consisting of whisky or wine casks cut into two, make useful receptacles for growing large plants, as palms, &c. Such tubs should be painted green, and raised off the ground by means of bricks placed underneath. Iron handles fixed to the side of the tubs will facilitate their being removed when this is necessary. A square tub, fastened together at the corners by means of a couple of clamps and pegs, is the simplest form to make, and it can be taken to pieces or put together when desired.

Tins and metal receptacles are not infrequently employed for growing plants in, but their use can only be recommended as a last resource. Apart from their ungainly appearance, plants cannot be expected to thrive so well in these as in pots or receptacles

made of a porous material. When, however, only tins are procurable and *have* to be used, a number of small holes should be driven in the bottom, and a quantity of broken pots or small pieces of brick placed over these for drainage.

Seed-pans.—These are most useful in propagating work, whether for seeds or cuttings. Those made in Ceylon are circular in shape, and about 3 inches in depth; they vary in size, but should not exceed 12 inches in diameter, for if too large they are less portable and are more liable to be broken.

Seed boxes are especially useful in the Hill districts, both for raising seedlings under some protection from the weather, and also for pricking them off afterwards before finally planting them out. The boxes should not be more than about 3 inches deep, and should be provided with free drainage.

Painted pots.—Not infrequently one sees in verandahs and at railway stations earthenware pots, in which plants are growing, painted in green or other striking colour. This is owing partly to a mistaken idea of artistic beauty, and partly to the oriental innate love of striking colours. The writer recalls a case where a well-meaning garden cooly painted all the pots in his charge a vivid pink! It should be remembered that there is nothing unsightly or unbecoming about earthenware flower pots if kept neat and clean, and that their natural colour is the most pleasing. Smearing them with paint destroys their porosity, which is an essential quality for the successful growth of plants.

PLANT LABELS.

The utility and interest derived from a garden, especially a public or botanic garden, must to a large extent be in proportion to the use made of neat, legible labels bearing the names of the plants, trees, shrubs, &c. One important fact, however, must not be lost of, *i.e.*, that labels should always be made as inconspicuous as possible, for otherwise they are apt to become offensive to the eye. Small plants should as far as practicable have small labels, but the largest trees need not have unnecessarily large ones. The upkeep of labelling in tropical gardens is a matter of considerable difficulty, owing partly to the attacks of termites, which destroy most forms of dead wood, and partly to the liability of metal labels being stolen. Various designs of labels have been resorted to, and the following are some of the principal kinds now used:—

Wooden labels.—These are perhaps the most convenient form for ordinary purposes; they may be of any size and shape, can

easily be altered to suit requirements, and are neat while they last in good condition. Those which are intended to remain in the ground should be of the hardest wood. Deal-wood labels in the tropics are only suitable for very temporary purposes, as for seeds in pans or boxes under cover; these being planed, should be lightly painted with white-lead, as they are then easier to write on, look best, and last longer. Large stout wooden labels, made of hard woods, as Pehimbiya (*Filicium*), She-oak (*Casuarina*), Iron-wood (*Mesua*), Palu (*Mimusops*), are extensively used at the Royal Botanic Gardens, Peradeniya, for trees, shrubs, &c. These labels are painted black, and the name printed in white zinc paint with a fine brush; the stem of the label is afterwards dipped in tar, and allowed to dry before being put out to the trees. An improvement on this form, recently adopted at Peradeniya, is to stamp the name on the wood by means of steel dies, the impressions being then filled in with white paint. Thus the lettering remains much longer, and the impressions if properly made will last almost as long as the label.

Bamboo-splint labels.—Splints of bamboo, with one end sharpened for fixing in the ground, and the other flattened and planed, will make a cheap and serviceable label. When writing upon it, first rub some white paint on the planed surface, and use a soft lead pencil.

Lead labels.—This is perhaps the best permanent label for trees and shrubs, and is used exclusively for these at the Royal Gardens, Kew. It consists of a piece of sheet-lead, about 3 inches by 2 inches, with about $\frac{1}{2}$ inch of one long side turned over to form a rim, below which 2 holes are pierced for suspending by wire. The letters are punched in with punch-type, the impressions being filled with white-lead or zinc, and the surface afterwards rubbed over with an oiled rag.

Brick labels.—To obviate the destructive effects of termites, brick labels, made to a given mould, have been largely used at Peradeniya. The top has a sloping smooth surface which is painted black, the name and other particulars being printed on in white-lead or zinc. Though this label is not durable, it is comparatively cheap, and is of course termite-proof.

Zinc labels.—Narrow pieces of clear zinc make excellent labels for pot-plants, orchids, hanging baskets, &c., and are extensively used at Peradeniya. These are written on with an indelible ink, which can be obtained ready-made. (See under *Indelible ink*).

Sheet-iron labels.—Strips of sheet-iron painted black, with the name, &c., written in white, are said to be often used for labels in India.

The "Imperishable Stratford" labels.—These excellent labels are made in England to order, of almost any size and shape required, and may include any name, description or notice as may be desired; the names, &c., which should be typed, being sent to the manufacturer with the order. The "Stratford label" is cheap while satisfactory, and differs from the "Acme" in being made of white metal, with the raised letters in black.

The "Acme" labels are made of stout zinc, with raised letters on black ground. They are supported on stiff wire stems, or have a pair of eyes for suspending by wire or nailing to a wall. These are neat and serviceable labels.

Ivory label.—This label, which is a composition of thick parchment-like substance, of the appearance and consistency of ivory, is now largely used in Europe for labelling pot-plants, especially orchids. It is of neat appearance, is said to be imperishable and unbreakable, and it can be written upon by either pencil or pen, the writing being indelible, except when well rubbed with soap.

Waterproof labels.—For the temporary labelling of plants, &c., as in packing them for transport, these labels are most serviceable and convenient. They are made of "Manila substances," with a parchment surface, and are easily written upon with ink or pencil.

Preservatives for wooden labels.—Wooden labels should always have the part that is to be fixed in the ground treated with some preservative before being put out. Various compounds of creosote, copper sulphate, carbolic acid, &c., are used for the purpose, all with more or less success. Dipping the labels in boiled tar, and then plunging them in sand is adopted with satisfactory results at Peradeniya. Mr. W. Nock, formerly Superintendent of Hakgala Gardens, found the following method an excellent one: mix fine coal-dust with linseed oil until of the consistency of thick paint; boil the mixture, and while in a state of boiling dip into it the part of the label which goes in the ground. When the labels are dry the operation should be repeated.

Indelible ink for Zinc labels.—A solution of platinum bichloride (one tube of 15 grains to about $1\frac{1}{2}$ fluid oz. of water) forms one of the best and most durable of writing fluids for zinc labels. It can be used with a steel pen, or a pointed piece of

palm-leaf petiole. Special writing fluids may be obtained from nurserymen, but when neither these nor the platinum are procurable a useful substitute may be made as follows: take 1 part sal ammoniac, 1 part verdigris, and 10 parts of water; mix well together and keep in a glass-stoppered bottle; shake before using. A solution of copper sulphate will also answer the purpose to some extent, but is less efficient.

GARDENS AND ESTATE TOOLS AND IMPLEMENTS.

Though the number of tools actually required for a garden or an estate in the tropics is not large, there are many which are not generally known and which would not only facilitate various operations in connection with garden or field work, but would also prove a considerable saving of labour. The stock-in-trade of a garden coolie is often limited to a mamottie, watering-pot and a sickle, and it is only at the expense of time and labour

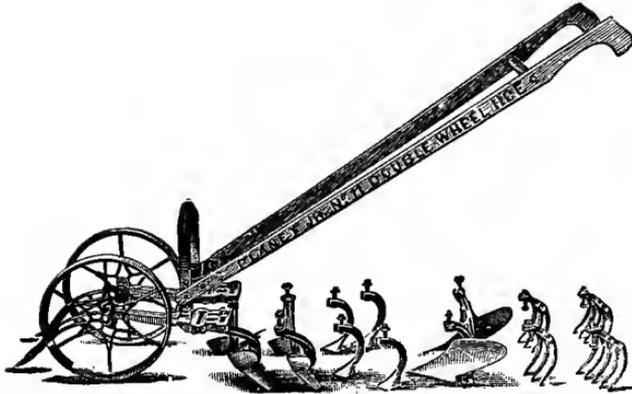


STUMP EXTRACTOR.

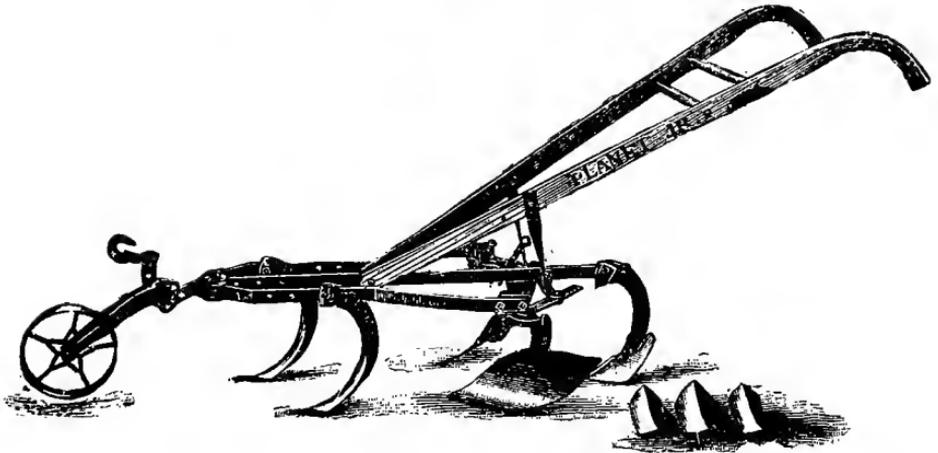


STUMP EXTRACTOR.

that he gets over the work with these. The quality of the work done, however, is not always as it should be. Of late years the number of useful farm and garden tools has been considerably increased, more especially by inventions from America. It is true economy to employ the best, and particularly labour-saving, implements. Though the following list includes many that are not necessary for a small garden, all are more or less indispensable in a large or public establishment, while most will also be found useful for estate work.



PLANET JR. DOUBLE WHEEL HOE.



PLANET JR. CULTIVATOR.

Name.	Purpose for which generally used.	Approximate price, (varying according to quality).
		Rs.
Alavango, or Crowbar ...	Digging holes, levering, &c.	1·50-4·50
Ant -exterminator ...	Fumigating ant nests : very effectual.	75·00
Antipest, or Knapsack Sprayer ...	Fluid spraying.	60·00
Auger, "Awa-kara," S. ...	Boring holes in tubs. boxes, &c.	1·30-2·50
Averruncator, Axe, "Porowa," S. "Kodali," T. ...	See Tree-pruner	—
Basket, garden, hand ...	Felling or cutting trees, chopping wood, &c.	1·30-4·00
	Gathering flowers, seeds or vegetables	0·75-1·00

S=SINHALESE ; T=TAMIL,

Name.	Purpose for which generally used.	Approximate price, (varying according to quality).
Basket, garden manure, "Kooday," S.	Carrying manures, soil, gravel, &c. It is carried on the head, and in the tropics takes the place of the wheel-barrow.	Rs. 0.25-0.35
Do., transport (large) ...	Removing leaves, grass, light rubbish, &c.	0.75
Bill-hook, "Wak-pihya," S. "Vettu-kathi," T.	Lopping branches, &c.	1.75-2.50
Branch-shears	Excellent for cutting stout branches.	6.00-8.00
Brooms, "Edal," S. Ekel...	Sweeping paths, &c.	0.10-0.15
Do., bass, "Rata-kossa," S.	Cleaning concrete floors, &c.	1.65-2.00
Budding knife	See under Knife	—
Crowbar ...	See Alavangoe	—
Dibber ...	Making holes for planting out seedlings, cuttings, &c.	0.50
Edging-iron ..	Indispensable for cutting turf-edges, as of paths, beds, &c.	2.00-3.00
Edging-shears	For trimming grass-edges of paths or borders.	6.00-7.00
Flower-gathering scissors	Especially convenient for cutting flowers of thorny plants.	3.00-3.50
Fork, digging, "Mulluwa," S. ...	Digging earth, turning manure, &c.	2.00-3.00
Do., weeding	Weeding, and forking up surface soil.	0.60
Fruit-picker, "Kekka," S.	Picking fruit from branches that are not easily accessible.	0.50-2.00
Garden engine ..	A water-barrow with a force-pump and hose. Most useful for syringing, spraying, or watering plants over-head	150.00
Gloves, pruning ...	Enabling spiny plants being pruned or handled with ease	2.50
Grind-stone ..	Indispensable for sharpening tools.	28.00
Grubber, various forms ...	A draught implement, with or without wheels, and furnished with several long broad teeth, used for cultivating or forking up the soil between crops.	12.00-30.00
Hammer, "Mittiya," S.	Miscellaneous.	1.00-2.00
Do., sledge...	Breaking large stones, splitting logs, &c.	0.25 per lb.
Handcart, "Ath-caratha," S. ...	Serviceable for removing plants, soil, manure, &c.	65.00-80.00
Hoe, Dutch or thrust ...	Weeding loose paths, beds, &c.	1.00
Do., draw...	Useful for weeding, earthing up crops, &c.	0.50
Do., grub ...	Digging, cutting trenches, &c.	1.25
Do., roller...	Suitable for weeding soft soil or gravelly walks	2.00

Name.	Purpose for which generally used.	Approximate price, (varying according to quality).
Hone, or sharpening stone.	Necessary for sharpening small tools.	Rs. 0.50
Knife, budding "Pehiya," S. ...	Budding plants; a small blade, with a white handle reduced to an edge at the end.	3.00-4.00
Do., grass; sickle, or hook "De-ketha."	Used for cutting grass, rice crops, &c., instead of scythes.	0.75
Do., pruning or grafting...	Pruning, grafting, &c.	3.50-4.00
Ladder, step. "Iny-magga," S. ...	Essential for reaching trees, tall shrubs, &c.: especially useful in a garden.	7.00-12.00
Lawn-mower.	See mowing machine.	—
Lawn sprinkler. ...	Useful for watering lawns, flower-beds, &c.	7.00
Lawn-weeder or Daisy-grubber ...	Extracting deep-rooted weeds, as "Etadi"	1.50
Mallet, or wooden hammer. ...	Driving stakes into the ground, &c.: also breaking up hard soil-clods.	0.50
M a m o t t i e "Udella," S. ...	Digging, weeding, &c.; the most general implement used by labouring coolies, with the blade at right angles to the handle.	1.00
M a m o t t i e - f o r k "Pohhara-mulluwa," S. ...	Digging, grubbing, stacking manure, &c.	1.00
Mattock ...	Cutting roots in digging or trenching.	2.00
Monkey-jack	See Stump extractor.	—
Mowing-machine, chain.	Mowing lawns; indispensable in a large garden.	90.00-150.00
Do., cog wheel	Light and portable; suitable for small garden.	18.00 - 30.00
M e a s u r i n g tape. ...	Measuring plots, timber, &c.	3.50-5.00
Nail extractor	Useful for opening cases, extracting nails, &c.	4.50-7.00
Oil-can, "Telkendiya," S.	Necessary for oiling mowing-machines, &c.	1.50
P e a v y , o r "Cant-dogs."	Levering large logs, stones, &c.	5.00
Pick (both ends pointed)	Loosening hard soil in trenching, picking roads, &c.	1.60
P i c k a x e ; "Pickasia," S.			Do. do.	1.60
Planet Jr. cultivator ...	An excellent combination of tools, as drill, grubber, drill harrow, surface scarifier. hoe, ridge, &c.	30.00
Pliers, wire-cutting ...	Straining, cutting wires, &c.	1.00

Name.	Purpose for which generally used.	Approximate price, (varying according to quality).
		Rs.
Plough; "Nagula," S. ...	Ploughing paddy fields or other soft ground.	2·50-20·00
Porawa. ...	See Axe.	—
Posthole-digger. ...	Digging holes for fence posts or for plants.	6·50
Rain-gauge ...	Measuring rainfall.	7·00
Rake, daisy ...	For cutting the flowers off dwarf-growing weeds, so as to prevent seed-production.	2·50
Rake, iron ...	Indispensable for smoothing the surface of seed-beds, paths, &c.	0·45-1·00
Do, hay, (wooden or wire)..	Raking grass, leaves, &c., off lawns.	0·75-1·00
Raffia. ...	An excellent tying material, much used in gardens in Europe.	7d. per lb.
Reel, garden ...	An iron reel with stout cord; indispensable for making or maintaining straight or curved edges.	1·75
Roller, garden	Rolling and levelling paths or lawns.	35·00
Root-puller ...	Pulling out plants with long tap-roots from lawns.	1·50
Saw, hand ...	Cutting branches, pruning, &c.	1·50
Do., pruning.	A variety of saw with a short, narrow blade.	1·50
Do., cross-cut.	Cutting logs, trees, &c.	4·25
Scrape, weed-ing ...	Used by coolies for keeping down weeds among Tea, &c.	0·25
Scythe ...	Most serviceable for cutting long grass or corn. A small pattern can be worked successfully by coolies.	6·50
Scythe-stone.	Sharpening scythes by drawing it lightly along each side alternately.	0·80
Secateurs, or pruning scissors ...	A powerful little instrument for use in one hand in pruning.	1·50-3·00
Seed-sower, fiddle-bow ...	Sowing seeds broadcast.	3·50
Shears, hedge-cutting ...	Indispensable for maintaining neatly kept hedges, and useful for clipping bushes generally.	3·50-7·00
Do., spring or sheep ...	Very popular with coolies for trimming grass verges.	2·00
Shovel, "Iskōpay-henda" S. ...	Removing gravel, earth work, &c.	2·00
Sieve, "Penāray," S. ...	Sifting soil, &c., for potting composts. There are different sizes, from $\frac{1}{4}$ to 1 inch mesh.	3·50-6·00
Soil stirrer, or Aerator ...	A central fork with revolving arms set at different angles.	8·00
S p a n n e r, shifting ...	Adjusting nuts, lawn-mowers, &c.	5·00
Spirit-level ...	Taking levels of plots, roads, buildings, &c.	3 00
Spade, "Iskōpay," S. ...	Mixing or turning soil, cutting turf, earth, &c. Small light spades only are suitable for coolie labour.	1·75-3·00
Sprayer, Knapsack ...	See Antipest.	—

Name.	Purpose for which generally used.	Approximate price, (varying according to quality).
Stump extractor, or Monkey-jack ...	An excellent implement for extracting tree stumps or roots.	Rs. 150.00
Sulphurator, or powder sprayer ...	Distributing sulphur or tobacco powder on plants affected with mildew or insect pest.	8.00
Syringe, garden. "Vasthikooduwa," S.	Squirting or spraying water on plants, both for cleansing them and moistening the atmosphere; also spraying with insecticides.	6.00-16.00
Tree-pruner ..	Pruning tall shrubs or trees.	7.50
Trowel, "Kuda-skoppay," S. ...	Planting out small plants.	0.40
Verging shears. ...	See Edging shears.	—
Watering-can, "Waturakendiya," S. ...	In daily use for watering plants in pots, beds or borders; 2-gallon capacity is a most convenient size.	3.50-8.00
Do., rose ...	Forming a spray from a watering-can; should consist of brass, with the perforated face removable by a screw.	0.25-1.00
Wedges, steel, "Kooniya," S. ...	Splitting logs, &c.	1.25
Weeding fork, hand ...	Stirring surface of beds or borders.	0.60
Weeding fork and hoe combined ...	Weeding.	0.50
Do., hook ...	Useful in weeding rocky soil.	0.25
Wrench. ...	Adjusting nuts, lawn-mowers, &c.	3.00-7.00

S=SINHALESE; T=TAMIL.

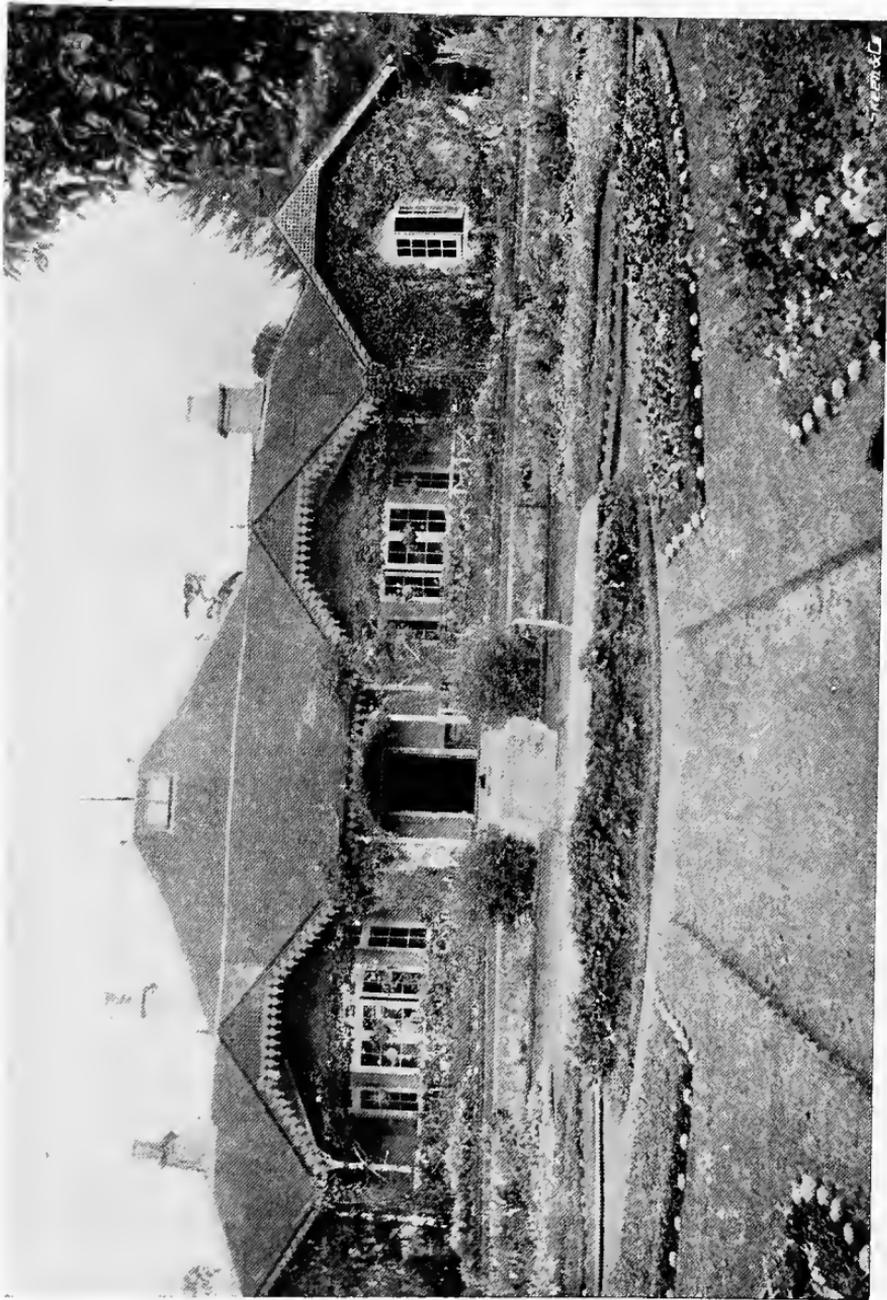


CHAPTER IX.

LAYING OUT A GARDEN.

How to lay out a garden is often a more vexing problem than how to manage it afterwards. But it is well to remember that however much the success of a garden depends upon its original design and apportionment, the work of laying out the space available to the best advantage may be said to be a progressive one, and can hardly ever be considered to have attained a perfect state. It is in this fact that much of the charm of gardening lies, the ever-varying opportunities of effecting changes and carrying out new ideas. In giving the following suggestions it must be remembered that no hard and fast rules can be recommended for application in all cases, as so much depends upon local circumstances, the climate, lay of the land, supply of water, labour available, &c.

Position.—A favourable position may be said to be the most valuable asset that a garden can possess. Yet much can be accomplished, with properly directed effort and a due expenditure of money, in overcoming obstacles and physical disadvantages, and thus a wilderness may sometimes be converted into a most pleasurable resort. One of the first considerations should naturally be, how to transform and beautify present conditions with the least possible expenditure of time and labour. It should be remembered that it is often easier to beautify an ugly object than to remove it, and that serious obstacles may sometimes be turned into ornaments. In commencing a garden, the mistake is sometimes made of cutting out all the existing vegetation, forgetting that this, although it may be "jungle," may not only have certain ornamental features, but will also furnish useful shade or shelter until at least other trees will have had time to grow up. Moreover, where virgin vegetation exists, a good effect may be quickly obtained by isolating it in clumps, or separating shapely trees to form solitary specimens, levelling and turfing the ground between. Details can be attended to later, and a choicer variety of plants may gradually take the place of the less desirable ones.



VIEW IN FLOWER-GARDEN, QUEEN'S COTTAGE, NUWARA ELIYA.



VIEW IN FLOWER-GARDEN, PERADENIYA.

Water Supply.—This is an essential provision for every garden, and the laying out or arrangement of the grounds must be to some extent modified in reference to it. In the low-country of Ceylon, the garden is usually supplied from a well; up-country, a diverted stream or specially constructed channels generally meet requirements. It is important that the source of supply should be placed where the water will have the readiest access, or be easiest carried to all parts of the garden. If a well, it should be somewhat concealed from view by having trees, &c., planted around it.

Preparation of the ground.—The ground must be thoroughly trenched and drained, the soil being turned over to a depth of 16 or 18 inches, and all large stones, roots, &c., removed. A certain amount of levelling will be necessary, it being important to obtain a uniform, even surface with a fine tilth. The texture and nutritive condition of the soil should, according to its needs, be improved by the addition of suitable manurial material. If the land be steep, it should be formed into terraces, which lend themselves to a very pleasing effect.

Designing.—When a clear conception is obtained of what is actually desired, a sketch or diagram, however crude, should be made in order to materialise the mind's plan. The ground may thus be easily apportioned; and spaces allotted to the various purposes as may be required. This will not only save time and labour, but probably confusion and disappointment later. At the outset it is essential to distinguish between the front and back of the garden. The main features should first be marked out, starting with the drive or leading walk, followed by the secondary walks; these, as well as the borders, &c., may easily be traced on the ground by means of string and wooden pegs.



A GARDEN REEL.

Planting out.—In the low-country, the first attention must be to provide a certain amount of shade or screen where such do not already exist; while at the higher elevations it is equally important to furnish shelter against strong winds by means of wind-breaks in the form of trees supplemented, when necessary, by hedges and shrubberies. The selection and planting of suitable plants to meet these requirements must, therefore, have the first consideration,

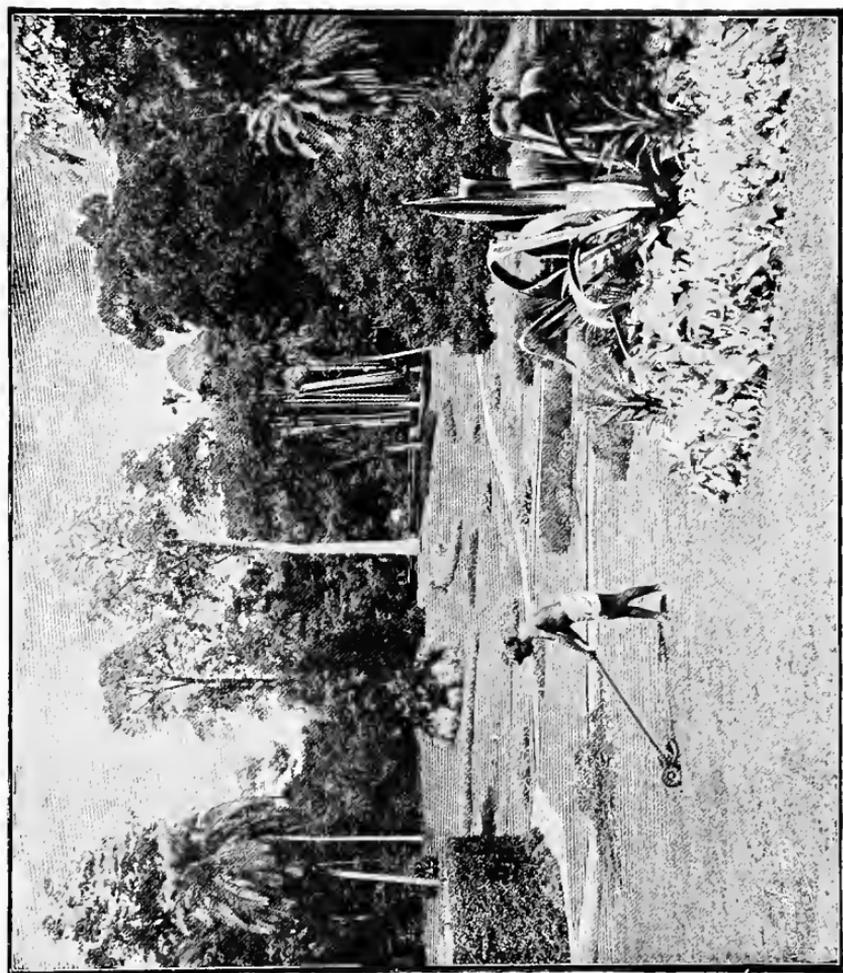
Paths.—It has been said that paths are a necessary evil in a garden; but in the tropics, as ladies especially will admit, they are very indispensable, owing to the presence of land-leeches, ants, &c., which infest the grass at different seasons. Though essentially for convenience, paths may, however, be made to contribute to the general effective appearance of a garden. But they should not be made for appearance alone, and only where actually required. Their width should depend upon the importance of their position, a breadth of 4 to 5 feet being a good average size for a small garden. The main walks should be wide enough to allow of at least two or three persons walking comfortably abreast, and in the more extensive gardens or parks they may well be from 10 to 15 feet in width.



A SERVICEABLE GARDEN ROLLER.

The Long Walk at Windsor Castle in England is about 50 feet wide and two miles long. It is an invariable custom with the garden cooly in Ceylon to make the paths absurdly narrow and numerous, his object usually being to make a garden of paths, rather than of flower-beds, borders and lawn. In making paths, a good foundation and drainage are essential. Having removed the surface soil, place a layer of drainage material (stones, broken bricks, &c.) in the bottom; cover this with coarse binding gravel, and roll or stamp thoroughly, watering well meantime; finish off with a layer of finer gravel firmly beaten down. It is often advisable in the tropics, owing to the heavy plumps of rain so frequently experienced,

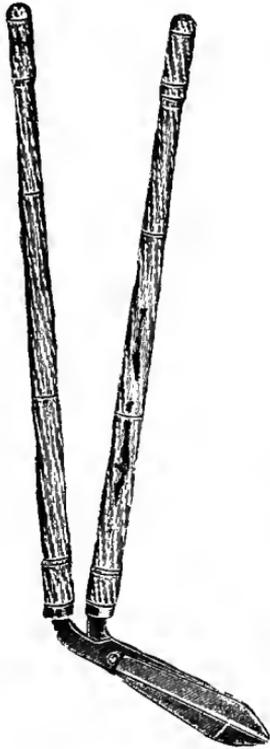
to make a small parallel side-drain on either side of the path, below the level of the latter, leaving a strip of turf not less than 12 inches wide between the drain and the path; small sloping channels should at intervals lead into the side-drains, so as to facilitate the escape of surface water during heavy rainfalls. Paths should not be of too steep a gradient, or they will be liable to get washed away by heavy rains. This can be obviated on steep slopes by introducing graceful curves or flights of easy



VIEW IN FLOWER-GARDEN, PERADENIYA.

steps, which will also render the path pleasanter to walk upon. To maintain the paths in a clean and even condition, free from weeds and hollows, is a matter of the first importance.

The grass verges should always be cut evenly and straight, and not notched at the edges. Weedy paths, with crooked edges, give an unfavourable impression of their surroundings, however well-kept they may be.



EDGING SHEARS.

Drains and Culverts.—Provision for the escape of waste or excessive rain water must have early attention, for even the most absorbent and best drained soils are liable to be flooded, or, if on a slope, washed away by the heavy showers characteristic of a tropical climate. Paths, roads, terraces, &c., must therefore have ample surface drainage; good culverts, with a cemented and sloping foundation, should be made wherever the water is liable to accumulate. It is advisable to build at the higher end of each culvert a silt-pit; this will not only collect the washed-away gravel, which may again be used on the paths or roads, but also prevent leaves and rubbish from entering and choking the culvert. Small surface channels, as inconspicuous as possible, should be made wherever a surface-wash

is liable to occur, whether in the vegetable garden or elsewhere.

FLOWER GARDEN.

Background.—Though a background is not always necessary, its presence as a rule does much to enhance the beauty of the flower-beds, &c., in the foreground. A bank of mixed tall foliage and flowering shrubs meets the purpose to advantage, the taller kinds of plants being placed at the back, and gradually smaller ones towards the front. Thus when the plants grow up to a sloping surface, they will all be seen at once from the front. In the case of borders which are to be seen from both sides, the taller plants should, of course, be planted towards the centre.



A USEFUL TRIO.

Bedding, Grouping, &c.—As a general rule flowers or foliage look best when massed together in beds of simple design, like the square, oval, circle, and rectangle. Thus a large circular bed formed of a sloping mass of harmonising colours, from centre to margin, is always a pleasing sight. Beds of elaborate designs, with many points and angles, should be avoided; they involve much more labour than simpler designs, and it is impossible to find plants which can be adapted to very small nooks and corners. The only exception to this rule is, perhaps, the star-shaped bed, which, when space permits and suitable plants are available, can be made very effective. It should be remembered that the beauty of a garden does not consist in fantastic designs and serpentine wriggles. In order that the beds and borders may be maintained in a proper condition and be admired, they should not be placed too closely together; sufficient space must be left to enable the coolies to work them, and spectators to walk comfortably between them. The groundwork should, as far

as possible, be of lawn, which if well-kept will always afford the most beautiful setting. Plants of even mediocre quality will present an effective appearance when set in a well-kept green sward. If the grounds be large enough to admit of it, the grouping of plants in what is called the "natural style" has much to recommend it. In this case the plants are grouped harmoniously, according to their habit, colour of the flowers or leaves, and formed into isolated clumps to suit the contour of the ground. Keeping this idea in view, irregular clumps planted at the bends and curves of walks or drives may be made to present a pleasing effect. It should of course be remembered that violent contrasts of colour are at all times objectionable. In order to enhance the effect of either beds or borders, it is well as a rule to raise the soil well in the centre.



AN EFFECTIVE GROUP OF FOLIAGE PLANTS, PERADENIYA.



VIEW IN HAKGALA GARDENS.



EDGING IRON.

Massing and Isolating Clumps.—Many plants which are comparatively inconspicuous individually, may present a striking effect when planted in masses, whether they be “foliage” or “flowering” plants. Thus, a very ornamental display may be made by isolated clumps of a suitable combination of foliage plants, such as Palms, Heliconias, Cannas, variegated grasses, Caladiums, variegated Pineapple, &c. These have also the recommendation that, when once planted, they do not require much attention or frequent renewals.

Ribbon Borders.—Although planting in lines or rings are, as a rule, to be avoided, yet a ribbon border in which a suitable blending of colours is obtained has a striking effect. This, however, should not be attempted unless a fairly long and broad stretch be available, and, as already stated, violent contrasts of colour should be avoided.

Foliage Plants.—In a garden where a continuous rather than a periodical display is aimed at, free use must be made of striking foliage plants. These may, in fact, be arranged so as to present by their striking colours an effect similar to flowering plants. It is to such foliage plants that much of the fine effect of the Flower-garden at Peradeniya is due. Flowering plants should, however, find a place when suitable kinds are obtainable, and it is well to remember that these make the best display when each kind is grown by itself, instead of mixed with others. Unfortunately in the tropics, the flowering period of many of the most showy plants is of so short a duration that they are not suited to situations where a continuous ornamental display is desired.

Fergeries.—See under *Ferns*.

Banks, or Double-Cuttings, which usually occur in a garden, may be so treated as to render them interesting in themselves, and to greatly enhance the beauty of their surroundings. Where sufficiently shaded they may be occupied by a pleasing variety of ferns, small foliage and flowering plants, which should be planted

in pockets filled with rich humous soil. If the ground be much exposed, it may be either covered with smooth turf, or planted with showy forms of sun-loving creepers. An excellent example of a charming bank of the former type may be seen skirting the entrance drive to Hakgala Gardens, under the shade of Cupressus trees.



THE LAKE, PERADENIYA GARDENS.

Ornamental Water.—Water in almost any form adds appreciably to the attractiveness of a garden or pleasure grounds. It should be introduced, if practicable, when not already present, and advantage should be taken of the opportunity it affords of lending distinctive charms to the vicinity. As a rule an expanse of water is most suitable in a hollow, in imitation of nature, and should not be too close to the dwelling house. An island with an irregular outline and planted with suitable shrubs, &c., has a pleasing effect, so long as it does not look too artificial. The water margins should not be too thickly planted with trees or shrubs, &c., and in order to provide a mirror for the reflection of the banks, at least two-thirds of the water surface should be kept clear of foliage or other vegetative growth. Rippling streams or cascades in a garden have a charm all their own.



A HANDSOME GROUP OF FOLIAGE PLANTS, IN THE FLOWER-GARDEN, PERADENIYA.



THE GREAT-CIRCLE LAWN, PERADENIYA GARDENS.

LAWNS: THEIR MAKING AND UPKEEP.

It has been well said that a lawn is to a garden what a background is to a picture. An expanse of smooth and green sward has a distinctive charm; it enhances the beauty of surrounding objects, whether they be trees, shrubs, or flower-beds, and forms a most pleasing adornment to a bungalow. In making a lawn, it is essential that the ground be first properly prepared, the surface being thoroughly trenched and uniformly levelled, all stones, roots, &c., being raked off. If the nature of the ground requires it, provision must be made for drainage and for the escape of excessive rain-water, but if the ground is undulated, or the sub-soil of a gravelly nature, artificial drainage may not be necessary. If the soil be very poor, the turf is liable to become patchy in dry weather; therefore a layer of good soil or compost should be laid on the surface. In order to ensure a uniform or level surface, pegs should be driven into the soil at the extreme points, and intermediate pegs at regular distances between; the desired level or gradient from peg to peg can best be obtained by means of a spirit-level and a long piece of wood having a straight edge.

Turfing.—Laying turf by hand is the quickest and, for the low-country the most satisfactory, method of forming a lawn, sowing seed being generally somewhat precarious. The turves should be obtained from close-grazed pasture-land, and cut as nearly as possible of uniform thickness. This is best done by a spade, or better still by the implement turf-cutter,* though for ordinary purposes a mammoty will answer the purpose, and it is the easiest tool for coolies to handle. The turves should be used fresh, and the soil worked in between them to fill up all interstices, finally sprinkling some fine soil on the surface and brushing it in. The turves being beaten down into position with a flat heavy piece of wood, the whole surface should be thoroughly rolled over and watered. In the case of a large area, or when turf or labour is scarce, economy of both may be effected by laying the turves a foot or more apart, sinking them level with the surface, and sowing seed, or dibbling in roots, in the intervening spaces, the whole surface being then watered and rolled. Another economical and successful method of forming a lawn is to obtain the best grass roots from a well-grazed pasture-land (choosing wet weather for the purpose), and dibble these in the ground, the latter having first been

* In England a horse-drawn turf-cutting machine is sometimes used, which, it is said, is capable of cutting at the rate of $\frac{1}{2}$ an acre of turf a day.

brought to a fine tilth and uniform level, afterwards rolling and watering the surface. A method which is said to be successfully adopted in Northern India is described thus:—"Pull up a quantity of grass by the roots, chop it tolerably fine, mix it well in a compost of mud of about the consistency of mortar, and spread this out thinly over the ground where the lawn is required." This, however, would not be suited to wet climates, where a single heavy shower might wash the preparation away.

Seed-Sowing.—Although lawn-making by sowing seed is not usually satisfactory in the low-country, at higher elevations, where certain English lawn-grasses will thrive, it is often very successful,



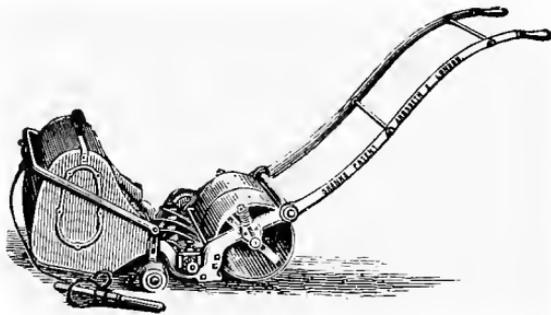
A COG-WHEEL GEAR MOWER.

as may be seen on the cricket pitch at Nuwara Eliya. In the low-country however, a uniform green sward can seldom be obtained by sowing seed, owing to the rapid growth of weeds, prevalence of bird and insect pests, and the liability of the seeds to being washed away by heavy rain. Whichever method is adopted, the margins of walks and flower beds should always be laid with a continuous belt of turf, even if it be but a foot in width.

Up-keep.—The success of a lawn depends upon its proper upkeep; it should as far as practicable be kept free of weeds, mowed at brief intervals with a mowing machine, and never allowed to produce seed-stalks or wear a neglected appearance. A heavy roller should be used frequently, but not when the ground is either

very wet or unusually dry. The mower should not be used until a firm green sward has been formed, the grass at first being cut by a scythe or sickle, so as to encourage the roots to spread. When lawns become impoverished, a top-dressing of a rich compost consisting of fine loamy soil and rotted manure should be given, this being raked well in, and the surface afterwards rolled and watered. The dressing should not be sufficient to completely hide the grass from view. An application of artificial manure may be given when needed, nitrate of soda (at the rate of 2 lbs. per square rod) being considered about the best for the purpose.

Enemies of Lawns.—Not the least formidable of these is the pernicious termite or white-ant, whose nests should be looked for and destroyed at the earliest signs, either by digging them out, or pouring poison or pumping poisonous fumes down their crevices.



A CHAIN-GEAR LAWN MOWER.

The "ant-exterminator" (see under *Insect Pests*) is one of the best means yet discovered for destroying them. Certain weeds are particularly partial to lawns, one of the worst being the "Elephant's foot" (*Elephantopus scaber*). These should be dug up by a spud or "daisy fork"; or the plants may be killed by dropping poison into their centre. Worm-casts in lawns are particularly objectionable. Yet the presence of worms might be regarded as more useful than otherwise, for they are the means by which nature manures the grass and drains the surface; moreover, their presence is a sign of good soil, as their food consists of decaying vegetable matter, which after being digested by them is ejected in the form well-known as worm-castings. Watering the soil with *Vaporite*, or with a weak solution of ammonia or lime water, will cause the worms to come to the surface, when they should be collected and destroyed.

Suitable grasses for lawns.—As to what constitutes the best grasses for lawns, much depends on climate and local conditions. The “Doob-grass” (*Cynodon dactylon*) is a favourite for dry regions, as on the plains of India, while the Love-grass or “Tutteri” (*Chrysopogon aciculatus*) forms an excellent turf in the moist low-country, in spite of the objection to its sharp hooked awns, which adhere to and penetrate one’s clothes. The ordinary self-formed turf on the lawns in Peradeniya Gardens has been found by Dr. Trimen to consist chiefly of the following:—*Chrysopogon aciculatus* (“Love-grass”), *Ischaemum ciliare* (“Rat-tana”), *Setaria glauca* (“Kawulu”), *Panicum sanguinale*, *Sporobolus diander*, and the clover-like *Desmodium triflorum* (“Hin-undu-piyala”). Under the



A LAWN-SPRINKLER.

shade of trees the principal turf-grasses are *Paspalum conjugatum*, *Panicum trigonum*, *Oplismenus compositus*, and *Apluda aristata*. The “Barbadoes Sour grass” (*Paspalum conjugatum*), an introduced species from the West Indies, and now completely naturalised in Ceylon, is specially adapted for shaded situations, and when kept closely cut it forms very fair turf. Certain English grasses will thrive at the higher elevations in well-prepared ground, and grass-seed mixtures adapted for particular purposes may be obtained from seed-merchants in Europe or Australia.

HEDGES AND BOUNDARIES.

For several reasons a garden in the tropics should be enclosed by a hedge or fence, that is if exclusion of cattle and other vermin, shelter from wind, and privacy be considered essential.



A SERVICEABLE REAPER, ADAPTED FOR BULLOCK DRAUGHT.



INTERIOR OF OCTAGON CONSERVATORY, PERADENIYA GARDENS.

Well-kept hedges are ornamental as well as useful; they form a protective boundary, shut off private quarters, divide portions when necessary (as the Kitchen-garden from the Flower-garden), or conceal unsightly parts. A large number of plants are adapted for forming hedges, and the suitability of each kind depends upon the purpose and locality for which it is required. For an effective hedge of coloured foliage, such plants as *Acalypha*, *Croton*, *Panax*, *Pisonia*, *Cordyline*, &c., either mixed or singly, will supply all that can be desired; whilst for a hedge of flowering plants, different varieties of *Hibiscus*, *Ixora*, *Poinsettia*, *Thunbergia erecta*, &c. make a striking display. In many cases a hedge may be formed by simply planting cuttings where they are required to grow. It is always advisable to give a hedge a good foundation, *i.e.*, a trench dug deep and filled in with good soil; otherwise gaps or unevenness of growth are likely to occur. When a hedge has to answer the



HEDGE-SHEARS.

purpose of a barrier, a good plan is to run a few strands of barbed wire along the middle; or if the wire-fence is already in position, the hedge may be planted (or sown) by its side. Certain plants, as the "Madras-thorn," form the best hedge when started from seed sown *in situ*.



SELECTED HEDGE PLANTS FOR THE LOW-COUNTRY.

Name.	How Propagated.	Remarks, Height, &c.
<i>Acacia sphaerocephala</i> . "Bull's horn Acacia."	S.	Slow-growing, 4-6 feet.
<i>Acalypha</i> , different varieties.	C.	Quick-growing. 10-15 ft., coloured foliage.
<i>Agave americana variegata</i> . "American Aloe"	S. & Su.	Slow-growing, 5-6 ft., ornamental & barrier.
<i>Aralia filicifolia</i> .	C.	Quick-growing, 6-8 ft., handsome fern-like foliage.
<i>Bambusa nana</i> . "Dwarf Bamboo"	Div.	Slow-growing, 6-8 ft.
<i>Clerodendron aenealeatum</i> . "Wild Coffee"	S.	Rather slow grower, 5-8 ft.
<i>Croton (Codiaeum)</i> , different varieties.	C.	Do. do. do.
<i>Duranta Plumieri</i> . <i>Duranta</i> .	C. & S.	Rather slow grower, 8-15 ft.
<i>Ehretia buxifolia</i> . "Ceylon Box-wood"	Do.	Slow-growing, 3-4 ft. or dwarf, suitable for edging.
<i>Eranthemum maculatum</i> , and other var's.	C.	Quick-growing, 6-8 ft., variegated and coloured foliage.
<i>Euphorbia Antiquorum</i> . "Daluk"	C.	Quick-growing, 8-15 ft., barrier. juice poisonous.
<i>E.—Tirucalli</i> . "Milk-hedge," "Nawahandi." S.	C.	Quick-growing, 6-8 ft; used as boundaries for paddy fields.
<i>Flacourtia Ramontchii</i> . "Uguressa."	S.	Slow-growing, 6-8 ft., thorny, good barrier.
<i>Haematoxylon campechianum</i> . Logwood.	S.	Slow-growing, good barrier.
<i>Hibiscus rosa-sinensis</i> , var's. Shoe-flowers.	C.	Quick-growing, fine-flowering; 8 to 10 ft.
<i>Jatropha Curcas</i> . Physic-nut, "Rata-endaru." S.	C.	Quick-growing, 5-6 ft.
<i>Justicia gendarussa</i> . <i>Malpighia glabra</i> . "Barbados Cherry"	C.	Fairly quick-grower, 3-4 ft., bushy.
	C. & S.	Slow-grower, 3-4 ft., or dwarf, suitable for edgings.
<i>Murraya exotica</i> . "Limonia"	S.	Slow grower, 6-8 ft.
<i>Panax fruticosum</i> .	C.	Quick grower, 6-8 ft., handsome foliage.
<i>Pithecolobium dulce</i> . "Madras-thorn"	S.	Moderately quick grower; good barrier, thorny; 6 to 10 ft.
<i>Pedilanthus tithymaloides</i> .	C.	Moderate grower, 3-4 ft.
<i>Phyllanthus myrtifolius</i> . "Ceylon Myrtle"	S. & C.	Slow grower, 5-6 ft., dense foliage.
<i>Punica granatum</i> . Pomegranate.	Do.	Quick-grower, 6-8 ft.
<i>Triphasia aurantiola</i> . "Sweet Lime."	S.	Slow grower, 4-5 ft., good barrier.

SELECTED HEDGE-PLANTS FOR UP-COUNTRY.

Name.	How Propagated.	Remarks, Height, &c.
<i>Acalypha marginata</i> . "Copper-leaf."	C.	Quick grower, 4-5 ft., ornamental foliage.
<i>Agave americana variegata</i> .	S. or Su.	See above.
<i>Berberis Fortunei</i> . Chinese Berberis.	S.	Slow grower, 3-4 ft.
<i>Caesalpinia sepiaria</i> .	S.	Quick grower, 5-6 ft.
<i>Cestrum fasciculatum</i> .	S. or C.	Fairly quick grower, 6 to 8 ft., fine-flowering.
<i>Colletia cruciata</i> .	S.	Slow-growing, very thorny.
<i>Cryptomeria japonica</i> . Japanese Cedar.	S.	Slow grower, 6-10 ft.
<i>Cupressus Lawsoniana</i> . Cypress.	S.	Moderately quick grower, 6 to 12 ft.
<i>Duranta Plumieri</i> . Duranta.	S. or C.	Do. do. do.
<i>Francisea bicolor</i> (<i>Brunfelsia uniflora</i>).	S. or C.	Slow grower, 4-6 ft.
<i>Frenela rhomboidea</i> . Conifer.	S.	Do. 6-8 ft.
<i>Furcraea gigantea</i> . Mauritius Hemp.	S. or Su.	Fairly quick grower, 6-8 ft., snited for boundary.
<i>Habrothammus elegans</i> .	S. or C.	See <i>Cestrum</i> .
<i>Lihonia floribunda</i> .	C.	Slow grower, 2-4 ft., ornamental.
<i>Spiraea peruciana</i> .	S. or C.	Rather slow grower, 4-5 ft; fine-flowering.
<i>Tecoma capensis</i> .	Do.	Do. do. do.
<i>Ulex europaea</i> . Gorse; furze.	S.	Slow grower, good barrier; ornamental.

SELECTED HEDGE-PLANTS FOR THE DRY REGION.

Name.	How-Propagated.	Remarks, Height, &c.
<i>Agave americana</i> .	Su. or S.	See above.
<i>Carissa Carandus</i> . "Mabakaramba," S. "Perunkila." T.	S.	Shrub or small tree, thorny.
<i>Dichrostachys cinerea</i> . "Andara." "Vidattal."	S.	Slow grower, 5-6 ft., thorny.
<i>Duranta Plumieri</i> . "Duranta."	S. or C.	See above.
<i>Euphorbia Antiquorum</i> . "Daluk."	C.	Do.
<i>E.—Tirucalli</i> . "Milk-hedge."	C.	Do.
<i>Jatropha Curcas</i> . Physic nut.	C.	Do.
<i>Pandanus Zeylanicus</i> . "Akeyiya."	S. or Su.	Slender stems, 5-6 ft., boundaries of paddy fields.
<i>Parkinsonia aculeata</i> . "Jerusalem Thorn."	S.	Quick grower, 4-5 ft., good barrier.
<i>Pithecolobium dulce</i> . "Madras Thorn."	S.	See above.

CONSERVATORIES, PLANT-SHEDS AND
GREEN-HOUSES.

The object of a plant-house in the tropics is not, except in the hills, to protect plants from the cold, but from the fierce sun's rays and strong winds, while also maintaining a uniform and moist atmosphere. Though combining the purposes of shelter and shade, however, plant-houses must be constructed so as to also allow of a free circulation of air and admit sufficient light for the growth and health of the plants. Such structures when suitably built and tastefully filled with well-grown and choice plants, form a most delightful and cool retreat during the heat of the day, and afford the essential conditions for the successful cultivation of a vast number of showy tropical plants.

A modest structure of bamboos covered with palm leaves may for a time answer the purpose of a plant-house, and last for about a couple of years. But a more substantial and lasting building affords greater satisfaction, and may have its framework composed of teak or other hard wood, or better still of iron. The iron Octagon Conservatory in the Royal Botanic Gardens, Peradeniya, might be taken as a model of an economically built and eminently satisfactory type of a tropical plant-house. The upright supports consist of old rails, 12 feet long, 3 ft. of each rail being buried in concrete. The top is flat for a distance of 12 ft. from the circumference, and rests on horizontal rails with iron bars placed transversely at distances of a few feet. In the centre rises an octagon "dome," the rails forming the pillars of which being 21 ft. long, with 4 feet buried in concrete. The circumference of the house is outlined by a half-brick wall 3 ft. high, the outer edge of which is flush with the iron posts. The whole structure is covered over with a 3-inch mesh wire-netting. Over the flat tops are placed split-bamboo, strung together like tats and tarred. The handsome evergreen climber, *Passiflora laurifolia*, is planted round the house and trained on the wire-netting of the upright portions, forming a useful and effective screen. The interior is occupied with graduated plant-stages, a broad planted border forming the background on one side, and all the paths and stages are concreted.

In building a conservatory, it is important that the site should be somewhat higher than the surrounding level, so as to admit of proper drainage being secured. Shade or screen for plant-houses may be effectively provided by means of suitable evergreen climbers with small leaves. These should not, however, be permitted to grow over the roof, as they would thus interfere with

the light and ventilation, causing the interior to be unsuitable for the growth of plants. In India, a layer of grass placed on the roof is often used for shade, while in Ceylon coir-netting is generally employed for the purpose. In the Hill districts, the growing of tender tropical plants can usually be carried on only by means of a green-house, or at least a well-protected or glazed verandah. A green-house may be easily heated by a flue passing from a fire and stoke-hold outside to within, and then under the plant-staging. An excellent green-house, built on this principle, may be seen in Hakgala Gardens.

Propagating frames.—Glazed frames are most useful adjuncts to up-country gardens. The frames may be varied in size, according to requirements, and should always be movable, *i.e.*, not fixtures. Bottom-heat may be provided for a propagating frame by means of a hot-bed made of fermenting horse-dung, the latter being heaped in a deep pit, covered over with a layer of fine soil, and the glazed frame placed over it.

CULTIVATION OF POT-PLANTS.

The successful cultivation of the choicer kinds of ornamental plants in pots is a branch of horticulture which demands special care and a certain amount of skill. A knowledge of the requirements of each class, gained by observation of their growth and general progress, is the most valuable guidance in the matter. An important condition, both for the health and appearance of the plants, is cleanliness; therefore the foliage should be frequently syringed, or sponged with soapy water if necessary, and the pots scrubbed to prevent the growth of moss or lichen upon them.

Potting plants.—The essential requirements for this operation are clean earthenware pots, a suitable compost of soil, and broken pieces of potsherds or porous tiles, &c. Commencing with the drainage of the pot, a crock (piece of potsherd) is placed, concave side down, over the hole in the bottom; around and over this are placed more crocks, finishing with smaller ones, the drainage being then about an inch deep; over this should be laid some moss or coir fibre to prevent the soil clogging the drainage. A layer of the potting compost being then filled in, the plant is placed in the centre, the soil being filled in around it and pressed firmly. A space of $\frac{1}{2}$ inch from the rim should be left for the purpose of holding water when the plants are watered. It is usual at Peradeniya Gardens to cover the surface of the soil in the pots with a layer of small pieces of brick or sandstone, which has the effect

of preventing the soil from being washed out in the course of frequent waterings, while also checking the evaporation of moisture. After the plants are potted, a copious watering is given, and the plants are kept for a few days in a dark room or under heavy shade. A very common error on the part of native gardeners is to use pots many sizes too large; these are not only ungainly, but also less suited to the health of the plants growing in them. Plants look best in pots which are in proportion to their size, and also thrive best in them.

The proper time for potting.—This should be determined by the progress of the plants and the condition of the soil, rather than by any fixed seasons. Generally speaking, the best time for the purpose is when the plants are commencing their more active periods of growth, which usually occur at the commencement of the monsoon rains. The necessity for re-potting a plant may be ascertained by turning it out of the pot, and observing the state of the roots, soil, or drainage. "It is a standing rule," said Sir Joseph Paxton, "with experienced horticulturists that no plant should be allowed a larger pot till the one in which it is growing is filled with fibrous roots."

Drainage of pot-plants.—There is no point of greater importance than the drainage. In the great majority of cases when plants are sickly, the cause is to be found in imperfect drainage, in consequence of which the soil becomes sodden and sour. Whenever this condition is suspected, the plant should be gently turned out, and the drainage repaired as at first done.

Soil for potting plants.—The ideal soils for potting most plants should consist of rich loam, leaf-mould and silver-sand, made up in various proportions to suit the plants in hand. A peaty soil is considered specially suitable for ferns and plants of the Rhododendron and Azalea family (though these may also thrive in loamy soils), while palms and most foliage plants prefer a rich loamy soil. The best potting soil for general purposes is obtained from the turf of pasture-land, which should be procured long before it is required, and stacked (with the grass side down), incorporating with it layers of cattle manure. Where it is difficult to obtain turf or loamy soil, a good substitute may be made by a mixture of well-decomposed coir dust, leaf-mould, and cattle manure. In Colombo, for instance, this is practically the only kind of soil procurable for potting plants.

Worms, centipedes, &c., in pots.—"Vaporite" is an excellent remedy for disposing of these, and should be in the possession of

everybody who grows plants in pots. It is a simple but effectual preparation, and may be applied in a solution with water, or merely sprinkled dry on the surface of the soil before watering. Where "vaporite" is not at hand, lime-water or soot-water may to some extent answer the purpose. In obstinate cases it is recommended to stop the hole of the pot with clay for a few hours, so that the whole of the soil may become saturated with the solution.

VERANDAH GARDENING.

An essential feature of horticulture in the tropics is what may be called verandah-gardening, which in many cases covers the entire gardening operations of a householder. Nothing brightens the appearance of a bungalow so much as a verandah furnished with well-grown and choice plants, which may be considered as indispensable to a verandah as the latter is to a bungalow. As window-gardening is now a prominent feature in many European towns, being publicly supported and supervised by tasteful women, the attention of municipal authorities in the tropics might well be directed to the advisability of encouraging verandah gardening in towns. The successful growth of plants in a verandah will, of course, depend very largely on aspect and situation. Many beautiful foliage plants which become stunted or scorched by the sun on the south side of a bungalow, will thrive luxuriantly in a shady north verandah. Ferns generally are best suited to a shady north aspect. It is often advisable, however, to change the plants, as may be gauged by their growth, from north to south, or *vice versa*. All plants growing in a verandah should be turned round frequently in their position, so as to equalise the effects of the light, otherwise their growth will be one-sided. Overcrowding of the plants should be avoided, for space as well as cleanliness is essential for their well-being. The foliage should be syringed frequently, and all dead, sickly, or superfluous growth removed. The pots or tubs should not be ungainly in size, or of grotesque appearance, and should always be raised off the ground and placed on neatly arranged or concealed bricks or other supports.

Drawing-room Plants.—Everybody experiences at one time or another the difficulty of keeping plants in good condition in a room, for however carefully tended, the plants sometimes sicken or become discoloured. This may be due to insufficient sunlight, which may be obviated to a large extent by placing the plants out of doors at night and on all occasions when not required ;

frequently, however, excessive watering is the cause of failure. (See under *Watering pot-plants*.) Whenever practicable, the plants should be placed out of doors in the rain, in a shady corner, in order to keep their foliage clean and fresh.

Selection of Plants for Verandahs.—Certain plants are more adapted for growing under cover than others. Thus in a selection for the low-country foliage plants, such as Ferns, Begonias, Palms, &c., should predominate; while for the higher elevations flowering annuals or perennials, hardly ferns, &c., are best adapted. The following indicate the kinds chiefly suited in either case. For the Low-country :—Feathery palms, such as *Chrysalidocarpus*, *Caryota* ("Kitul"), *Ptychosperma*, *Martinezia*, *Phœnix* (Date kind), and *Cocos* (Coconut kind); Fan palms, as *Livistona australis*, *L. rotundifolia*, *L. chinensis*, *Thrinax*, *Latania*, and *Sabal*; also *Anthuriums*, *Alocasias*, *Begonias*, *Marantas*, *Ferns*, *Caladiums*, *Ophiopogon*, &c. For Up-country :—*Pelargoniums*, *Geraniums*, *Petunias*, *Begonias*, *Primulas*, *Gloxinias*, *Cineraria*, *Chrysanthemums*, *Fuschias*, *Cyclamens*, *Gesnerias*, *Streptocarpus*, *Bouvardias*, *Adiantum* and other ferns, &c.

WATERING OF POT-PLANTS.

Watering is one of the most important operations connected with the cultivation of plants in pots, for a deficient or excessive supply of water is a most frequent cause of languid growth or death of such plants. To know just the proper amount of water beneficial to a plant requires judgment, and can only be learned by observation of the requirements of each species. In watering plants, especially young or delicate kinds, a watering-can with a rose should always be used. The best roses are those made of brass, with fine regular holes. The finest roses only should be used for watering seeds in pans or beds. One of the first and most important lessons to teach a garden cooly is that it is the roots, and not the leaves and flowers, that require water, and that more than a mere wetting of the surface is necessary to maintain the plants in health and vigour. All watering should, if possible, be done late in the afternoon or in the early morning. Always use rain or pond water if procurable, in preference to well-water. Watering with a weak solution of liquid manure is of great benefit to plants, whether in pots or beds, but it should not be applied when they are suffering from drought, nor until they have their root system well established after potting.

To test whether a pot-plant is dry at the roots, give the pot a sharp tap; if it gives a sound like that of an empty pot, the plant is

in need of water. If a plant has become very dry at the roots, it should be left for a time in a bucket of water to become thoroughly soaked. When the leaves droop, it is generally a sign that the plant needs water. No water should be allowed to remain in the saucer or vases in which flower-pots are standing, for this will cause a stagnant condition and form a breeding-ground for mosquitoes.

Plants vary in their capacity for drawing moisture from the soil, *i.e.*, some have more rapid transpiration than others. Some have a thin epidermis and take up a large amount of water; while others of a succulent nature, as Cactus, Agaves and Aloes, have a thick cuticle and, relatively, take up very little water, being therefore able to thrive in dry arid regions. Vigorous-growing plants require more water than slow-growing species; while deciduous plants, when they have shed their leaves, should be watered but sparingly, as owing to the transpiration surface being greatly reduced, excessive moisture at this stage may prove fatal. During wet weather there is less evaporation, and therefore plants take up less water by their roots, while in dry weather the conditions are reversed. Plants which are exposed to sunshine transpire more rapidly than those growing in the shade, and therefore require more water. When the roots are confined in a small area, naturally there is a great demand on the supply of water available; therefore plants in this condition require frequent and copious supplies of water.

Syringing.—The operation of syringing is very important to the health of plants growing under cover, where the rain does not reach them. Syringing creates a moist atmosphere, cleanses the leaves and thus assists in promoting their functions, and therefore in their presenting a cleaner and finer appearance. In dry weather

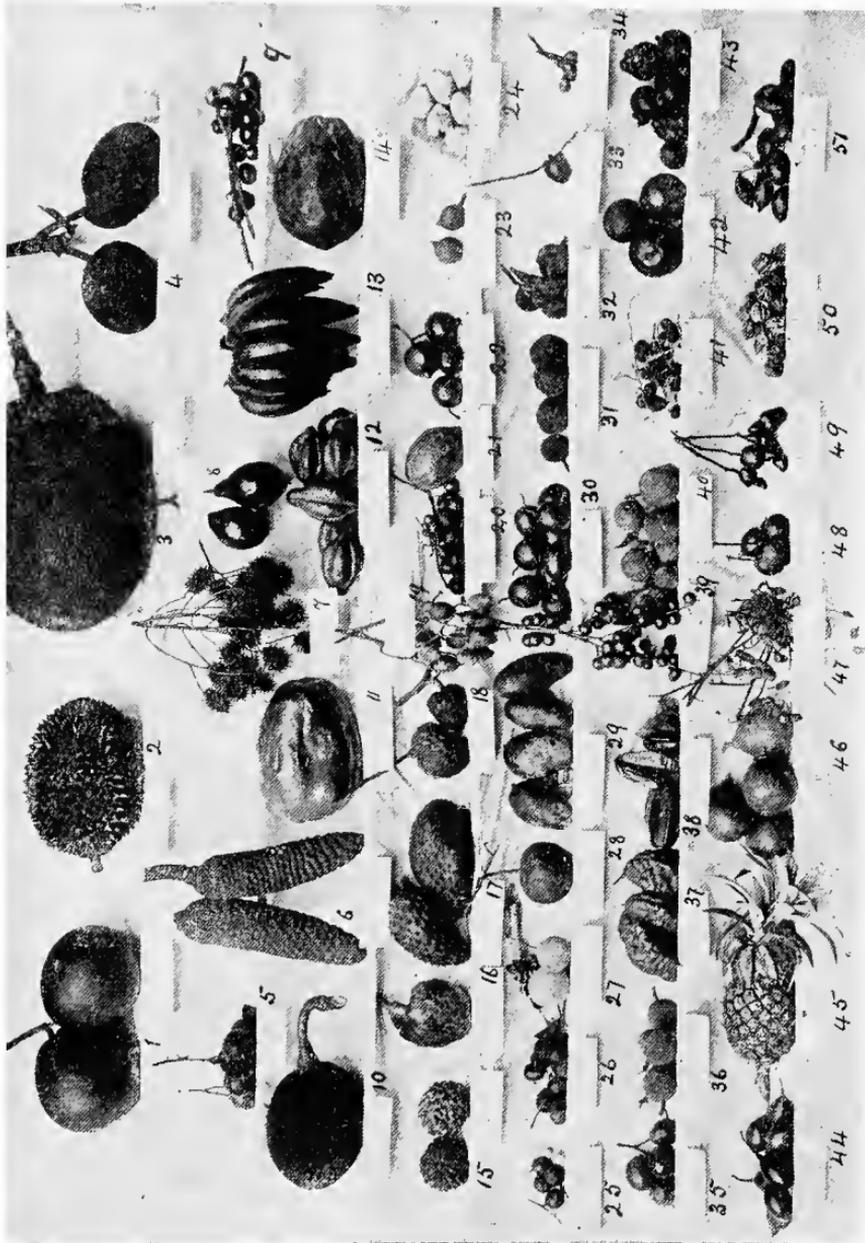


A GARDEN SYRINGE.

the syringing of plants, which should only be done with perfectly clear water and through a fine rose, may with advantage be carried out twice or three times a day. During wet weather, however, it should be done sparingly, if at all.

KEY TO BLOCK ON OPPOSITE PAGE.

- | | | |
|---|--|---|
| 1.- <i>Citrus Decumana</i> , var.
[Pomelo or Grape-fruit]. | 18.- <i>Anona Cherimolia</i> .
[Cherimoyer]. | 35.- <i>Psidium Guyaba</i> . [Guava]. |
| 2.- <i>Durio sibethinus</i> . [Durian]. | 19.- <i>Canarium commune</i> .
[Java Almond]. | 36.- <i>Sarcocephalus esculentus</i> .
[Negro Peach]. |
| 3.- <i>Artocarpus integrifolia</i> .
[Jak-fruit]. | 20.- <i>Psidium Cattleyanum</i> .
[China Guava]. | 37.- <i>Cynometra cauliflora</i> .
[Nam-nam]. |
| 4.- <i>Artocarpus incisa</i> .
[Bread-fruit]. | 21.- <i>Citrus medica</i> . [Citron]. | 38.- <i>Aberrhoa Carambola</i> .
[Kamaranga]. |
| 5.- <i>Citrus nobilis</i> .
[Mandarin Orange]. | 22.- <i>Garcinia Xanthochymus</i> .
[Cochin Goraka]. | 39.- <i>Flacourtia inermis</i> .
[Lovi-lovi]. |
| 6.- <i>Monstera deliciosa</i> .
[Giant Creeper]. | 23.- <i>Mammea americana</i> .
[Mamsee Apple]. | 40.- <i>Achras sapota</i> .
[Sapodilla Plum, or Naseby]. |
| 7.- <i>Nephelium lappaceum</i> .
[Rambutan]. | 24.- <i>Eugenia malaccensis</i> .
[Rose Apple]. | 41.- <i>Abertia Gardneri</i> .
[Ceylon Goose-berry, or
"Ketembilla"]. |
| 8.- <i>Persea gratissima</i> .
[Avocado Pear]. | 25.- <i>Macadamia ternifolia</i> .
[Queensland Nut]. | 42.- <i>Citrus Aurantium</i> .
[Sweet-orange]. |
| 9.- <i>Vangueria edulis</i> .
[Voa-vanga]. | 26.- <i>Chrysobalanus Icaco</i> .
[Coco Plum]. | 43.- <i>Garcinia Mangostana</i> .
[Mangosteen]. |
| 10.- <i>Pangium edule</i> .
[Kapayang or Pangi]. | 27.- <i>Feronia elephantum</i> .
[Wood-apple]. | 44.- <i>Cyphomandra Betacea</i> .
[Tree-tomatoe]. |
| 11.- <i>Passiflora quadrangularis</i> .
[Granadilla]. | 28.- <i>Punica granatum</i> .
[Pomegranate]. | 45.- <i>Ananas sativus</i> , var.
[Pineapple] |
| 12.- <i>Carica candamarcensis</i> .
[Mountain Papaw]. | 29.- <i>Mangifera indica</i> , var.
[Mango]. | 46.- <i>Aegle Marmelos</i> .
[Bael-fruit]. |
| 13.- <i>Musa paradisiaca</i> .
[Plantain or Banana]. | 30.- <i>Passiflora edulis</i> .
[Passion-fruit or Sweet-cup]. | 47.- <i>Arachis hypogoea</i> .
[Ground-nut, or Monkey-nut]. |
| 14.- <i>Carica Papaya</i> .
[Papaw or Tree-melon]. | 31.- <i>Sandoricum indicum</i> .
[Santol]. | 48.- <i>Citrus Limetta</i> . [Lime-fruit]. |
| 15.- <i>Anona squamosa</i> .
[Custard Apple]. | 32.- <i>Diospyros discolor</i> .
[Velvet-apple]. | 49.- <i>Anacardium occidentale</i> .
[Cashew-nut]. |
| 16.- <i>Anona reticulata</i> .
[Bullock's Heart]. | 33.- <i>Diospyros Kaki</i> .
[Persimmon]. | 50.- <i>Physalis edulis</i> .
[Cape Gooseberry]. |
| 17.- <i>Anona muricata</i> .
[Soursop]. | 34.- <i>Photinia japonica</i> .
[Loquat]. | 51.- <i>Terminalia Catappa</i> .
[Country Almond]. |



SELECTED EDIBLE TROPICAL FRUITS.



CHAPTER X.

FRUIT CULTIVATION.

It may hardly be necessary to explain that by the term "fruit" here is meant *dessert fruits*, as distinguished from fruits which are cooked and used as vegetables, such as Bread-fruit, Jak-fruit, Cho-cho, Bandakai, Gourds, &c. Many of these latter may, however, be eaten either raw as "fruit," or as a "vegetable," when cooked, *e.g.*, Jak-fruit, Granadilla, Tomato, and Papaw. Botanically speaking, any portion of a plant which produces a seed is a fruit. As compared with most European fruits, the great majority of edible tropical fruits have undergone but little improvement by a process of cultivation and selection. That, nevertheless, many of them are capable of being greatly improved in quality by a system of selection and hybridising, and by bud or graft propagation, seems hopeful. Following on these lines, the cultivator should aim at producing or selecting fruits which approach a seedless state, as has already been attained in the case of the Banana, Orange and others.

Fruit-culture for Market. In recent years fruit-growing for export has considerably advanced in the West Indies, South Africa and Australia, forming an important industry in these countries. The export of tinned Pineapples has developed into a considerable source of revenue in Singapore, Cuba, Hawaii, &c., while the inhabitants of the Canary Islands are chiefly dependent on the cultivation of tropical or sub-tropical fruits for supplying the London and other European markets. The more purely tropical fruits are, however, as yet practically unknown outside the countries of their production. Hitherto fruit-growing in Ceylon has been carried on in an hap-hazard manner, either as an auxiliary means of livelihood, or for private consumption, and it is asserted that there is not sufficient inducement to make it a business venture. Yet the requirements of the Colony in the way of fruit, either fresh, preserved,

or in jams, are considerable, and it is probable that were a central factory established in Colombo or Kandy for canning, drying, sterilising, or pulping fruits, as well as for making jams and preserves, it would probably not only prove a profitable undertaking, but also afford the requisite incentive to systematic fruit-growing.

Climate in Relation to Fruit-culture. Certain fruits are more adaptable to a wider range of climate than others. Thus, Oranges will thrive in Ceylon from sea-level up to about 6,000 feet elevation, while Mangoes, Plantains, and Pineapples may be grown up to at least 4,000 feet in specially sheltered localities; yet the requirements of others, as the Mangosteen, Durian and Sapodilla, are strictly confined to the hot and moist low-country below 1,500 feet. A rather dry than wet climate is usually the most suited for fruit cultivation, and the most luscious fruits are generally produced in districts with a comparatively limited rainfall, or where the crops are subjected to intermittent irrigation. Dry weather favours the formation of sugar in fruit, whilst a prolonged wet period is not only against the proper development of flavour and colour, but also adverse to keeping qualities. It is remarkable that fruits which are produced in an equable hot and moist climate are often green in colour, even when fully ripe.

TROPICAL FRUITS SUITABLE FOR LOW OR MEDIUM ELEVATION.

WITH A RAINFALL OF 70 INCHES OR MORE.

[NATURAL ORDER IN BRACKETS. S=SIHHALESE; T=TAMIL].

Aberia Gardneri (Bixaceæ). Ceylon Gooseberry; "Ket-embilla," S. and T.—A small shrubby tree endemic in Ceylon, bearing large purple, velvety berries, of the size, form, and consistency of gooseberries; these have a pleasant acid taste, and make excellent jam and preserves. The fruit is in season during August and September. It is well worth cultivation, being capable of improvement by systematic selection and propagation. Cultivated as a fruit-tree in Peradeniya Gardens, where plants are raised for distribution. The tree thrives in rich humous soil and likes good drainage. In propagating from seeds, the latter, being small, should be sown in pots under cover.

Achras sapota (Sapotaceæ). Sapodilla-plum; Zapote, Bully-tree; Naseberry; "Rata-mi," S.; "Shimai-eluppai," T.—A small

symmetrical tree, 25 to 30 ft. high, with leathery dark-green shining leaves, native of Tropical America and the West Indies. Introduced to Ceylon about 1802, but as yet only occasionally cultivated, chiefly in the Kalutara and Galle districts. The fruit is not unlike a smooth brown-skinned potato in appearance. Unless perfectly ripe it is unfit for eating, owing to the gutta-percha and tannin it contains; but after keeping for a few days the fruit becomes delicious. The skin is extremely thin, and the interior consists of a pale brown juicy and most luscious pulp, in which the large black shining seeds are embedded. Firminger said: "A more luscious, cool and agreeable fruit is not to be met with perhaps in any country in the world." The tree is somewhat commonly cultivated in Lower Bengal, and thrives up to 3,000 feet elevation in Southern India; but in Ceylon it is seldom productive above 1,500 feet, and succeeds best at the coast. It is a slow grower, and may be propagated by seed, but preferably by grafting; usually bears two crops a year, one during August and September, and the other in February and March. The fruit is either round or oblong, and in India is sometimes erroneously called "Mangosteen."

Aegle Marmelos. (Rutaceae; Orange family). Bengal-quince; Bael-fruit; "Baeli," S.; "Vilvam," T.—A small spiny tree, originally a native of India, now commonly grown in the low-country of Ceylon and other tropical countries for its fruit. The latter is globular, and varies in size from that of a cricket ball to a large melon; it has a very hard green shell, enclosing a mass of doughy aromatic pulp, intermingled with which is a limpid glutinous substance, which some people relish for its flavour, but more particularly for its medicinal value. The fruit is a well-known specific for dysentery, and is much used in native medicine. The principal season for it is during the months of February to April. The tree is propagated by seed, and thrives in ordinary soil.

Anacardium occidentale. (Anacardiaceae, Mango family). Cashew-nut; "Caju-gaha," S.; "Mundiri-maram," T.—A spreading tree, about 30 to 40 feet high, with large leathery leaves, considered to be a native of the West Indies, but thoroughly naturalised in Africa, Ceylon, India, etc. Its well-known fruit consists of two distinct parts, viz., (1) the large swollen pear-shaped stalk (*cashew-apple*), 2 to 4 inches long, which is juicy, astringently acid, and used in preserves; (2) the comparatively small kidney-shaped, grey or brown *nut* (about 1 inch long) at the extremity. The latter has

an edible kernel (seed), which when roasted is of a very agreeable nutty taste ; it is much relished for dessert, being considered by some people superior to all other nuts, and is in demand in Europe for confectionery and flavouring purposes. The crusted shell of the nut is acrid and poisonous. All parts of the fruit are of various uses in medicine. An intoxicating beverage ("Kaju"), said to be largely consumed by the natives in Eastern Tropical Africa, is made from the fleshy receptacle. The tree yields a gum which is said to be obnoxious to insects, and is recommended for book-binding. The juice obtained from incisions in the bark forms an indelible ink. The tree thrives best in the low-country up to 1,500 feet. Adopted for moderately dry districts, especially near the sea. Propagated by seeds or layering.

Ananas sativus. (Bromeliaceae). Pineapple ; "Anasi," S.—A perennial stemless plant with long narrow fibrous and usually spiny leaves, native of Tropical America, introduced into all warm countries, and extensively cultivated in South America, West Indies, Cuba, Hawaiian Islands, Queensland, &c. The fruit is borne by a stalk issuing from the centre of the plant, after which the latter dies, being reproduced by the suckers thrown out from the base. In a state of nature the pineapple is generally an *epiphyte* or "air-feeder," *i.e.*, living in the forks of trees or on rocks ; but in cultivation, partial shade and sheltered situation suit it best. In Florida, where pines are produced extensively as an industry, the plants are grown chiefly under the shade of lightly constructed sheds. Pineapples thrive in Ceylon from sea-level to about 2,000 feet, or higher in sheltered situations. The plants are naturally suited to a rather dry climate, but also flourish in moist and hot districts, provided the land is well-drained. They thrive best in rich humous or loamy soil, especially if it contains a proportion of lime. Fallow or jungle soil, under the shade of trees, produce the largest and most luscious fruits. After the first crop has been obtained, the plants should be taken up, the ground deeply dug, and enriched with well rotted manure. The rows should be planted in the inter-spaces of the previous crop, if any. A change of site should be given after every second or third crop, as otherwise the quality and size of the fruit will be affected. Manuring is essential ; animal-manure is the best and should be applied in a well-decomposed state. Of mineral manures, a mixture of basic slag and nitrate of soda, in the proportion of 5 cwts. and 1 cwt. of each respectively for an acre, is recommended by experienced growers. A potash manure is also very beneficial. The ground

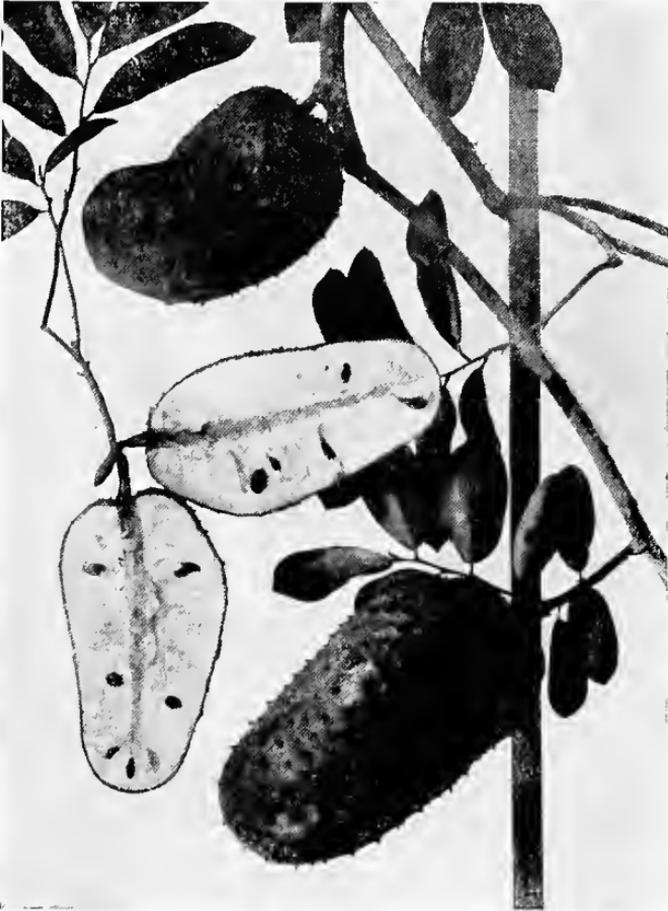
should be well-tilled and kept free of weeds. When planting, the strongest suckers should be used, as these produce the earliest fruits. Trim off the lower leaves, and plant in rows, about 4 feet apart each way, or 2,800 plants to the acre. The fruit should commence to ripen about 12 months from the time of planting the suckers, the weaker suckers taking longer to bear fruit. A return of 90 *o*/*o* of sound fruits is considered good. When suckers are scarce, the "crowns" of the fruit may be planted in a bed of leaf-mould and sand, for planting out when large enough. Plants may also be propagated from the leaves, these being laid in a bed of light sandy soil and kept moist and shaded.

VARIETIES.—A large number of varieties occur in cultivation, and different names are given in different countries to the same varieties. One of the most distinct and best varieties is the "*Smooth Cayenne*," known in Ceylon as the "*Kew Pine*." This bears large, luscious and juicy fruits, often weighing from 9 to 12 lb., sometimes 16 lb. or more. This variety has the additional merit of having spineless leaves. It is said to be the chief variety cultivated in, Hawaii, Florida and Azores, and commands the highest price in the London market. In the West Indies the "*Red Spanish*" is perhaps the most popular kind, the "*Ripley Queen*" or "*Black Antigua*" being also highly spoken of. "*Maurtius*" ("*Ripley Queen*") is the variety most commonly grown in Ceylon; it is of a hardy nature, thriving in comparatively poor soil. "*Gal-anassi*" is a variety naturalised in Ceylon, distinguished by small yellow, rather insipid fruits. The following are among the best varieties cultivated in the West Indies:—" *Abbaka*," "*Black Antigua*," "*Sugar-loaf*," "*Monsterat*," "*Egyptian Queen*," "*Pernambuco*," "*Porto Rico*," "*Bracomorensis*."

Anona muricata. (Anonaceae). Soursop; "Katu-anoda," S.; "Seetha," T.—A small quick-growing shrubby tree, 15 to 20 feet high, with fragrant laurel-like leaves, native of the West Indies, and commonly grown in the Eastern tropics for its fruit as well as for ornament. The large green fruit, weighing from 4 to 6 lb. (sometimes 10 lb. or more), varies in form from kidney-shape to oval or ovate, and is covered with soft green prickles. The white, rather wooly pulp, amongst which the large black seeds are scattered, is juicy and sweet, suggesting the flavour of pineapple, and is sometimes used in the preparation of a very grateful cooling drink. The fruit is not generally popular. There is, however, much difference in the produce of different trees, and the fruit of some has been described as "lusciously sweet and of a delightful acidity." Propagated by seed. Thrives up to 2,000 feet.

A. —reticulata. Bullock's Heart; "Anoda," S.; "Ramsita," T.—A small bushy tree of Tropical America and the West Indies, commonly met with in native gardens in the low-country of Ceylon.

The fruit is usually heart-shaped, sometimes round, 3 to 4 inches across, and varying from brownish-red to yellow. It contains many dark-brown seed and sweet custard-like granular pulp. Some Natives in the low-country are prejudiced against this fruit, owing to a supposition that it causes leprosy. Propagated by seeds, which are large and may be sown in nursery beds. Will thrive up to 3,000 feet.



SOURSOP. *ANONNA MURICATA*.

A.—squamosa. Custard-apple ; Sugar-apple ; Sweet-sop.—A small tree, considered to be a native of Asia as well as Tropical America. It is commonly cultivated throughout the tropics for its fruit, which is of the size of a fairly large apple, with a peculiar



BREAD-FRUIT, —ARTOCARPUS INCISA.



WILD BREAD-FRUIT,—ARTOCARPUS NOBILIS.

rind which appears to be formed of scales ; these when ripe break away separately ; the interior contains white granular sweet custard-like pulp. The fruits should be wrapped in muslin bags before they attain maturity, so as to prevent their being eaten by squirrels and birds. Custard-apples are chiefly in season during the drier months, when they are commonly sold in markets and kaddies. The tree is propagated from seed, and thrives in ordinary, well-drained soil up to about 2,500 ft. In India the fruit is said to be grown to perfection in the neighbourhood of Cawnpore, "thriving in the most barren and sterile places."

Artocarpus incisa. (Urticaceae, Fig family). Bread-fruit ; "Rata-del," S. ; "Erapillakai," T.—One of the most handsome of tropical trees, native of the Pacific Islands, Java, &c., and introduced into Ceylon before 1796. It is a quick-grower, attaining a height of 40 to 50 feet, and bears very large, shining, deeply cut leaves. The fruit is roundish or oval, 4 to 6 inches long by 3 to 5 inches in diameter, pea-green in colour, and produced in twos or threes at the ends of the branches. It seldom contains seed, the interior consisting of a solid mass of fleshy pulp, which when sliced and roasted is said to resemble the crumb of a new loaf. As a vegetable for curries, it is much esteemed. It is also roasted, ground into flour, and prepared and used in various other ways. The Bread-fruit is said to form the principal article of diet of the natives of the South Sea Islands. Firminger, after partaking of the fruit in Ceylon when sliced and fried, considered it to be "hardly distinguishable from an excellent butter pudding." The tree thrives up to 1,500 feet in the moist hot districts of Ceylon, and is especially adapted to the sea-coast. Propagated by suckers from the roots, or by gootee or layering.

A.—integrifolia. Jak-fruit ; "Kos," S. ; "Pilla-kai," T.—A very large tree, native of South India and Malaya, introduced and cultivated in Ceylon, where it has become semi-naturalised. The enormous fruits, a single one of which may weigh over 100 lb., are borne on the trunk and older branches, sometimes at the base of the trunk or even under ground. It is usually oblong and irregular in shape (sometimes almost round), being always green, with the rind consisting of somewhat hexagonal knobs. This fruit forms a very important article of food with the Natives, whilst some Europeans also relish it when cooked in curries. When ripe, the fruit has an overpowering odour, and the stronger the latter, the better the quality of the fruit, the former not being

disliked by those who relish the latter. With the exception of the rind and core, the whole of the fruit is eaten, the white or cream-coloured soft, flakey pulp, being used either raw, or boiled or fried and used as a vegetable for curries, &c. The large albuminous date-like seed are roasted and esteemed in curries. The timber is excellent for cabinet work, building, &c., and is much used in Ceylon; lemon-yellow at first, it turns with age to a very dark tint like Mahogany, to which it is but little inferior. The tree is propagated by seed and is suited to moist or semi-dry districts, up to 2,000 feet.

VARIETIES.—Jak-fruit occurs in several varieties. The two most distinct in Ceylon are: (1) "*Waraka*," distinguished by a firm fruit, which the natives recognise by the sound when flicked with the fingers; (2) "*Vela*," distinguished by its softer rind through which the finger may be thrust when approaching ripeness, the pulp also being less sweet than that of the former. Of these there are several sub-varieties, as "*Kuru-waraka*" (with small and almost round fruit), and "*Peni-waraka*," (= honey-jak), with sweet pulp. A variety called "*Johore Jak*," with hairy leaves and a small fruit with a most overpowering odour, is greatly esteemed.

A.—nobilis. Wild Bread-fruit; "Wal-del," S.; "Asinipillakai," T.—A noble tree, usually 40 to 50 feet high, but sometimes attaining an enormous size, with large leathery, crimped or wavy, undivided leaves, peculiar to the moist low-country of Ceylon. The fruit is long or cone-like, 5 to 8 inches in length by $1\frac{1}{2}$ to 2 inches in diameter; it is similar in texture to the Bread-fruit proper, and is commonly eaten by the poorer Natives, being cooked and used as a vegetable with curries. It contains several round white seeds, of the form of large peas, which are roasted and eaten. The tree thrives in a wild state up to 2,000 feet in the moist low-country of Ceylon, where it is endemic. Propagated by seed.

Averrhoa Bilimbi (Geraniaceae). Cucumber Tree; "Blimbing"; "Biling," S.; "Bilimbi-kai," T.—A small fine-foliaged tree, native of the Moluccas, and commonly cultivated in the Eastern Tropics for its fruit. The latter is about 3 inches long, resembling a small green cucumber, and is produced in clusters on the trunk and oldest branches; it is esteemed in pickles and preserves, and is sometimes used for making jam and cooling drinks. As an ingredient in curries, the fruit is especially relished. The tree thrives up to medium elevations, and is propagated by seeds or layering. The seed, being small, should be sown in pots under cover.

A.—Carambola. Karambola Tree; "Kamaranga," S.; "Tarmarta," T.—A small tree, similar to the preceding species, but more ornamental in habit. It is a native of the Moluccas, and

has long been in cultivation in the East. The curious oval-shaped, winged fruit, borne in great profusion, gives the tree a striking effect. When ripe the fruit is semi-transparent, of a fine rich amber colour, very juicy, and of a sweet acid taste. Its principal culinary use is for making jelly, for which it is esteemed. The juice removes stains from linen, and is commonly used for burnishing brass. The degree of acidity of the fruit varies in different varieties. I have tasted some fruit at Shows which were agreeably sweet and well worth growing for the table. The best varieties should be propagated by gootee or budding. The tree is usually propagated from seed, which, being small, should be sown in pots under cover.

Bertholletia excelsa (Myrtaceae). Brazil-nut, or Para-nut.—A tall handsome tree, with oblong wavy leaves which are 14 to 16 inches long and about 3 in. broad, native of Guiana, Venezuela and Brazil. In its native home, especially on the banks of the Amazon and Orinica, the tree attains a height of over 100 feet. The tree has been introduced at Peradeniya in 1880, and notwithstanding the indifferent ground chosen for it when first planted out, appears to find here a congenial home. It is now about 60 feet high, and produces at the top each year, in the dry season, large erect racemes of white flowers, followed a few months later by a number of large brown round fruits, which hang on the tree for some months after ripening. Ridley records similar success of the tree at Singapore, where it was introduced in 1881. Each fruit is from 4 to 6 inches in diameter, with a hard, brown woody shell, which has to be sawn or broken with an axe in order to get at the contents. In the interior are, closely packed, from ten to twelve large angular seeds with a brown horny testa; these are the Brazil-nuts of commerce, which form an important article of export from their native country, being largely used for dessert in Europe, America, &c. The tree may be propagated by seed or gootee (layering), and thrives best on a rich alluvial soil, in a hot and moist climate.

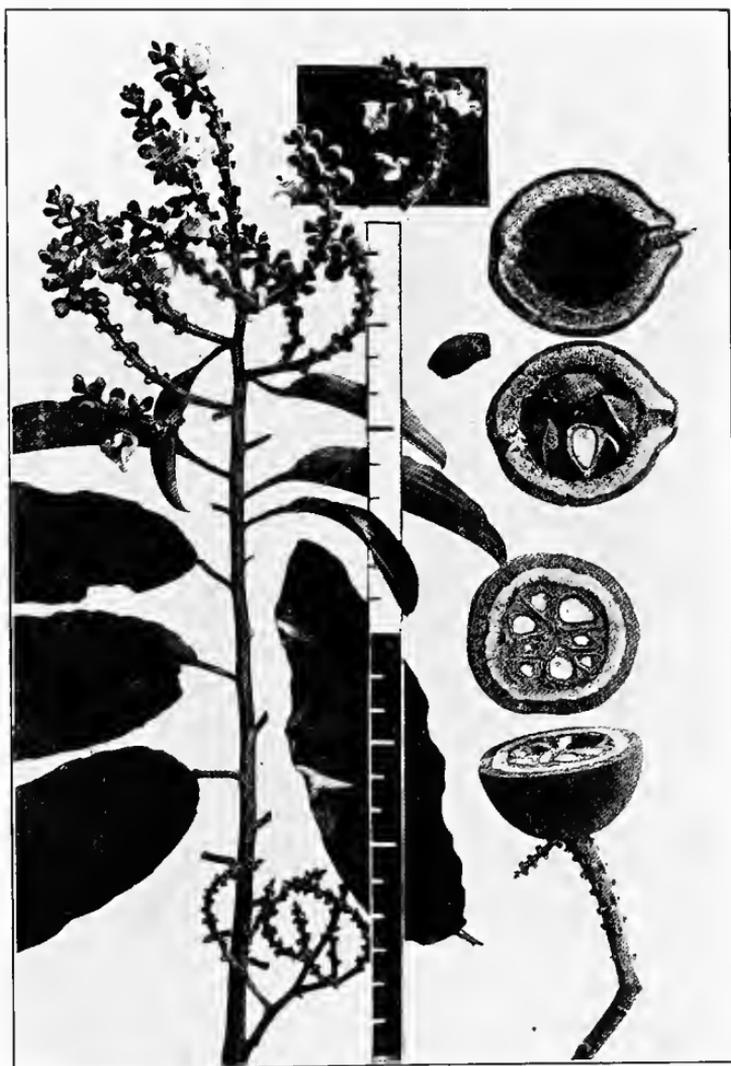
Blighia sapida,= **Cupania edulis** (Sapindaceae). Akee Tree.—A fairly large spreading tree, native of West Tropical Africa, introduced and cultivated to some extent in the West Indies for its edible fruit. The latter is of the size and form of a small lemon or pear, about 3 inches in length, and bright red when ripe. The seeds, of which two to three are in a fruit, are jet black and of the size of marbles. The edible portion is the firm, cream-coloured fat-like substance (*aril*), developed in a succulent socket round the base of

the seed. This is generally cooked, but may also be eaten raw, and is considered delicious when par-boiled with salt, and stewed or fried with butter. The fruit when ripe splits open, and must then be picked, as on long exposure to the air the aril becomes discoloured and unfit for food. Between the two lobes of aril there is a pink integument ; this must be removed when preparing the aril for eating, as it is considered highly poisonous. The tree is suited to the moist or semi-dry low-country up to about 2,000 feet. There is a tree in the Hon'ble the Colonial Secretary's garden at "Temple Trees," that bears fruit freely twice a year, chiefly in April and September. The tree may also be found in some Indian Gardens, but so far as I know the fruit is never eaten in Ceylon or India. Propagated by seed or gootee, or sometimes by suckers.

Buchanania latifolia (Anacardiaceae). "Cheronjee."—A moderate-sized tree, attaining about 30 feet in height, and bearing simple leathery leaves, native of the mountainous parts of Coromandel, Malabar, Mysore, &c. The kernels of the fruit are of the size of small pears, and are said to be a general substitute for Almonds, being considered superior and more agreeable to the taste than either the Cashew-nut, Country-almond, or Ground-nut. They are sometimes sold in the bazaars in India at 4 to 6 annas per lb. The tree is not known in Ceylon, but it might be found suited to medium elevations in the Uva Province. Propagated by seed.

Canarium commune (Combretaceae). Java Almond ; "Ratakekuna," S.—A large handsome Malayan tree, characterised by a remarkable buttressed trunk and latterly compressed aerial basal roots ; the latter develop enormous erect flanges of uniform thickness, so that solid circular pieces may occasionally be cut out from them to form ready-made cart wheels. The tree is much cultivated for shade or ornament in Java. It bears in great abundance large pendant clusters of dark-purple fruits, which are of the size of small plums ; these are produced all the year round, but chiefly in June. The kernel of the fruit is edible, being similar in flavour to Sweet Almonds ; it yields by expression an oil used for burning in lamps and for cooking purposes. A desirable tree for planting in avenues, &c. It thrives in hot and moist districts up to about 1,500 feet elevation, and prefers deep, well-drained soil. Propagated by seed, which may be sown in nursery beds, and kept moist and shaded until germinated.

Carica Papaya (Passifloraceae). Papaw ; Tree-melon ; "Pepol," S. ; "Pappali," T.—A fast-growing, small, herbaceous,



BRAZIL-NUT. *BERTHOLLETIA EXCELSA*.



PAPAW, SHOWING FRUIT, FLOWERS, STEM & LEAVES.

branchless and dioecious tree, attaining a height of about 15 to 20 feet, indigenous to Central America and the West Indies. It bears a crown of very large palmate leaves, at the base of which the large green fruit are produced. The latter varies from round to oval or oblong in shape, but is usually 10 to 16 inches long by 4 to 6 inches in diameter, not unlike a melon or a gourd. The fruit has



PAPAW TREES. *CARICA PAPAYA*.

a central cavity, to the walls of which the olive-coloured seeds are attached, usually in great abundance, but sometimes entirely absent. The succulent flesh varies in colour from a slight pinkish to an orange tint, is very refreshing and agreeable to the taste, especially on first acquaintance with it. It is commonly used for dessert, and is considered an aid to digestion. Some people prefer to eat it with a little sugar and fresh lemon or lime juice. It may also be made into jam and sauce; while in the unripe state it may either

be pickled, or boiled and used as a vegetable. The seeds have a flavour like that of water-cress, and are relished by some as a substitute for it. The milky juice of the unripe fruit curdles milk like rennet, and from it is obtained vegetable pepsin (*papaine*). This is prepared commercially, chiefly in Jamaica, whence it is exported to Europe, &c., for use in medicine. Fair quality papaine is worth from 5/- a lb. in London. The property of the leaves in rendering meat tender is well-known, and is commonly made use of by cooks in Ceylon, who either wrap the leaves round the fresh meat, or place a piece of the green fruit in the water in which the meat is boiled. The tree bears fruit continuously from the time it is about ten to twelve months old, but deteriorates at the age of five to six years, after which its life is soon over. The flowers being usually *unisexual*, the tree is dependent on cross-fertilisation for its reproduction by seed. Therefore the varieties become much mixed, the fruit varying from globose to long and narrow, with many, few, or no seeds. Occasionally, however, *bisexual* flowers are produced by either male or female trees which are normally *unisexual*; thus "male" trees sometimes bear fruit, which only differs from that of "female" trees by being smaller and perhaps less palatable. Propagated by seeds, which germinate readily. Sow thinly in nursery beds. Suited to the moist low-country, and thrives best in rich porous soil.

Carissa Carandas. (Apocynaceae). "Maha-karamba," S.; "Perunkila," T.—A small tree or large shrub, with sharp, rigid, forked thorns and oval leaves, native of the dry region of Ceylon, also of India and Malaya. It blossoms chiefly in February to March, and ripens its fruits in August and September. The fruit when ripe much resembles a Damson, both in size and colour; but in the interior are a number of small seeds. In India it is made into pickle just before it is ripe, and is also employed in tarts and puddings, being considered to resemble gooseberries in flavour. For these purposes the fruit is said to be "superior to any other Indian fruit." When ripe it makes a very good jelly. The plant is commonly used for barrier hedges, for which purpose it is well suited. Propagated from seed. Suited to dry districts at low elevations.

Caryocar nuciferum. (Ternstroemiaceae). Butter-nut; Souarinut.—A handsome lofty tree, attaining a height of over 100 feet, with large lanceolate trifoliate leaves, native of Brazil and British Guiana. It bears a large roundish fruit, about the size of a child's head, containing when ripe four large kidney-shaped seeds,

which have a very hard woody and reddish shell. The latter is so hard that it needs an axe to break it open. The kernels have a pleasant nutty taste, and are esteemed in England for confectionery and fruitarian dishes. They yield by pressure a valuable oil. Souari-nuts are imported into England, and are retailed in London at about 3d. or 4d. each. The tree flourishes in the moist low-country of Ceylon, and prefers deep open soil. The two trees in the Peradeniya collection, introduced in 1891, grow luxuriantly, but have not yet arrived at a fruiting stage. Propagated by seed.

Cassimora edulis. (Aurantiaceae, Orange family). Mexican-apple.—A medium-sized tree, characterised by pale green leaves (each divided into 5 leaflets) and green flowers borne in racemes, native of Mexico. The edible fruit is of the size of a large apple; it has an agreeable taste, and is said to induce sleep. The seeds are considered poisonous; these as well as the bark and leaves are used medicinally in Mexico.* The tree has been introduced at Peradeniya in 1899, but has not yet produced fruit.

Chrysobalanus icaco. (Rosaceae). Icacó; Coco-plum; Spanish-nectarine.—A small spreading shrubby tree, native of Tropical America. It bears fruit of the size and shape of a plum, varying from round to egg-shape, with a purplish tender rind; the scanty white pulp, adhering to the kernel, is of somewhat an agreeable acid taste. The fruit is said to be largely made into conserves in Cuba, where it forms an article of export. The tree succeeds in the moist low-country up to 2,000 ft., and is propagated by seeds.

Chrysophyllum Cainito. (Sapotaceae). Star-apple; "Ratalawulu," S.; "Seemaipala-pallam," T.—A fairly large handsome West Indian tree, with striking dark green leaves, which are copper-coloured underneath. The purplish black smooth fruit is round in shape, about $2\frac{1}{2}$ to 3 inches in diameter, and usually two- to four-seeded, the seeds being brown and $\frac{1}{2}$ inch long. In an unripe state the fruit contains a sticky white latex, but when fully matured the white, transparent, jelly-like substance surrounding the seed is sweet and agreeable. The fruit when cut across presents a stellate form, the cells with their white edible contents radiating from the central axis; hence the name "Star-apple." The tree is well worth cultivating for ornament or shade for road-sides, &c. It thrives at Peradeniya, where it was first introduced in 1802. Propagated by seed, and thrives best in deep, rich and well-drained soil.

* Treasury of Botany.

C.—monopyrenum. Date-plum; "Kos-eta-lawulu," S.; Seemai-pala pallam," T.—An ornamental West Indian tree, of more slender and up-right habit than the preceding species, but resembling it in the foliage, introduced at Peradeniya in 1844. As the vernacular names signify, the fruit is similar in size and form to a Date fruit or a Jak seed, and suggests a Damson in form and colour: it has a thin shining, purplish-black outer skin, and contains but one seed; the milky reddish pulp is edible, but rather insipid. The principal fruiting season for both this and the preceding species is from February to April. Propagation by seed.

Citrullus vulgaris (Cucurbitaceae). Water Melon. "Komadu," or "Peni-komadu," S.—A smooth, oval-shaped fruit, usually about 8 to 10 inches long, produced by a quick-growing creeping gourd, commonly cultivated in the dry region of Ceylon and in the Tropics generally. The fruit is of a dark green colour, with a reddish juicy flesh, cool and refreshing in the hot season, though rather insipid. In India the fruit is described as in some cases growing to an enormous size, "sometimes 3 to 4 feet in length and from 18 inches to 2 feet in diameter," but the smaller sized ones are the best. It is occasionally spherical in shape. The plants will thrive on ordinary soil, provided sufficient moisture is afforded at the root, and are best suited to dry districts. In India they are commonly grown on the banks of rivers. The natives often bury the fruit with sand, under which it grows and ripens slowly. Easily propagated by seed.

Citrus aurantium (Rutaceae). Sweet Orange; "Peni-dhodan," S.; "Naran-kai," T.—A small tree or shrub, 8 to 12 feet high, supposed to be a native originally of Northern India. The Orange has long been cultivated in all tropical climates, where the trees are subject to wintering, or at least a period of rest. The tree also luxuriates in the torrid zones, being more or less naturalised in the moist low-country of Ceylon; but the fruits here produced are often coarse and thick-skinned, being green in colour when ripe, which, however, may be largely due to the want of a proper system of cultivation and selection, as well as to the effects of the tropical climate. At the higher elevations, imported grafted plants flourish for a few years and produce attractive yellow fruits of good quality, but the excessive rains and strong winds are against the health and productiveness of the tree.

The nearest approach to the proper conditions for successful orange culture in Ceylon would appear to be found in the

drier parts of the Uva Province, between 1,000 and 3,000 feet elevation. A gentle slope with free natural drainage, a light rich soil with a marly or limestone sub-soil, a rather dry climate and shelter from strong winds are especially suited to the requirements of the tree. A "resting period" is imitated annually in India, usually with good results, by stopping the water supply and opening up the soil around the stem of the tree, the fibrous roots nearest the stem being cut off; this has the effect of making the trees drop the greater part of their leaves. When the roots have been thus exposed for a month or two, the soil is again filled in, and manure added. The sea-breeze is considered to be injurious to Orange culture, yet the Cotta oranges, grown on the sea-board, are noted in Ceylon for their excellence. In the dry region, oranges would probably do well under irrigation, as Orange cultivation is thus successfully carried on in parts of India, &c. The Orange tree has no serious pest in Ceylon. (See *Insect and Fungus Pests*).

Propagation of the Orange is best carried out by budding or grafting (especially the former) upon the hardy and vigorous growing kinds of Citrus, as the Sour Orange and the Pumelo. Only budded, grafted, or layered trees can be relied upon for producing fruits of a uniform type and quality. The flowers being naturally subject to cross-fertilisation, plants raised from seed are obviously liable to produce fruits of a variable character. Seedling trees are, however, usually the healthiest and longest-lived. In raising seedlings, care should be taken to choose the best fruits, selecting from these only full and plump pips or seeds. Sow the latter in well-prepared soil, about half an inch under the surface. The seeds will germinate in about fourteen days; when the seedlings are 2 or 3 inches high, transplant them into small plant-baskets or bamboo-pots. These should be ready for budding or grafting in the course of eight or ten months, and the budded or grafted plants should be fit for planting out when about two years old.

Planting and Yield. The distance for planting apart should not be less than 15 by 15 feet, or 193 trees to the acre. The trees should commence to bear when about four or five years old, and are considered to be in their prime when about fifteen years old. When in full bearing, each tree should bear from 300 to 700 fruits.

Manuring and Mulching. Although any well decomposed organic manure may be applied with advantage, the chief requirements of the Orange tree are considered to be lime and

potash. A successful grower in Australia applies 5 lb. of bone-dust and phosphate of lime to each tree once a year, while in Florida burnt-shell lime is applied at the rate of $\frac{1}{2}$ ton to the acre. The ground around the tree should be frequently stirred, and never be allowed to harden. Light mulching of litter or leaves is of great benefit in hot dry weather.

Pruning Oranges. Good orange trees require little or no pruning, except as regards the removal of superfluous, dead or broken branches. The plants should be topped at a height of about $2\frac{1}{2}$ feet, so as to induce a spreading and evenly balanced form. The fruits, it should be remembered, are borne on one year-old wood. Excessive woodiness may sometimes have to be checked by cutting the tap-root below 15 inches from the surface.

Bi-products of the Orange.—Various by-products are obtained from oranges, as *candied peel* (from the rind); *citric, lactic, and acetic acid* (from the fruit-juice); *essential oils* (from the peel); the perfume *bergamot* (from the flowers); also *orange wine*, &c. Marmalade is made chiefly from the sour varieties.

VARIETIES. The following are well-known :—

Jaffa. A large oval fruit of first-rate quality; pulp rich and juicy, seeds few or none.

“*Jamma-naran.*” See *Mandarin*.

Maltese Blood. Fruit medium size; flesh stained with deep crimson; seeds few; tree spineless.

Mandarin; “*Jamma-naran*” *S.* Loose-skinned, large fruit of deep colour, usually compressed at ends.

Mediterranean Sweet. Thornless tree; fruit medium to large, seeds few.

Nagpur Suntra. An Indian variety, famous for its sweetness.

Navel Orange. Fruit large, with a navel-like mark, very juicy and with melting pulp; almost seedless; tree slightly thorny, bears fruit early.

Satsuma. Said to produce its fruits in enormous bunches, “upward of 50 fruits in each, in Florida.”

Seville Orange. A bitter fruit, bright orange colour; the tree thrives and bears freely at Hakgala Gardens. The finest marmalade is made from this orange.

St. Michael. Large, thin-skinned fruit, of fine flavour.

Tangerine. A variety of *Citrus nobilis*; fruit medium-sized, fine flavoured.

C.—Decumana. Shaddock; Pumelo; “Forbidden Fruit”; “Jambola,” *S.*; “Jamblica,” or “Bambalinas,” *T.*—A small tree, 25 to 30 feet high, native of Tropical Asia, and commonly cultivated throughout the tropics for its large round or oval fruits. Numerous varieties occur in different countries, varying in the shape and size of the fruit, as well as in the colour and flavour of the pulp; in some the latter is green and acid, in others it is reddish or crimson,

juicy and sweet. The fruit is valued for making jams, the best sorts being sometimes used for dessert. The Pumelo grows luxuriantly in the moist low-country, producing large globular fruits which measure from 6 to 9 inches in diameter; thrives up to about 2,000 feet elevation, either in moist or semi-dry districts; easily propagated by seed. Seedlings of Pumelo are recommended for stocks upon which to graft Oranges.

C.—Decumana, var. "Grape-fruit," so-called because the fruits grow in a cluster like a bunch of grapes. These resemble large oranges, being usually globular in form, but sometimes pear-shaped, with a smooth skin of medium thickness. The pulp is pale yellow or greenish white, sometimes pink or crimson. The juice sacks of the pulp are more distinct than in the orange, the pulp being very juicy, somewhat sweet, with a distinct but agreeable bitter flavour. In the United States, Cuba, Jamaica, &c., the Grape-fruit is very popular, being usually eaten in the early morning or as a dessert. It is imported into England, where it is usually esteemed by those who know it, and finds a ready sale at Covent Garden Market at 4d. to 8d. each. According to the *British Medical Journal*, it has "a wholesome, clean, slightly bitter taste, blending with the acidity of the orange, and has the physiological action of stimulating the appetite and promoting salivary and gastric digestion." This fruit has not yet become well-known in the East, though it is often met with experimentally in gardens. Propagated by grafting, budding, or from seed. There are several varieties.

C.—acida. Lime; "Dehi," S.; "Dhaisikai," T.—A small spiny tree, cultivated in all tropical countries for its acid juicy fruit. The latter varies in size and shape, degree of acidity and juiciness, also in shape from almost round to egg-shape. The Lime fruit is used by all races for flavouring and other culinary purposes; it is largely employed for the manufacture of cooling drinks, especially lime-juice cordial, whilst it is also of much importance in native medicine. Applied externally, it is valued as a cure for snake-bites. Limes are grown as a commercial product in some West Indian Islands, and the export of concentrated lime-juice and citrate of lime (in casks) forms the chief industry of Dominica. In Ceylon, Limes are in season practically all the year round, and are at all times sold in the boutiques and markets. The tree thrives up to 2,000 feet elevation, preferring a light marly soil with good drainage. It is propagated by seed (pips), or preferably by budding or grafting on stocks of a vigorous growing kind; plants thus raised should come into bearing at three years old.

VARIETIES. Among the principal varieties recognised in India are:—

“*Patee*” (a small round fruit, much esteemed), “*Kaghuzee*” (of the size of a hen’s egg, in most general cultivation), “*Gova*” (a small oval fruit, much cultivated), “*Kamuralee*” (a large handsome fruit, of pale lemon colour, about the size of a small coconut), “*Rungpore*” (a round smooth-skinned fruit), and “*Taba*” (a large globose, spongy fruit). The “*Kaffir Lime*” in Ceylon is almost the size of a lemon, with a warty coarse skin.

Spineless Lime. A sport of the ordinary Lime, said to have originated in Dominica in 1891, the stems and branches being without the usual formidable spines.

Seedless Lime. In recent years several varieties of limes have been raised whose fruits are almost, if not quite, free from seed. The “*Persian Seedless*” or “*Tuhiti Lime*” is reported as being the chief variety grown in Cuba, the fruit being prolific and containing a high percentage of citric acid.

C.—Limetta. Sweet-lime.—This is a distinct variety, the fruit of which is of the form of a moderate-sized orange, with smooth pale-green rind. It has a sweetish instead of an acid taste and is considered very refreshing and agreeable. The tree is used largely in parts of India for budding the Orange upon.

C.—Limonum. Lemon. (See under *Sub-tropical fruits.*)

C.—medica. Citron. (See under *Sub-tropical fruits.*)

Clausena wampi,=Cookia punctata (Aurantiaceae). Wampee; “Rata-karapincha,” S.—A small ornamental and aromatic tree, native of China. Its pale yellow berries have a strong aromatic acid taste, and are sometimes made into preserves, and used for flavouring meat curries, &c., but they cannot be considered suitable for dessert. The fragrant leaves also are esteemed by the natives for flavouring curries. The tree is suited to humid districts at medium elevations, and is propagated by seed.

Cucumis Melo (Cucurbitaceae). Musk Melon; “Pitta-kekiri,” S.—A round or oval fruit about 4 to 6 inches in diameter, or 7 to 8 inches long by 3 in. in diameter, produced by a creeping annual gourd with large angular leaves. In its natural state the fruit has a strong musk-deer odour, the interior being of a somewhat flowery consistency. The best varieties, as grown in hot-houses in temperate countries, are very highly prized on account of their luscious flavour. The plant is suited to a hot dry atmosphere and rich porous soil. It requires moisture at the root, but the vines are susceptible to a damp atmosphere, and in cultivation the precaution has usually to be taken of forming a collar of earth round the base of the stem so as to prevent any water lodging there. Musk Melon is never seen grown in the moist

low-country of Ceylon, and but seldom in the dry region. Firminger referred to a fine variety, called the "Surdah," the fruit of which is "sometimes brought from Cabul to Punjab for the wealthy natives, who are said to pay as high as Rs. 6/- each for them." The seeds of this variety are distinguished by their very large size. There are many varieties in cultivation, these being divided into "Netted" and "Smooth-skinned" groups. The flesh, in either group, may be red, green or white. Propagated by seed, like other gourds.

Cynometra cauliflora (Leguminosae). Nam-nam.—A shrubby, much branched tree with small binate leaves, native of India and Malaya. The fruit is a one-seeded, much wrinkled pod, semi-circular in shape, and produced in large numbers on the trunk near the ground (sometimes on the lowermost portions of the branches), chiefly in May and June. The succulent green, or greenish yellow, shell is about $\frac{1}{2}$ an inch thick, and is of a pleasant, sweet sub-acid taste, not unlike an apple. Whilst, however, the fruit of some trees is very palatable, that of others may be sour and unpleasant, much depending on the degree of cultivation afforded. The fruit is also used for pickling, and the large flat seed yields a medicinal oil. The tree thrives in the moist low-country of Ceylon up to 1,500 feet, and prefers deep rich soil. Though indigenous to parts of India, it does not seem to be commonly cultivated there, for neither Firminger nor Cameron mentions it. Easily propagated by seed, but the best varieties should be increased by gootee or grafting.

Davidsonia pruriens (Saxifrageae). A medium-sized tree, with handsome serrate leaves, native of Queensland. The fruits are of the size of plums, bright pink when ripe, with a reddish flesh. In their native country they are made into jams and preserves. The tree has been introduced at Peradeniya, where, however, it has not yet flowered or produced fruit.

Dialium ovoideum (Leguminosae). Velvet Tamarind; "Gal-siyambala," S. "Kalupullium," T.—A tall tree with pinnate leaves, peculiar to the semi-dry region of Ceylon. From near the ends of the branches the dark brown velvety fruits are produced in clusters, each fruit being about the size of a filbert, and slightly compressed. The thin brittle shell encloses a seed surrounded by farinaceous pulp, which has an agreeable acid taste and is considered a delicacy by the Natives, who use it in the preparation of a fine chutney. When in season, the fruits are sold in the markets and bazaars. The tree affords a handsome dark red timber; thrives at Peradeniya. Propagated by seeds.

D.—Guineense. West African Velvet-tamarind.—A tree similar to the preceding species, but easily distinguished from it by having larger leaves. The genus is characterised by the flowers having only two stamens, most Leguminous plants having ten.

Dillenia indica (Dilleniaceae). “Hondapara,” S. A medium-sized tree with large leaves, native of Ceylon and tropical Asia generally. It produces a profusion of large round green fruits, each about 3 inches in diameter, being juicy and very acid. The fruit is formed by the much enlarged, closely imbricate fleshy sepals; it is used for making jelly and a cooling drink, also sometimes as a vegetable in curries. The tree is often cultivated, both for ornament and for its fruit. Propagated by seed, which, being small, should be sown in a pot under cover.

Durio zibethinus (Malvaceae). Durian; Civet-cat Fruit.—A very large, handsome pyramid-shaped tree, native of the Malayan Archipelago, and commonly cultivated in the Straits, Burma, Java, &c., for the sake of its celebrated fruit. The latter is produced on the older branches, varies somewhat from round to oval in shape, and usually weighs from 5 to 7 lb. or more. It is armed with thickly set formidable prickles about $\frac{1}{2}$ inch long; when ripe it becomes slightly yellow, and possesses an odour which is intensely offensive to most people, especially on first acquaintance with it. The cream-coloured pulp surrounding the seed is the edible portion; this is most highly prized by the Malays and other oriental people, and is also relished by Europeans who acquire a taste for it. Firminger described it as “resembling blanc-mange, delicious as the finest cream,” whilst Mr. Russel Wallace considered that “eating durians is a sensation worth a voyage to the East.” The large seeds may be roasted and eaten like chestnuts. Pounded into flour, they are said to be sometimes made into a substance like “vegetable-ivory.” The Durian tree thrives in the moist low-country of Ceylon up to 2,000 feet elevation, and luxuriates in deep alluvial or loamy soil. In Peradeniya Gardens, there are magnificent specimens well over 100 feet in height. They usually flower in March or April, and the fruit is ripe in July or August. Durian fruits are variable in size, shape, flavour and quantity of pulp, according to variety. The trees also vary in productiveness, some varieties being almost barren. Selection and high cultivation should, therefore, be practised in order to obtain the best fruits. The tree is readily propagated by seed if sown fresh; the seed is of short vitality and germinates in seven to eight days.



DILLENIA INDICA. "HONDAPARA."



THE DURIAN FRUIT. *DURIO ZIBETHINUS*.

Elaeocarpus edulis (Tiliaceæ).—A small ornamental tree, native of New Guinea, producing bright red fruit, which is three to five sharp-angled, oval in shape, seeded, and nearly 2 inches long. The outer scanty rind (*pericarp*) is of a sweetish-bitter taste, and may be made into a savoury jelly or used for pickling. The tree is worth growing for ornament on account of its graceful foliage and handsome red fruits. It thrives in shady places with loose rich soil, up to about 2,000 feet. Propagated by seed, which take several weeks to germinate.

E.—serratus. Wild Olive; "Veralu," S.; "Verali-pallam," T.—A handsome medium-sized tree, indigenous to Ceylon, producing smooth oval green fruits, of the size of small plums, and resembling olives. The fleshy portion surrounding the stone (seed) is sub-acid and palatable. In an unripe state it is excellent for pickling like olives. The principal season for the fruit is April and May. The tree thrives in the moist low-country up to about 2,000 feet, and is propagated by seed.

Eugenia Jambos. (Myrtaceæ). Rose-apple; "Veli Jambo," S., "Seeni Jambo," T.—A medium-sized handsome tree, native of India and Malaya, and introduced early into Ceylon. Its fragrant pinkish-white or rose-coloured fruit, about the size of a hen's egg, is of a sweetish-acid taste, and is said to be used in preserves. Its quality varies with different trees and conditions of cultivation, being in some cases woolly and almost tasteless. The tree thrives best in moist districts, at medium elevations up to 3,000 feet, preferring a deep rich soil. Propagated by seed.

E.—javanica. Wax Jambo; "Peni-Jambo," S.—A small ornamental Malayan tree, producing clusters of very pretty, shining, rose-pink, or pinkish white, waxy-looking fruits. Each fruit is about the size of a large strawberry, with the base laterally compressed; the pulp is edible, but is usually too fragrant and pithy to be agreeable. The tree is propagated by seed, and thrives best at elevations of 1,000 to 3,000 feet in moist districts.

E.—malaccensis. Malay-apple; "Jambo," S.; "Peria Jambo," T.—A handsome tree, 30 to 50 ft. high, with large leathery oval leaves, indigenous to the Malay Islands. It produces a great profusion of beautiful crimson flowers, which for several days during January and February make a bright carpet under the tree as they drop. The pear-shaped white or bright red fruits are produced chiefly in May and June, these too making the tree an attractive object. The snowy white but rather pithy pulp

surrounding the seed is edible, but not of much account. Propagated by seed. Thrives in the moist low-country up to 2,000 feet.

E.—Micheli. Brazil or Surinam Cherry ; “Goraka-Jambo,” S.—A small shrubby tree of Brazil, bearing small round and ribbed fruit, about 1 inch in diameter, rather flattened at the ends, and of a bright red waxy appearance. These suggest small tomatoes at a distance ; the pulp is edible, but to most people is too acid and perfumed to be agreeable. It is said to make good jelly, being also used in preserves. The tree thrives best at medium elevations, 1,500 to 3,000 feet. Propagated by seed.

Feronia elephantum (Rutaceae). Wood-apple or Elephant-apple ; “Diwol,” S. ; “Vila” or “Vilatti,” T.—A good-sized tree, 40 to 50 feet high, native of India and Ceylon. It bears round fruit, about the size of a large cricket ball, similar to the Bael-fruit, but distinguished from it by having a whitish warty surface. The hard woody shell encloses a mass of soft brownish mealy substance, which has a strong aromatic smell. The fruit is generally relished in Ceylon, and is also used in native medicine. The tree is common throughout the dry region, being often cultivated there as well as in the moist low-country. Propagated by seed.

Flacourtia Cataphracta (Bixaceae). “Rata-Uguressa,” S.—A small thorny tree, native of India and Malaya, producing round berries of the size of large cherries, purplish or deep-red in colour, and of a rather tart flavour. Firminger thought it “suggestive of something better than a sloe, but worse than an indifferent plum.” But there are several varieties in cultivation, and some if properly cultivated merit a better description than the above. The fruit can be made into a very agreeable jam or preserve. Plants are usually raised from seed, but a good variety should be budded or grafted.

F.—inermis. Lovi-lovi, Tomi-tomi ; “Louvi,” S.—A Malayan ornamental thornless tree, growing to about 30 feet high, bearing in great profusion bright red, cherry-like berries, which are produced in two seasons, March to April, and August to September. The attractive-looking fruits are deceptive, being exceedingly sour in taste ; but they make excellent jelly, and are also used in preserves. The tree is propagated by seed, and thrives in any moderately good soil in the low-country. Sow the small seed in pots or boxes under cover ; prick out the seedlings into baskets or bamboo pots when strong enough. The plants take about eighteen months to be ready for planting out.

Garcinia Cambogia (Guttiferae). "Goraka," S.; "Korakkai-pulli," T.—A moderate sized handsome tree, with a round head and drooping branches, native of the moist low-country of Ceylon and Western India. The large roundish fruit is of the size of an orange, with several (usually eight) deep vertical grooves forming blunt lobes; it is smooth on the surface, red or orange yellow in colour, and sweetish-acid in taste. When ripe (from June to July)



"GORAKA." *Garcinia Cambogia*.

it is commonly collected by the Natives in the low-country, the thick succulent shell being cut in sections, dried in the sun, and preserved for use as required. It is largely employed for preserving fish, being made into a brine with salt; also used as a substitute for limes in curries. The tree thrives up to 2,000 feet. Propagated by seed.

G.—Mangostana. Mangosteen; "Mangus," S.; "Manguskai," T.—A moderate-sized conical tree with large leathery leaves, indigenous to the Malay Islands. Its globular, purplish brown fruit, about the size of an apple, is famed as one of the most delicious fruits of the tropics, some writers describing it as "perhaps the most luscious fruit in the world, partaking of the flavour of the strawberry and the grape." The delicate white juicy pulp surrounding and adhering to the seed is the part eaten. In striking contrast to it is the dense, thick reddish rind, containing tannic acid and a dye. The fruit is in season in the low-country from April to June, and at higher elevations from June to August or September. In Ceylon it is usually sold at the markets or hawked about at 75 cts. to Re. 1 per dozen, and is always charged for on hotel menus as an *extra*. The tree is of very slow growth, and does not usually come into bearing till about nine or ten years old. The essential conditions for it are a hot, moist climate, and rich well-drained soil. It thrives up to 1,500 feet elevation in the moist region, but is not suited to dry districts. Propagation is usually by seed, but may also be effected by "gootee" or layering.* Sow seeds in pots under cover. The plants are of very slow growth, taking about two years to become large enough for planting out, being then only about 12 inches high.

G.—Xanthochymus. "Cochin-goraka,"; or "Rata-goraka," S.; "Seemai-goraka," T.—A symmetrical cone-shaped bushy tree, growing to 25 or 30 feet high, native of South India and Malaya. It bears large leathery leaves, 12 to 16 inches long and $2\frac{1}{2}$ to $3\frac{1}{2}$ inches in width. The handsome yellow fruit, produced in great abundance in December and January, is of the form and size of a small orange, usually with a pointed projection at the end, the tender thin skin being smooth and polished. The yellow juicy pulp is of an acid but refreshing taste. The tree is propagated by the large seeds, and thrives up to about 3,000 feet or more.

Grias cauliflora (Myrtaceae). Anchovy Pear.—A small slender, unbranched West Indian tree, with a crown of very large drooping leaves, the latter measuring up to 3 feet in length by about 6 to 8 inches across. The brown oval fruits, produced on the stem, are of the size of a hen's egg, and in the West Indies are considered to resemble the mango in taste, being said to be used for dessert and pickling. The quality of the fruits produced by the trees at Peradeniya does not, however, warrant such a high opinion, and are seldom eaten. Propagated by seed.

* Seedlings may also be successfully inarched upon the following species.



LOVI-LOVI. *Flacourtia inermis*. (See page 146).



MANGOSTEEN. *Garcinia Mangostana*. (See page 148).

Hibiscus Sabdariffa. (Malvaceae). Jamaica or Red Sorrel; "Rozelle,"; "Rata-bilncha," S.; "Pulincha-kira," T.—An annual shrub, 4 to 5 ft. high, with reddish stems, leaves and fruit, native of the West Indies. It is cultivated in most warm countries



"RATA" (OR COCHIN) GORAKA. *Garcinia Xanthochymus*.
(See page 148).

(sometimes as an intercrop with other products) for the sake of its large fleshy sepals, which remain after the flowers fall away (*persistent*), and become enlarged and succulent (*accrescent*), enclosing the fruit-capsule; these make excellent jam, and a jelly is also made

from them which is considered to be almost equal to red-currant jelly. In an unripe state the fruit is adapted for pickles ; it makes an excellent condiment, while a refreshing beverage called "Sorrel-drink" is also prepared from it. The young tender acid leaves are esteemed by the natives of Ceylon as a vegetable in curries, and the stems afford a quantity of strong fibre. The plant thrives at elevations up to 2,500 feet with moderate rainfall. Seeds may be sown at the commencement of the monsoon rains, and the seedlings, when ready, planted out in rows about 6 feet apart, with about 4 feet between the plants in the row. The sepals should be fit for picking in three to four months from the time of planting out, and the plants will continue to produce these for about two months. The plant occurs in two varieties, viz., *White Sorrel* with greenish-white, and *Red Sorrel* with reddish sepals, the latter variety being considered to be the more acid, and is generally preferred.

Inocarpus edulis. (Leguminosae). Tahiti-chestnut.—A moderate-sized tree with large shining leaves, native of the Pacific Isles. The large fleshy seeds, of which one or two are contained in a stout pod, are edible, and said to form an important article of food to the natives in the tree's indigenous home. When boiled and roasted, the seeds are considered palatable, though not suited to weak stomachs. The tree thrives and produces flowers and fruit at Peradeniya, where it has been introduced in 1861. Propagated by seed.

Lansium domesticum (Meliaceae). "Langsat" or "Lanseh," Malayan names.—A moderate-sized ornamental tree, native of Malaya. It bears long pendant clusters containing a number of closely packed berries; these have a tough skin, pale yellow when ripe, and enclosing opaque aromatic juicy pulp. This fruit is said to be much relished in its native country, being "eaten either fresh or variously prepared."* Dr. Ward described it as one of the finest fruits of the Malay Peninsula. Judging, however, by the product of a tree growing in Peradeniya Gardens it by no means justifies so meritorious a description, and I can only suppose that this must be an extremely poor variety. The tree does not seem to be much known in India. Propagated by seed. Will thrive up to 1,500 feet in moist districts. Introduced at Peradeniya in 1869.

Lucuma mammosa. (Sapotaceae). Mammee Sapota; Marmalade-fruit; Sapote, or Grosse-sapote.—A tree 30 to 40 feet high, with fulvous or grey branches, and long obovate pointed leaves, native of Central America and cultivated in the West Indies

* Treasury of Botany.

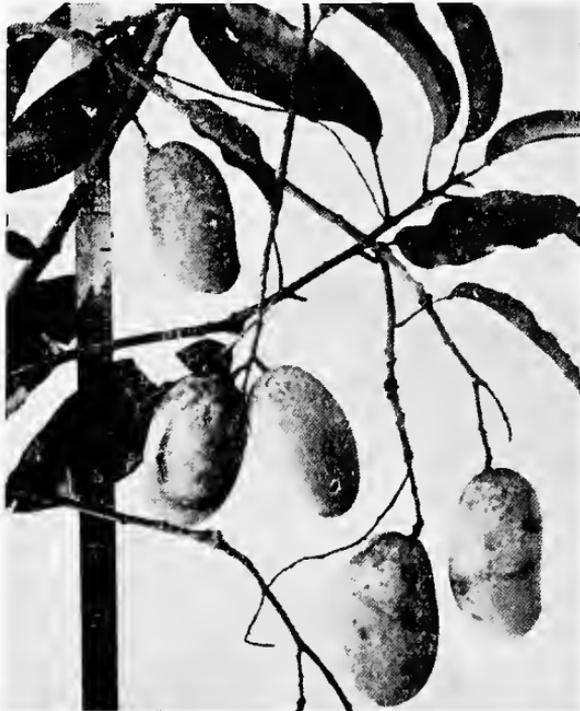
for its fruit. The cream-coloured, silky flowers are borne in clusters on the stem. Fruit about 6 inches long, with reddish pulp, containing one or more polished seeds. The pulp is sweet and resembles in taste a luscious pear. It is made into a marmalade, which is said to be not unlike good apple preserve. The common names of this tree are often confused with those of the tree *Mammea americana*.

Macadamia ternifolia. (Proteaceae). Queensland-nut.—A moderate-sized tree, about 40 feet high, with dense dark-green foliage, native of North Eastern Australia. It bears very hard nuts of the size of marbles, on spikes 5 to 8 inches long; the nuts are edible and of an agreeable flavour, being much relished in Australia, and sometimes retailed in Sydney at from eight pence to one shilling per lb. The extremely hard shell is the only drawback to these. The tree is propagated by seed; thrives and bears fruit at Peradeniya, where it has been introduced in 1868. Suited to medium elevations.

Mammea americana. (Guttiferae. Mangosteen family). Mammee-apple; St. Domingo-apricot.—A moderate-sized tree, 40 to 50 feet high, with large, rigid, leathery, shining leaves, and white, scented flowers, native of tropical America and the West Indies. The fruit is nearly spherical, 3 to 5 inches in diameter, with thick brown bark-like skin, containing one (sometimes more) large seed. Towards the apex of the fruit is usually developed a distinct pointed nipple. The seed is covered with fibre and surrounded by a dense, orange-coloured, sweetish and slightly aromatic pulp. The latter is eaten raw or stewed, or preserved with sugar, and somewhat resembles an apricot in taste. The small flowers are cream-coloured and scented, and a distillation of these is used in flavouring the spirituous liquor known as *Eau de Creole*. Dr. Lindley referred to this fruit as the "Wild Apricot of South America, said to rival the Mangosteen"; while Macfadyen described it as "of a sweetish aromatic taste, bearing a resemblance to that of Carrots." The tree has been established at Peradeniya since about 1810, and bears a crop of fruit annually. Propagated by seed.

Mangifera indica. (Anacardiaceae.) Mango; "Amba," S.; "Manga," T.—A medium or large-sized tree, of a spreading and quick-growing habit, indigenous to tropical Asia. It bears large panicles of greenish-white, scented flowers, usually in January, February, or March, followed three or four months later by the fruit. The latter

is generally in oval form, somewhat flattened, often with a more or less pronounced beak at the apex. It may weigh from 6 oz. to 2 or 3 lb., has a tough thin skin, and, when ripe, is yellow, reddish, or green. The flesh is usually of a reddish tint, with a more or less sweet, turpentine flavour, sometimes resinous and fibrous. In the centre is the large fibrous seed. The Mango is the fruit *par excellence* of India, where it has been cultivated from time immemorial. Here it may be considered an article of food as well as dessert, while it



"JAFFNA," OR ALPHONSO MANGO.

also enters largely in the preparation of chutneys and other preserves. The tree grows from sea-level to about 4,000 feet or more, but is scarcely fruitful at elevations over 2,000 feet in Ceylon. A hot and rather dry climate and a rich, well drained soil suit it best. The trees should be irrigated during prolonged drought, and receive a good mulching once a year. *Pruning* is confined to thinning out superfluous or sickly branches; while *root-pruning* is sometimes applied with advantage to trees which are unfruitful (owing to their running too much into wood and leaf), this being performed by cutting

a deep trench round the tree at a few feet from the stem. Shade is not necessary, except when the plants are young. Propagation is best by inarching or layering, the *gootee* mode of increase being commonly adopted in India. Propagation of the mango by budding may also be successfully effected (see under *Propagation*.) Plants are easily raised from seed, and if care be exercised in selecting the best fruits from the best varieties, these may become good fruitful



TYPES OF MANGOES IN CEYLON. (For names of these see page 150).

trees. Some varieties are said to come more true to seed than others. Frequently, however, seedling trees are liable to be disappointing in the quality of their fruit, and they take longer to come into bearing than layered or grafted plants, the latter commencing to fruit in their fifth or sixth year. Before planting out, large holes not less than 3 by 3 feet, should be dug, and a good proportion of well-rotted manure should be mixed with the soil for filling in. The

distance for planting the trees apart should be not less than 25 feet each way. The trees should commence to bear in their fifth or sixth year.

VARIETIES.—There are numerous varieties of the Mango in cultivation, the fruit varying in point of flavour, juiciness and succulency, size and shape of seed, &c. Different names are sometimes given to the same varieties in different countries. In Ceylon there commonly occur the following five distinct types of Mango, but of these there are numerous sub-varieties:—

Jaffna.—Large oval fruit of excellent quality when well-grown; probably equal to “Alphonso” of India.

Rupee.—Very large and somewhat round, pulp luscious and free from fibre; similar to “Iuerma” of Bombay.

Parrot, “*Gira-amba*,” *S.*—Medium-sized oblong fruit, with a distinct beak, piquant and pleasant flavour.

Bombay, or “*Baitee-amba*,” *S.*—Round and rather flat. very juicy. yellow when ripe.

Honey, or “*Mi-amba*,” *S.*—A small roundish fruit, of a sweet flavour.

Seed-mango, or “*Et-amba*,” *S.*—A small oval fruit, with scanty juicy pulp of a distinct piquant flavour.

The following are a few, out of a great number, of the principal Indian Mangoes:—

Afonza.—Greenish yellow with dark specks, about 18 oz., very sweet.

Alphonso.—About 12 oz., 4 in. by 3½ in., pulp of the finest piquant and delicate flavour. Generally considered the best of all mangoes.

Banchore of Dhairey.—Yellow, 3 in. by 2½ in., very sweet.

Borsha.—Oblong, bright green with yellow spots when ripe: up to 10 oz.. delicious flavour.

Custodio.—Very large, yellowish green, free from fibre.

Mulgoba.—Fairly large, yellow and green blotched, no fibre, flavour piquant and sweet.

Pakria.—Medium-sized, pale yellow, of delicious flavour, slightly fibrous.

Ryotya.—Bright crimson, weight about ½ lb., extra fine flavour, no fibre.

Salgadina.—Medium-sized, rich crimson, pulp deep yellow.

Sundersha.—Large, clear yellow, with a distinct beak, juicy and tender, free from fibre.

Totapari.—Medium-sized, slightly fibrous, of excellent flavour.

Monstera deliciosa. (Aroideae, Arum family.)—A noble epiphytic creeper with large, scolloped and perforated leaves, native of Mexico. It produces in the axils of the uppermost leaves a cone-like fruit (*spadix*), 6 to 8 inches long, which is edible, and has a pleasant odour when ripe. The fruit has an agreeable flavour suggesting a pineapple, but is rather juiceless. Its chief drawback, however, is the presence of minute black spines attached to the inside portion; these cause a disagreeable itching in the throat. The plant is a creeper, and requires stout tree trunks to grow upon.

It may be readily propagated by placing cuttings in a mixture of old bark, leafmould, coir-fibre, at the base of the tree on which it is to grow. After getting a firm hold of the tree it requires no further attention.



MONSTERA DELICIOSA.

Musa sapientum. (Scitamineae, Ginger family). Plantain or Banana. "Kehel," S. "Vala," T.—A small quick-growing tree, 10 to 20 feet high, with a herbaceous stem composed of the succulent leaf-stalks. As regards utility combined with magnificence, this must be considered one of the most remarkable of tropical products. When the plant is about eighteen months old the enormous flower-stalk issues from the centre of the crown of leaves, and curves over with its own weight. The flowers are in clusters and alternate with large reddish succulent scales; the latter drop off as the fruit stalk develops, and the ovaries of the flowers rapidly grow into large finger-like fruits, which are borne in *combs* or clusters. The banana fruit, or plantain as it is generally called in the Eastern

Tropics, is considered to be to the inhabitants of the torrid zone what bread and potatoes are to those of the north temperate zone. It has been calculated that a pound of plantains contains more nutriment than 3 lb. of meat. The Plantain is the most prolific of all food plants known, for it is computed that the same space of



"SUWANDALE" PLANTAIN OR BANANA.

ground which produces 3 lbs. of wheat or 90 lbs. of potatoes will yield 4,000 lbs. of plantains. The Plantain or Banana will grow in any ordinarily good soil, provided it is sufficiently moist and well-drained. It is essentially suited to a hot and moist climate, but will also thrive in a dry climate under irrigation, and up to 5,000 feet in sheltered valleys. A windy situation and a sandy calcareous soil

are both unsuited to it. Propagation is by offshoots or suckers, and these may be planted out direct at a distance of 12 ft. by 12 ft. apart, good large holes, filled with manured soil, being first prepared for them. Fertile seed is rarely produced by cultivated varieties. The plant will throw out several suckers, forming a clump, which should not be allowed to exceed five or six stems. The clumps should be moulded up with surface soil and any mulch of leaves, &c., available. The first bunches of fruit may be obtained about a year from time of planting, while the subsidiary suckers produce fruit when from twelve to sixteen months old. Each stem as it fruits dies, and others take its place, the clump thus continuing productive for several years. Under good tillage, an acre is considered to produce 260 to 400 or more bunches annually. The plants will respond well to manuring and deep tillage. An application of a mixed fertiliser composed of (for an acre) 200 lb. sulphate of potash, 250 lb. sulphate of ammonia and 450 lb. superphosphate, is recommended by growers in the West Indies. All leaves and trash should be returned to the soil.

VARIETIES.—A great number of varieties occur in cultivation. Of those grown in Ceylon the two best are doubtless *Suwandel* and *Kolikuttu*. Less superior kinds are, however, the most cultivated (because the most prolific and easiest of cultivation), such as *Embul-hondarawala*, *Anamalu* and *Rath-kehel*, or forms of these. The following are the principal varieties met with in Ceylon:—

Anamalu (fingers stout, rather angular, sub-acid, large bunches); *Biu-kehel* or *Dwarf plantain* (similar to *Anamalu*, fingers thickly set, smooth yellow skin); *Embul-hondarawala* (most common kind met with in markets and bazaars; fingers straight, fragrant, sub-acid); *Hamban-Puwalu* (fingers stout, rather angular, sub-acid); *Koli-kuttu* (fingers large and stout, loose-skinned, sweet, mealy, borne in large bunches); *Puwalu* (fingers thin and rather angular, somewhat acid); *Ranel* or *Red Plantain* (large red fingers, borne in huge clusters, coarse, thick-skinned, mealy, chiefly grown in the North of Ceylon); *Rata-Hondarawala* (thickly set combs: angular stout fingers, sweet); *Rath-kehel* (short, smooth, round fingers, rather acid but pleasant); *Suwandel* (thin-skinned, tender and sweet; considered the best in Ceylon; not commonly grown for market.)

While almost all the above may be cooked in an unripe state and used as a vegetable, the following are used chiefly for that purpose only, although some are also eaten raw when ripe, viz.:—*Alu-kehel* or *Ash Plantain* (slender stems; fingers stout and angular, covered with a greyish bloom); *Marthamalu* (short stout thick fingers, resembling *Anamalu* in taste); *Nawuri* or *Wandura-anamalu* (long, thin greenish-yellow fingers; dark slender stems); *Puspakadali* (short stout fingers, thin-skinned; suited for dessert); *Suramondan* (large green angular fruits, borne in huge clusters).

Gros Michel is said to be the principal variety grown in Jamaica (and apparently also in Hawaii, Cuba, &c.) for export, while *Musa Cavendishii* or "Dwarf banana" is the one so largely cultivated in the Canary Islands and exported to England, &c. This latter variety is said to be now the one chiefly grown in Barbados.

While in the Eastern Tropics all bananas are known as plantains, in the West Indies the name "plantain" is applied only to cooking varieties.

Nephelium lappaceum. (Sapindaceæ). Rambutan; "Rumtum," S.—A large handsome spreading tree, native of Malaya, yielding a profusion of bright red or orange-yellow fruits, the latter being produced in large clusters suspended from the ends of the branches, affording a very ornamental effect. Each fruit is of the size of a large gooseberry, covered with long soft coloured spines, the interior being occupied by a large seed, surrounded by a layer of white opaque pulp (*aril*), which is of an acidulous agreeable taste. Birds and bats are particularly partial to it. It is curious that this fruit, which is so common in the low-country of Ceylon and in the Straits, appears to be scarcely known in India, Mauritius, Madagascar, &c. The tree is readily propagated by seed, but the best varieties should be raised from grafts or gootees. Thrives up to 2,000 feet elevation.

N.—Litchi. "Litchi," or "Litchee."—A small bushy tree, with handsome dense foliage, native of China. It blossoms in the dry season (about February), producing sprays of pale-green flowers, and ripens its fruit about June. The fruit, produced in clusters, is of the size and form of a large plum, with a rough, thin, scale-like rind, which becomes of a beautiful red tinge, gradually turning to a dull brown colour before it is quite ripe. The jelly-like pulp or aril which covers the seed is of a translucent whiteness and of an agreeable refreshing flavour. This fruit, represented by different varieties of varying quality, is grown to great perfection about Calcutta and elsewhere in India, and is commonly sold in the bazaars when in season. Cameron says it thrives up to 3,500 feet in South India, giving at Bangalore two crops of fruit a year (in May and December). It is grown successfully in Mauritius, but curiously enough it is rarely met with in Ceylon, though introduced here as early as 1802. The tree flourishes and produces fruit at Peradeniya, but the variety here grown is obviously an indifferent one. There are several varieties in cultivation, distinguished by size and shape of fruit, quality of pulp, and size of seed. Litchi fruits are dried and preserved in China and Cochin China, from whence they are exported to Europe and America. Dried litchis

are not unlike raisins, both in appearance and taste. The tree may be increased by seed, but budding or grafting should be adopted to propagate the best varieties.



THE LITCHI FRUIT. *Nephelium Litchi*.

Passiflora laurifolia. (Passifloraceae, Passion-fruit family). Water-lemon; "Jamaica Honey-suckle."—A handsome West Indian climber with laurel-like foliage, said to be cultivated in its native home for its fruits, which are much esteemed for dessert.

The plant appears to have been introduced at Peradeniya before 1824, but although it grows and flowers freely, it has not yet set fruit here ; neither does it seem to be fruitful elsewhere in the East. The fruit is of the size and shape of a hen's egg, with a smooth yellow rind when ripe, and sweet watery pulp. The plant is readily propagated by cuttings, and is especially adapted for growing as a screen on the sides of plant-houses. Light humous, well-drained soil suits it.

P.—edulis. Passion-fruit. (See *Sub-tropical Fruits*).

P.—quadrangularis. Granadilla ; "Garnadilla" or "Ratapuhul," S. ; "Seemasorakai," T.—A strong quick-growing climber, with large oval leaves and a square stem, native of tropical America. Its large oblong greenish-yellow fruit is not unlike a short and thick vegetable-marrow, and contains in its hollow centre a mass of purple, sweet-acid pulp mixed with the flat seeds. In the unripe state the succulent portion of the fruit may be boiled and used as a vegetable. The root is usually swollen and fleshy, and is sometimes eaten like a yam. The flowers are generally fertilised by insects, but these should be aided by artificial fertilisation by hand, so as to ensure a larger crop of fruit. When the fruit is over, the shoots should be well cut back, retaining little but the stem. The plant is propagated by either seed or cuttings, and thrives up to about 3,000 feet in Ceylon. It should be trained over a trellis-work or fence, or allowed to climb a tree with low spreading branches.

Persea gratissima. (Lauraceae). Avocado Pear ; Alligator-pear ; Soldier's Butter ; "Et-pera," S., "Anakoya-pallam," T.—A small tree twenty-five to thirty-five feet high, native of tropical America. The fruit, which is suited for salad rather than dessert, becomes a pale green with a tinge of yellow when ripe ; in sub-tropical countries, however, it acquires a pinkish tint. It is of the form of a large pear, with a very thin tender skin, and contains in its hollow centre a large round fleshy seed. Between this and the rind is a thick layer of greenish-yellow pulp, of the consistency of firm butter, and somewhat resembling the walnut in flavour ; this pulp may be scooped out with a spoon and, being eaten with salt, pepper and vinegar, is much esteemed by many people, and considered wholesome. The fruit should be picked before it is quite ripe, and kept for a few days to become slightly soft. The tree is now commonly grown in the Eastern tropics, as well as in Florida, Queensland, Madeira, Natal, &c. The fruit is very popular in the United States, and is also imported into

London to a small extent, from the Canary Isles. It is very susceptible to injury, and therefore rather difficult of transport, the least bruise causing a black mark. The tree thrives best, in Ceylon, at medium elevations, where it bears fruit abundantly, chiefly from



AVOCADO PEAR. *Persea gratissima*.

July to August. Propagated by seed, which should be selected and sown as fresh as possible.

Phoenix dactylifera. (Palmae). Date Palm.—A sub-tropical, dioecious palm, attaining a height of sixty to eighty feet or more,

with stiff feathery leaves, extensively cultivated for its fruit (the Dates of commerce) in Northern Africa, North Western Asia, and the Mediterranean region. All parts of the palm are used for different domestic purposes, as in the case of the Coconut-palm in the torrid zone. Dates are a standard article of food with the inhabitants of the countries named, being also used as food for animals. The cultivation of Dates forms a large and important industry in the countries above named, the fruit being dried or preserved and largely exported. The chief requirements of the Date-palm are : great heat for a certain period of the year, a dry atmosphere, and a sandy soil. In the region where it is indigenous or cultivated, the temperature in summer may reach 100 Fah., whilst in winter it goes down to freezing point. An annual rainfall of five to ten inches is sufficient, but no rain should fall during the fruiting period, viz., June to October. The palm requires, however, a constant supply of water at the roots, and the water may be brackish, but not stagnant. The trees are planted about 25 feet apart each way, or 70 trees to the acre. Before planting, deep and sunken pits for the plants should be prepared : these are at first only partially filled, and rich light soil is the best for the purpose. The plants should be shaded and protected after planting, and the soil kept moist by watering until they have become established and put on fresh leaves. The best time for planting is at the commencement of the rainy season. The Date-palm has of late been largely planted in the Southern United States and Queensland. Its cultivation in Northern India is reported to be only partially successful, whilst in Ceylon and the Straits it has so far proved a failure. A Date-palm in the Royal Botanic Gardens, Peradeniya, has grown to a height of about seventy feet, being some sixty years old, but never flowered. Propagation may be effected by seeds or off-shoots. The latter is the method usually adopted, as seedlings cannot be relied upon for the quality of fruit produced, nor can the male be distinguished from the female plants until they have flowered. Only female trees are productive, and the flowers of these must be fertilised by those of the male tree. The trees bear off-shoots as a rule only between the ages of six and sixteen years. Off-shoots are not removed from their parents until three to five years old. When planting these out, one male off-shoot is planted to every hundred females, this proportion being considered sufficient to secure the fertilisation of the flowers of the female trees. The latter process is sometimes assisted by hanging the male inflorescence above the flowers of the female tree for a few days ; the dates are ripe and ready to gather

about four months after pollination of the flowers. The palms come into bearing in five to seven years, but are not in their prime until twenty years old. They continue productive until they reach the age of eighty to one hundred years, after which they are used only for their toddy, which is obtained by means of incisions made in the crown of the tree. The toddy being fermented and distilled, yields an intoxicating beverage or arrack. There is a large number of varieties of dates in cultivation, among the best being *Khadramee*, *Hallawee*, *Sayer*, *Zahdee*, and *Derec*.

Photinia (*Eriobotrya*) japonica (Rosaceae, Apple family). Loquat; Japanese-medlar.—A tree of medium size and symmetrical habit, with large handsome leaves, which are woolly-white underneath, native of China and Japan. It is cultivated in most warm countries, the small, oval, yellow fruit resembling a very small pear and having a sweetish acid flavour. There are different varieties of Loquat, but the merits of each depend largely on cultivation. The tree thrives from about 2,000 to 5,000 feet elevation. Plants are raised readily from seeds, but superior varieties should be propagated by budding and grafting. Light rich soil with good drainage is preferable.

Phyllanthus distichus. (Euphorbiaceae). Otaheite Gooseberry; Star-gooseberry; "Rata-nelli," or "Siri-nelli," S.—A shrub or small tree, with long graceful feathery leaves, native of India and Malaya, and often cultivated in low-country gardens in Ceylon. It bears a pale green acid, round and ribbed fruit, with a hard seed in the centre. The fruit is commonly used by the Natives for pickling; cooked with sugar it makes a delicious preserve, "hardly to be distinguished from gooseberries." A crop is produced twice a year, in April and August. Propagated by seed. Suited only to the moist low-country.

P.—Emblica. "Nelli," S.—(See under *Sub-tropical Fruits*).

Psidium Guyava. (Myrtaceae.) Guava; "Pera," S.; "Koiyapallam," T.—A shrub or small tree, ten to fifteen feet high, native originally of tropical America, but now thoroughly naturalised in Ceylon, India, Malaya, &c. In Ceylon a wild form of Guava frequently comes up as a weed in waste ground and in the poorest soil, bearing small round berries, chiefly from November to January; these are light yellow when ripe, and are sold in the boutiques or hawked about under the name of "Embul pera" (at about 3 to 5 cents per hundred), being used for stewing, and for making tarts and jelly. The best cultivated varieties have a large

juicy fruit, round or oval in shape, becoming a lemon-yellow when ripe. The tender skin encloses a reddish or yellowish pulp (which has a sharp tart flavour), towards the centre of which the numerous small seeds are embedded. The chief use of the fruit is for making the noted guava jelly. Propagation of the tree is easily effected by seed or suckers, but budding or grafting should be resorted to for the best varieties. The Guava thrives at all elevations up to 4,000 feet or higher, and flourishes in ordinarily good soil. The variety *Pear Guava* bears a large oval succulent fruit, of the form of a lemon, with a smooth yellow rind and pale-green scented pulp. *Kaffree* or *Kaffir Guava* is distinguished by a warted and furrowed fruit, not unlike a Citron in appearance. *Apple* or *Red-guava* (*P. pomiferum*) is similar to the *Pear Guava*, but differs in having a round fruit with reddish pulp.

P.—Guineense. Guinea Guava.—A shrub, eight to twelve feet high, native of Guinea. The fruit is described as “a fulvous berry, rather pleasant, red inside, about the size of a nutmeg, and of an exquisite taste.”

P.—Cattleyanum. (See under *Sub-tropical Fruits*.)

Prosopis dulcis. (Leguminosae). Algarobo Bean.—A moderate-sized deciduous thorny tree, with small bi-pinnate leaves, native of Central and South America. The sweetish succulent pods, which are similar to Carob Beans, are edible and much used for feeding cattle. Probably suited for the dry zone. Propagated by seed. The tree has not apparently been yet established in Ceylon.

P.—spicigera. A similar tree to the preceding species, native of Northern India, where its sweetish farinaceous pods form a valuable article of food in times of scarcity. They are eaten green or dry, raw or boiled, with salt and onions, &c., and are also used as fodder for cattle. Suited for the dry zone only; not yet established in Ceylon.

Punica granatum. (Lythraceae). Pomegranate; “Delun,” S. “Madalankai,” T.—A small ornamental tree, with large beautiful scarlet flowers, native of Northern Africa and South Europe. It is commonly met with in gardens throughout the East, thriving especially near the sea, but also to some extent up to about 4,000 feet elevation. The fruit is of the size of a large apple, with a tough rind, of a yellowish colour, tinged with red when ripe, and crowned with the persistent calyx lobes. The succulent juicy coating of the numerous seeds is of a sweet acid taste, but

sometimes very bitter and astringent. In the tropics the fruit is usually inferior to that grown in its native country, and in some cases seems to contain nothing but a quantity of closely packed seed with a little astringent juice. Superior varieties, however, occur in cultivation, some being described as "almost seedless, very sweet, deliciously perfumed, and as large as an infant's head." The best fruits I have seen in Ceylon were grown on the dry sea-coast of Puttalam. Propagation is best by budding or grafting, though plants are easily raised from seed.

Sandoricum indicum. (Sapindaceae). Santol.—A handsome lofty tree of Malaya, producing in June and July large clusters of yellow globular fruits, which resemble small oranges. Like the Rambutan, the soft white aril covering the seeds (five) is of a somewhat agreeable acid and refreshing taste; fermented and mixed with rice, an intoxicating drink is prepared from it in its native country. The tree thrives in hot and moist districts up to about 1,500 feet or more, and is worth growing for its ornamental effect. Propagated by seed.

Sarcocephalus esculentus. (Rubiaceae). Negro-peach; "Rata-bakmi," S.—A robust semi-climbing or spreading shrub, native of West Tropical Africa, and introduced at Peradeniya in 1883. Its soft brownish warty fruit, produced chiefly in July and October, is about the size of an apple; the soft reddish watery pulp is edible, but insipid, and hardly worth considering amongst edible fruits. Propagated by seed or cuttings; thrives up to 2,000 feet elevation.

Spondias dulcis. (Anacardiaceae). Otaheite-apple; "Am-barella," S.—A small tree with handsome foliage, native of the Society Islands, etc. The oval-shaped fruit is of the size of a large hen's egg, and of an amber colour when ripe; it has a large stone (seed) in the centre, which is covered with coarse fibre and a scanty, very acid pulp, "with a flavour like that of an exceedingly bad mango." Notwithstanding the high reputation given this fruit by some writers, it seems hardly worth a place in a fruit collection. Propagated by seed, and suited to the moist low-country.

Tamarindus indica. (Leguminosae). Tamarind; "Siyambala," S.; Pullium," T.—A large handsome upright tree, with fine feathery foliage, native of tropical Asia and Africa. It is commonly cultivated throughout the warmer parts of India, Ceylon, and Malaya, both for its shade and excellent timber, as well as for its fruit.

The latter consists of a brownish pod, 3 to 4 inches long, and containing a mass of sweetish acid brown pulp. This forms the "Tamarinds" of commerce, which is used in European as well as Native medicine. The pulp is pressed and preserved in large masses, being commonly sold in the kaddies or bazaars by weight. It is esteemed for flavouring various dishes, while Tamarind-wine and other cooling beverages are prepared from it. In the Northern part of Ceylon it is made into a brine for preserving fish. The principal season for the fruit is January to February. The tree thrives in moist as well as dry districts up to about 2,000 feet elevation, and in the dry northern part of Ceylon is commonly planted as a shade-tree for road-sides. Several varieties are recognised in India. The tree is readily propagated by seed.

Telfairea pedata. (Cucurbitaceae). Telfaria-nuts; "Mkweme."—A climber with a slender woody stem, reaching a height of 50 to 80 feet, native of Zanzibar and East Tropical Africa. The fruit attains a size of one to two feet or more in length, and eight or ten inches in thickness, containing a large number of flat nearly circular seeds, each about one and half inches across. These are eaten either fresh, or dried in the sun and roasted. They are said to be very palatable, and to contain about 36 % of oil with a value equal to that of olive oil. The seed germinates within a week.

Terminalia Catappa. (Combretaceae). Indian-almond; "Kotamba," S.; "Kottai," T.—A spreading tree, thirty to fifty feet high with large leathery leaves, native of Malaya. The fruit is of the size of a plum, compressed on two sides, and containing a kernel which is much relished and used for dessert in India. Firminger considered this to be "beyond comparison the most delicious nut of any kind the country* affords." The tree is deciduous twice a year, and bears two crops of fruit annually before dropping its leaves, *i.e.*, in June and November. It thrives up to about 2,000 feet in moist as well as rather dry districts. Propagated by seed.

Trapa bicornis. (Onagraceae). Water Chestnut; "Ikiliya, S.—An aquatic plant, common in the tanks of the dry region of Ceylon, also in Bengal, Malaya and Tropical Africa. Firminger stated:—"Much cultivated in many parts of India for its nuts." It does not seem however to be in any way cultivated in Ceylon, though the "nuts" are commonly collected and eaten by the Natives. The "nut" consists of the hard two-horned fruit, resembling a bull's head, and is of a dark brown or sometimes black colour. The interior is said to be agreeable when fried.

* India.

Triphasia aurantiola. (Rutaceae). Chinese Lime.—A small spiny shrub, native of South China, but said to be naturalised in India. It is cultivated in the West Indies, where it is said to be sometimes used for budding oranges and limes upon. The small red berry-like fruit, is when fully ripe considered agreeable by some persons. It is said to be esteemed in China, where it is preserved whole in syrup; in this state it is sometimes exported from Manila as “Lime berries.” Thrives at medium elevations. Probably not grown in Ceylon outside Peradeniya Gardens. Propagated from seed.

Vangueria edulis (Rubiaceae). Voa-vanga.—A small shrubby, deciduous tree, native of Madagascar, producing a large number of smooth, round, green fruit, of the size of a small apple. This when ripe becomes a greenish-yellow, the sweetish acid juicy pulp being of an agreeable taste, resembling that of the “Velvet Tamarind” (*Dialium*). The tree thrives and fruits at Peradeniya, where the coolies show a keen partiality for the fruit when approaching ripeness. The large, shining, light green leaves are said to be used in medicine in Madagascar. Suited to the moist low-country up to 2,000 feet. Propagated by seed or cuttings.

Vitis vinifera (Ampelidae). Grapes, or Grape-vine. The Grape-vine is extensively cultivated in Southern Europe (its native home), Australia, South Africa, and Southern United States; also in England and elsewhere in glass-houses (vineries), the finest dessert grapes being produced under the latter conditions. In the dry provinces of India, grapes of very fair quality are grown, both from exotic and indigenous sorts, while in the dry northern part of Ceylon certain varieties of grape have long been cultivated with some degree of success. Here the want of a winter rest, which is so essential to the plant, is partially supplied by baring the roots and exposing them to the sun. This operation is resorted to once a year, about the time of the principal pruning, in July. A practical experiment which was made a few years ago at Colombo, under the supervision of an expert viticulturist, proved conclusively the unsuitability of the uniformly steamy and hot climate here to the Grape vine. Exhaustive efforts have also been made by Mr. W. Nock at Hakgala Gardens in growing vines in a glass-house, which, however, ended in failure as regards the production of fruit. The essential conditions for the Grape vine are: a dry warm temperature when the fruit is setting and ripening, and a cold period for resting or “wintering.” A wet climate is unsuitable, but moisture at the roots is essential, and this is best supplied by irrigation, which may

be continued until the bunches are commencing to ripen, when it should cease. In vineyards, the vines are usually planted in rows and grown on the bush system, being pruned back each year to a height of about four feet. In glass-houses and in the tropics they are, however, best grown as climbers, being provided with supports by means of horizontal wires or trellises, pillars, etc. In Jaffna the vines are usually trained over a fence.

Propagation. The Grape-vine is readily propagated by cuttings, which should be inserted slanting in the soil, with only about two buds above the surface, and the earth well pressed upon them.

Pruning and Thinning. The usual pruning is carried out after the crop is over, all lateral shoots being pruned back once a year to within two or three buds of the main stem, and any unnecessary growth removed. In order to obtain fruit of the best quality, the berries should be thinned out by means of a pair of fine scissors, and the bunches also reduced in number.

Manuring. The plant requires liberal treatment. A mixture of loamy soil and decomposed cattle manure suits it well. In Jaffna, fish-manure is considered the best fertiliser, though the natives have also a strong belief in the value of salt as a manure for vines. As stimulants, artificial manures give excellent results.

Varieties. All the numerous varieties of the Grape-vine cultivated are considered to belong to *Vitis vinifera*. There are several species of *Vitis* indigenous to Ceylon, but none can be considered to produce edible fruit, except perhaps *V. indica*. The *Black Hambro*, with dark purplish fruits, and *Muscat* of *Alexandria*, with pale-green berries, are grown in the northern part of Ceylon. In addition to these the following varieties are said to give the best results in Jamaica, viz.: *Barbarossa*, *Muscat Hamburg*, and *Gross Colman*.

Yield. In Jaffna, two crops a year are obtained, the principal one in March, and the second in September. The fruit takes three to four months to ripen, from the time of flowering, the vines (which grow to a large size) each producing an annual crop of from 100 to 300 lb. or more, which is sold at prices varying from 30 to 50 cents per lb.

Zizyphus jujuba. (Rhamnaceae). Jujube; "Masan," S.; "Ilantai," T.—A small, very thorny, spreading tree, native of Ceylon, India, and Malaya. The fruit, which is borne in great profusion and is in season about October, is of the size of a large cherry, smooth and shiny, yellowish in colour, and with a kernel in the centre; it is rather acid in flavour, and in India is said to "afford a very nice dish when cooked with sugar." In Ceylon, however, the fruit is usually only eaten raw by children. The tree thrives up to about 3,000 feet, and is propagated from seed.

Z.—vulgaris.—A small thorny tree, native of Syria and Levant, said to be "commonly grown about Calcutta and in most parts of India." The round fruit has a thin, pale-green smooth rind; the

fleshy substance between the kernel and the rind is pleasant, crisp and refreshing, not unlike a juicy apple, but with no very marked flavour. Propagated by seed. Suited to low elevations only; not grown in Ceylon, except at Peradeniya.



CHAPTER XI.

SUB-TROPICAL OR TEMPERATE FRUITS.

SUITED TO HIGH OR INTERMEDIATE ELEVATIONS, WITH RAINFALL
FROM 60 TO 80 INCHES.

[S—SINHALESE; T—TAMIL].

Aberia caffra. (Bixaceæ). Kei Apple.—A small thorny tree or tall shrub, native of the Cape and Natal. The fruit is of the form of a small apple, and when ripe is made into a preserve; in an unripe state it is used as a pickle. The tree has been established at Hakgala Gardens, Ceylon, since about 1880, but has only been known to fruit once.

Anona Cherimolia. (Anonaceæ). Cherimoyer.—A small tree, native of the West Indies, introduced into Ceylon about 1880. The large green, round or heart-shaped fruit, is 3 to 5 inches in diameter, weighing from 2 to 4 lbs. and has a pitted rind; it somewhat resembles the Custard-apple, and is known in Covent Garden Market, London, under that name. The Cherimoyer has been described as one of the three finest fruits in the world, the other two rivals being the Mangosteen and Pineapple. Dr. Lindley, however, considered that "one good European Pear is worth all the Cherimoyers of Peru." The tree is now cultivated in many up-country gardens in Ceylon, especially in Udupussellawa, where it ripens fruit chiefly between October and December. In Madeira the tree is systematically cultivated, being propagated by grafting. It may also be raised from seed, but the best varieties have almost seedless fruits. Cherimoyers are regularly imported from the Canary Islands into London, where they are retailed at 1/- to 2/6 each. The white and somewhat granular pulp is similar to that of the Custard-apple, but much pleasanter to the taste than the latter. The tree is best suited to Hill districts with a rather dry climate, and is considered to thrive best on a hard stiff soil in which lime is present.

Carica candamarcensis. (Passifloraceæ). Mountain Papaw.—A small semi-herbaceous tree with a crown of large coarse palmate leaves, native of Colombia and Ecuador, similar to the

Papaw of the low-country, but with fruit only about $\frac{1}{4}$ or $\frac{1}{6}$ the size of that of the latter. It has been introduced at Hakgala Gardens, Ceylon, in 1880, and is now commonly grown in hill gardens for the sake of its fruit, being often found in a semi-naturalised state about up-country bungalows. The ovoid angular fruit is in season all the year round; though too acid to be used for dessert, it is very agreeable when stewed, and it can also be made into jam and preserves. When ripe the fruit has a pleasant apple-like odour. Propagated by seed.

Carya oliviformis. (Juglandaceæ). Pecan, or Pican-nut.—A handsome tree with a straight trunk, reaching a height of about 70 feet, native of Texas, &c. The nuts are considered to be the most delicious of the Walnut kind, and form an important article of commerce in the Southern United States. The export of these nuts from Texas is said to value about £12,000 annually. There are several varieties in cultivation. The tree has not as yet been established at Hakgala Gardens, nor apparently in India, with the exception possibly of "one or two varieties under trial at Saharanpur Botanic Gardens." It requires a rather dry and temperate or sub-tropical climate.

Castanea chinensis. (Cupiliferæ). Chinese Chestnut.—This tree, a native of China, yields a superior nut, but has not been found suited to the Hill districts of Ceylon, and is reported to have equally failed in India. The most likely conditions for it in Ceylon are found in the drier climate of Uva, at 3,000 to 4,000 feet elevation. Plants could be obtained through the Yokohama Nursery Coy., Yokohama.

C.—vesca. Spanish Chestnut.—A very handsome tree, lately introduced at Hakgala and certain other hill gardens in Ceylon. It is commonly grown on the hills of Northern India, where it produces in March and April its panicles of lavender coloured blossoms, the fruit following in May and June. I am not aware whether it has yet fruited in Ceylon.

Cerasus vulgaris. (Rosaceæ). Cherry.—The Cherry tree grows freely at Nuwara Eliya, and flowers abundantly in January and February, but so far as I am aware has never produced fruit in Ceylon. Cameron says (see Firminger's *Manual of Gardening in India*):—"Every attempt to cultivate it in the Plains of India has hitherto proved an utter failure. It is, however, grown to perfection on the hills with a little care." There are some species of Cherry indigenous to Northern India which yield fruits suitable for making tarts. Propagated by budding, cuttings, or layers.

Ceratonia siliqua. (Leguminosæ). Carob, or Carob Bean; Locust-bean; St. John's Bread.—A small shrubby tree, native of South Europe, and extensively cultivated in the Mediterranean region for its sweet, sugary, flat pods; the latter are about 6 inches long, nearly 1 inch wide, dark brown in colour and form a considerable article of export in the countries named; they are a valuable fattening and nutritious food for cattle, and are also eaten and relished by human beings. The tree is a slow-grower, but is of great longevity, being considered to remain productive for over a hundred years. When in its prime the tree produces several hundred-weights of pods in a season. Efforts have been made to establish this tree in Ceylon, but although specimens have for several years been growing at Anuradhapura, Hakgala Gardens, Albion Estate, &c., none have as yet borne fruit worth speaking of. The Carob Bean tree is frequently unisexual, so that seedling trees are often unproductive unless cross-fertilised; therefore propagation by budding or grafting should be resorted to.

Citrus Aurantium. (Rutaceæ). Orange.—(See under *Tropical Fruits*).

C. — Limonum. Lemon; "Naturan," S.; "Kidandar-attankai," T.—This small-sized tree, a native of Northern India, is extensively cultivated in Southern Europe and elsewhere for its fruit, which is usually oval in shape, and pale-yellow when ripe. The tree grows freely at medium and high elevations in Ceylon, but the fruit produced here is invariably coarse and pithy, with a thick warty rind, and can seldom compare with the lemons of temperate countries. The variety "Lisbon Lemon," imported as grafted plants from Australia, has for a time grown and fruited well in some up-country gardens; but, according to Mr. J. K. Nock, "after six to eight years it invariably dies from exhaustion." Lemon fruits are very largely used for flavouring in confectionery, &c. The rind yields a valuable essential oil and citric acid; for making candied lemon peel it is also largely used. Lemon and Oranges require similar conditions of climate and soil. (See Oranges under *Tropical Fruits*). Propagation of the Lemon should be by budding, but plants are easily raised from seed (pips), or by layering.

C. — medica. Citron; "Cidran," S.—A small tree, much cultivated in Southern Europe and Mediterranean region for its fruit. The latter grows to a large size, sometimes 10 to 12, but usually about 4 to 6, inches in diameter, and round or oval in shape. The thick rind is the part used, this being prepared in

brine, preserved in sugar, and largely employed in confectionery, preserves, marmalade, &c. The fruit varies in size and shape according to varieties. The "Fingered Citron" resembles a man's hand, with the fingers bent up with cramp. Citrons are not commonly cultivated in Ceylon, though good fruits may occasionally be met with in hill gardens. The leaves of Citron are distinguished from those of other species of Citrus by not having the petiole winged. Propagated by seed, budding, or layering.

Cyphomandra betacea. (Solanaceæ). Tree Tomato; "Gastakali," S.—An evergreen semi-woody shrub, native of Peru, and introduced into Ceylon, through Hakgala Gardens, in 1882. It has become thoroughly established in many hill gardens, and is commonly grown about Nuwara Eliya for market. The egg-shaped and smooth-skinned fruit, produced in great abundance and in hanging clusters at the ends of the branches, is in season almost throughout the year, but chiefly from March to May. At first greenish purple, it changes in ripening to reddish yellow. Some varieties are of a deep-purple colour. The sub-acid succulent fruits are refreshing and agreeable when eaten raw, but their chief use is for stewing; they may also be made into jam or a preserve. The tree is a quick grower, and commences to bear fruit when two or three years old, remaining productive for several years. Propagated from seed.

Diospyros Kaki. (Ebenaceæ). Persimmon; Date-plum.—A medium-sized, slow-growing tree, with large handsome, lanceolate leathery leaves, native of China and Japan. The attractive, shining smooth fruit is of a bright orange-yellow when ripe, sometimes pink or dark-purple. It is globular or pear-shaped, usually about 3 inches in diameter, though sometimes more. Each fruit usually contains two almond-like seeds in the centre, but some varieties are seedless. When perfectly ripe, or even in a blotted condition, it has an agreeable flavour, being compared to an Apricot with a suspicion of the Medlar, or to an over-ripe Apple. In a less ripened state it is, in its native country, made into a well-known preserve. Dried Kaki fruit is said to be equal to dried figs. The tree thrives on the Riviera, whence excellent fruits are imported into London, and sold in Covent Garden Market at fancy prices. It is also said to thrive and bear abundantly at Calcutta, Saharanpur, &c., but has not as yet become well-known in Ceylon. It was introduced at Hakgala Gardens in 1888, and occasionally produces fruit there. The Persimmon is usually diœcious, so that it is

necessary to have a male tree to ensure the fertilisation of the flowers of the pistillate tree.

Feijoa Sellowiana. (Myrtaceae). Feijoa-fruit—A small bushy tree of South America, recently introduced into cultivation. In Florida it is considered a valuable addition to the fruits of that country, the flavour being described as “delicious, and not unlike that of the strawberry.” The fruit is oblong in shape, $1\frac{1}{2}$ to 2 inches in length, highly perfumed, and is in season in November. The seeds, by which the tree may be propagated, are very small.

Ficus Carica. (Urticaceae). Fig.—A small spreading tree or large shrub, native of Turkey and the Mediterranean region, where it is extensively grown for its fruit. Fig trees grow moderately well and set fruit freely in Hill gardens in Ceylon, but owing to the S. W. Monsoon rains setting in when the trees are in bearing, the fruit seldom ripens well; in fine weather a few fruits occasionally ripen, but these are wanting in flavour. Firminger said: “In most parts of India Fig trees are to be met with thriving vigorously and bearing fruit abundantly,” but presumably this refers to the plains, for Cameron says he has “not seen the Fig tree under cultivation in the hills in India.” The Fig thrives in dry arid places, requiring no shade and but little moisture, the essential conditions being good drainage, a rich porous soil, and a dry hot season for ripening the fruit. Thus in the drier parts of Uva, in Ceylon, Fig trees have been found to ripen fairly good crops. The trees should be sheltered from strong winds, and usually thrive best in an enclosed yard, with their roots confined to a limited space. In Greece the average yield of Fig orchards is said to be about 1,600 lb. of fruit per acre. There are numerous varieties in cultivation, such as Golden-fig, Purple-fig, White Adriatic, Black Ischia, &c. The two last named have been found the most approaching to success at Nuwara Eliya, according to Mr. Cotton. The Fig is easily propagated by cuttings, which also travel well by post.

Fragaria vesca. (Rosaceæ). Strawberry.—A low herbaceous creeping perennial, producing “runners,” by which the plant is readily increased. A species of Wild Strawberry (*F. nilgerrensis*) is indigenous to the hills of S. India. Wild Strawberries are to be found occasionally in patches up-country, especially about Hakgala and Nuwara Eliya; Dr. Trimen considered these were escapes from cultivation. Improved cultivated varieties have been introduced into Ceylon from time to time, and in the dry season up-country these produce and ripen fruit of very fair quality, though somewhat lacking in flavour. The plants should be planted in rows about



TREE TOMATO. *Cyphomandra betacea*.



PASSION FRUIT. *Passiflora edulis*.

18 inches apart with 12 inches between the plants in the rows. The soil must be well-drained, rich and porous. Mr. Nock considers "Crescent Seedling" has so far afforded the best results at Hakgala Gardens.

Juglans regia. (Juglandaceæ). Walnut.—The Walnut tree is commonly cultivated on the hills of Northern India, where it produces abundant crops. It is not however a success on the plains, nor on the hills of Southern India. It has been tried at Nuwara Eliya and Hakgala Gardens, but has so far proved a failure.

Morus indica. (Urticaceæ). Indian Mulberry.—A small quick-growing tree, native of Northern India, where it is commonly cultivated. The fruit resembles a small pepper-corn, cylindrical in shape, rather deficient in flavour, and quite inferior to the European Mulberry. There are two sorts, the "white" and the "black," both being similar in taste. Firminger said: "the fruit, such as it is, ripens in February in Bengal, but it is fit for little but to be left to the birds." The Indian Mulberry is now commonly grown in Ceylon at low and medium elevations, especially at School gardens, where its cultivation has been encouraged for the purpose of affording food by means of its leaves to the mulberry silk-worm. Easily propagated by cuttings.

N.—nigra. European Mulberry.—This is a native of Persia, and has been introduced and established at Hakgala and some other up-country gardens. Mr. Nock informs me that it bears plentifully in the Haputale district (about 5,000 ft.), where the fruits are used for making tarts.

Olea Europea. (Oleaceæ). Olive.—A small tree, native of North-western Asia, and naturalised in the Mediterranean region. It is extensively cultivated in Northern Africa, Southern Europe, California, &c., both for its fruit, which is so largely used in preserves and pickles, and for the extraction of the valuable olive oil. Plants have been introduced into Ceylon, and grown for many years without producing fruit worth speaking of, though an odd fruit may be produced occasionally without being noticed. Mr. James Ryan, of Talawakelle, picked a fruit from an olive tree in his garden in 1908. Olives have not been found suited to the hills in South India, and even in the dry climate of Bangalore trees 30 years old have remained unproductive. Olive cultivation has of late been introduced into Australia and South Africa, with prospects of success. In California the crop is said to yield an average of 600 gallons of olive oil per acre, the maximum return being as high as 2,000 gallons per acre. The tree is susceptible to either a very hot

or very cold climate, and thrives best in light soil of a limestone formation. There are numerous varieties in cultivation, differing in the lateness or earliness of the crop, and in the shape and size of the fruit; the latter varies from round to ovate or oval, and from $\frac{1}{2}$ to 1 inch in diameter. Propagated from seed, cuttings, layers or suckers.

Passiflora edulis. (Passifloraceæ). Passion-fruit or Sweet-cup.—A perennial climber, native of Southern Brazil, introduced into Ceylon and commonly cultivated up-country for its fruit. It has escaped from cultivation, and may now be often met with in a wild state at elevations of 3,000 to 5,000 feet. It bears in great abundance a perfectly smooth oval fruit, of the size of a hen's egg, and purple when ripe. Two crops a year are produced, the principal season being from March to May. The fruit contains in its hollow centre a quantity of fragrant, sweet juicy pulp, inseparable from which are the small seeds; this when emptied out of the shell, and beaten up in a glass with a pinch of bicarbonate of soda and sugar, forms a delicious drink. The fruit is sold locally at about Rs. 1/- (1s 4d) per hundred. Trial consignments of the fruit have been exported from Australia and elsewhere to London, and fancy prices have been occasionally secured for them, but the shrivelled appearance which the fruit assumes on ripening is against it for market purposes. The Passion-fruit may be cultivated successfully from 2,000 ft. upwards, and may either be allowed to grow over a fence or trellis-work, or climb trees, &c. Rich humous soil and a moist shaded situation suit it best. Propagated by seed.

Persica vulgaris. Peach. (See under *Prunus*).

Phyllanthus Emblica. (Euphorbiaceæ). "Nelli," S.—A small tree or shrub, with graceful feathery foliage, native of Ceylon, India, Malaya, China, &c. It is commonly found wild in open patna land in Ceylon up to 4,000 ft., being also sometimes grown in gardens for ornament. The round green fruits, of the size of marbles, with a comparatively large kernel, are made into a much esteemed preserve. (See under *Useful Recipes*). The fruit is collected from plants in the wild state when in season, chiefly from November to February, and sold at from 3 to 6 cts. per hundred. Propagated from seed. Suited to intermediate elevations.

Physalis Peruviana. (Solanaceæ). Cape Gooseberry; Peruvian Cherry.—A small herbaceous perennial, native of Peru, naturalised at the Cape and to some extent in the Hill districts of Ceylon. The fruit is of the size and form of a small cherry, and is concealed in the dry, leafy, persistent calyx. When quite ripe it is of an agreeable and

refreshing flavour, and may be used for dessert or for making jam or preserves. In South Africa it is largely made into jam, which forms an article of export there. The plant is easily raised from seed, and will thrive in any ordinarily good soil, but is most productive on rich sandy soil. Sow in sheltered beds, and plant out seedlings about 18 inches from each other in rows 3 feet apart. Suited to intermediate rather than high elevations.

Pistacia vera. (Anacardiaceae). Pistachio-nut.—A small tree, reaching about 30 feet in height, considered to be a native of Syria. It is extensively cultivated in Northern India, Florida, &c. for its delicious nut, which is eaten as a dessert, or prepared and used in various ways. During the cold weather in India these nuts, being brought from Cabul, &c. by Afghan traders, are said to be obtainable in great abundance in the bazaars, so that “travelers often take them to be a product of the country.” In the Ceylon boutiques, however, the nuts appear to be an unknown commodity. The tree might thrive to some extent at moderate elevations in the drier parts of the Uva Province of Ceylon.

Prunus Armeniaca. (Rosaceae). Apricot.—The cultivation of this delicious fruit in Ceylon has nowhere been met with success; nor does it seem to have been attended with hardly any better results in India. In the latter country, however, the tree is said to grow with vigour on the hills, where it is sometimes propagated by budding or grafting, which is done in April or May.

P.—domestica. Plum.—A small deciduous tree, native country uncertain. In Ceylon, as in other parts of the Torrid Zone, the Plum has not so far proved quite amenable to cultivation. Certain varieties have been found to produce fairly heavy crops about Nuwara Eliya, but the fruit seldom ripens, as the monsoon rains usually commence when it is approaching maturity. In India, however, on the hills and in the Northern Provinces, Plums are said to be grown with a greater measure of success, the methods of cultivation there being much the same as those adopted for the Peach. The fruits, however, are “hardly palatable, except when cooked or preserved,” but for the latter purpose they are said to be excellent. Cameron says: “Of many kinds tried at Bangalore, “Kirk’s Blue,” “Greengage,” and “Golden Drop” are the best.” At Nuwara Eliya, Mr. Cotton found “Red-heart” (a cooking variety), “Alucha,” and “Greengage” to give the best results, while Mr. Kellow considers the Hedge-plum about the most satisfactory.

P.—Bokharensis. Bokhara Plum.—A species of Plum tree indigenous to Northern India. According to Firminger, “quantities

of the fruit in a dried state are annually brought down from Cabul. The tree thrives vigorously in the Upper Provinces, and is very common in Gardens in the Punjab, where it bears abundantly." Cameron adds that it is also successfully cultivated on the hills in India, the fruit being made into a good preserve, or stewed.

P.—*Persica* (= *Persica vulgaris*). Peach.—A small slender tree, supposed to be a native of China. At its best the Peach in the tropics is very different to the luscious melting quality of the fruit grown in Europe. Acclimatised varieties are, however, grown with appreciable success in certain localities at elevations of 4,000 to 5,000 feet. In a rather dry climate, as in the district of Wilson Bungalow in Ceylon, moderately good fruits (at any rate for stewing and making jam) are obtained. Here peaches are regularly grown for market, the fruit being retailed at about Rs. 1 per hundred. No systematic cultivation, however, is followed, the trees being propagated by cuttings, with but little regard for selection, manuring, &c. Peaches will not thrive at low elevations in Ceylon. At Bangalore, in South India, Mr. Cameron mentions an excellent variety called "Indore." The same authority also states: "It is a great point in the cultivation of the Peach tree to keep the roots as little below the surface of the soil as possible. This is sometimes effected by placing tiles underneath where the trees are planted." The tree may be propagated by sowing the stones (kernels) of the fruit, but preferably by cuttings, budding, or grafting. Seedling plants take three or four years to come into bearing. A good plan is to sow the seed, and bud or graft the best sorts on the seedlings when about a year old.

Psidium Cattleianum. (Myrtaceae). China-guava; Purple-guava; Calcutta-guava.—A small shrubby ornamental tree, 20 to 25 feet high, with smooth grey bark, and small leathery, shining, obovate leaves, native of Tropical America. The date of its introduction into Ceylon is not recorded, but that of its first discovery is given as 1818. It has been grown at Peradeniya and Hakgala Gardens for upwards of thirty or forty years, and is now sometimes met with in up-country gardens. Cameron does not mention it for South India, which is remarkable considering the excellent qualities of this as a fruit-tree. The fruit is undoubtedly the most palatable of all Guavas, and deserves to be more widely known. It is of the size of a large Greengage, deep claret-coloured when ripe, with soft juicy, purplish red pulp, which has an agreeable flavour and has some resemblance to that of a strawberry. It is excellent for making tarts, jam and jelly, and may also be eaten as

dessert. The tree thrives and bears fruit freely at elevations of 2,000 to 4,500 feet, producing two crops a year. With good cultivation the size and quality of the fruit is considerably improved. Usually propagated by seed, but the best trees should be increased by layering or budding.

Pyrus communis. (Rosaceae). Pear.—Certain varieties of Pear grow and bear well in many parts of the tropics, at moderate elevations and on the hills, but the fruit produced is usually very hard and unfit to be eaten uncooked. In some hill gardens in Ceylon, a variety of cooking Pear has become well established, thriving with but scanty attention, and producing fairly heavy crops of large, coarse fruits, which can only be eaten when stewed. Cameron states that “in Simla and other hill stations in India, the Pear can be brought to great perfection under cultivation,” and advises pruning the trees in February, just before they burst into leaf. In Ceylon, the trees are practically ever-green. Easily propagated by cuttings, layering or grafting.

P.—Malus. Apple.—The cultivation of the Apple in Ceylon, even at the highest elevations, has not so far met with success. On the hills in India, however, according to Cameron, “apples can be cultivated to perfection.” At Bangalore a number of varieties are generally grown, including such as *Ribston Pippin*, *Worcester Permain*, *Peasgood's Nonsuch*, *Kentish Fillbasket*, *Cox's Orange Pippin*, &c. Of the varieties tried at Hakgala Gardens and Nuwara Eliya, *Kentish Fillbasket* was found the most approaching to success. The climate, however, seems entirely unsuited to the tree. In India, apple trees are propagated by cuttings, layering or grafting, and a rich sandy soil is considered to suit them best. They flower in February and March, and the fruit ripens in April and May. In January the roots are laid bare, and after an interval of a fortnight, are again covered up with a mixture of cow-manure and soil. Copious watering is given when the fruit is swelling.

Rhodomyrtus tomentosus. (Myrtaceae). Hill-gooseberry; Hill-guava.—A handsome shrub with small thick oval leaves, indigenous to the mountain region of Ceylon, South India, and Malaya. It produces a profusion of pale pink flowers, followed by small round berries of pale yellow colour; from these a jelly is made, which in flavour somewhat resembles apple-jelly. Propagated from seed. Not suited to low elevations, but an acclimatised variety thrives at Peradeniya (1,500 ft.), where as an ornamental shrub it is much admired; this does not, however, bear fruit here.

Ribes Grossularia. (Saxifrageae). Gooseberry.—Plants of this have been imported both from England and Australia, and planted under the most favourable conditions in the Experiment Garden at Nuwara Eliya, as well as at Hakgala Gardens. They grew for a time, but failed in each case to become properly established. The climate in India has apparently been found equally unsuitable for the plant.

R.—nigrum. Black Currant.—The same remarks as above, under Gooseberry, may be applied.

Rubus lasiocarpa. (Rosaceae). Ceylon-, or Wild Raspberry.—A large, straggling bramble, remarkable for the white down with which the stems are entirely covered, indigenous to the hills of Ceylon, India and Java. The fruit much resembles the English Blackberry, and is, when well-grown, equal to it in flavour; its hoary woolly appearance is, however, against it. In India the fruit is frequently collected and made into delicious tarts, being in great demand at Simla and other hill stations for making jam. In cultivation the plant responds well to similar treatment as that usually given to the Raspberry and Bramble. A good rich soil should be afforded, and the old and barren shoots cut out. Propagated by suckers dug out during the rains.

R.—rosaefolius. Mauritius Raspberry.—A shrub, considered to have been introduced from Mauritius, and said to be commonly grown in gardens about Calcutta. The fruit, produced in February, is similar in appearance to the English Raspberry, but filled with hard seeds, and, according to Firminger, having no better flavour than a bad Blackberry. Sir Joseph Hooker gives this as an indigenous species in India.

R.—Idaeus. English Raspberry.—This has been tried at Hakgala and Nuwara Eliya Experiment Gardens, and found quite unsuited to the climate. The same remarks as under Gooseberry may be applied.

R.—trivialis. American Dewberry.—I am not aware that this has been tried in Ceylon; it has been reported to grow vigorously and bear fruit well at Saharanpur in India.

Secchium edule. Cho-cho.—See under *Sub-tropical Vegetables*.

Vitis vinifera. Grape Vine. See *Tropical Fruits*.

CHAPTER XII.

TROPICAL VEGETABLES AND FOOD PRODUCTS.

SUITABLE FOR THE LOW-COUNTRY, FROM SEA-LEVEL TO ABOUT 3,000 FT. WITH ANNUAL RAINFALL NOT LESS THAN 35 INCHES.

[S=SINHALESE; T=TAMIL].

Vegetables of one kind or another can, with some trouble, be grown in all parts of the tropics where any other cultivation is possible. While certain European vegetables, as Beet-root, Celery Parsnips, Cabbages, Globe-artichokes, &c., thrive to perfection in the cool moist climate at the higher elevations, many of these may also be grown at lower altitudes, or even at sea-level, with some degree of success, if sown at suitable seasons. Tropical vegetables are, of course, chiefly suited to low or intermediate elevations, and many of these are of excellent quality and well worth cultivating.

A deep alluvial soil, such as is found near river banks, is the best for vegetables generally. Where this does not exist, a condition approaching it may usually be obtained by the application of sand, humus and organic manure. Frequent stirring of the soil, weeding, watering when necessary, and earthing up of crops are essential to the successful cultivation of vegetables. In the low-country, light shade, especially for European vegetables, is usually beneficial if not indispensable.

Owing to the multiplicity of vernacular names, and in order to facilitate reference, the chapter devoted to *Tropical or Low-country Vegetables* is divided into four sections, thus :

- (1) Leguminosæ (Beans, Grams, and Pulses).
- (2) Cucurbitaceæ (Gourds, Pumpkins, Squashes, and Melons).
- (3) Root or tuberous Vegetables and Food crops.
- (4) Miscellaneous Vegetables and Food crops.

SECTION 1 :—LEGUMINOSÆ

INCLUDING BEANS, GRAMS AND PULSES.

Cajanus indicus. Pigeon Pea ; Congo Bean ; Dhol or Dhal ; “Rata-tora,” S. ; “Thovaroy” or “Paripu,” T.—A shrub 5 to 6 ft. high, characterised by thin straight branches and small trifoliate leaves, native of India. It is commonly cultivated in most tropical countries, but more especially in India, where the dark grey seeds, of the size of small peas, are almost a universal article of food. The dried split peas are largely imported into Ceylon, and much used in curries, vegetable soups, &c., being everywhere sold in the bazaars as “Paripu.” The plant resists drought well, and is recommended as a restorative crop in rotations. In India it is either grown mixed with other crops, or planted alone in rows 4 to 6 feet apart. $1\frac{1}{2}$ to 2 lb. of seed is required to plant an acre, and the crop is ready for harvesting in six months from the time of sowing. Grown alone, the yield may be as high as 2,000 lb. per acre, 500 lb. per acre being an ordinary return. Not commonly cultivated in Ceylon.

Canavalia gladiata. Sword Bean ; “Awara,” S. ; “Awara-kai,” T.—A robust woody, perennial, climbing bean, bearing large, flat, sword-shaped pods, fully 9 inches long and about $1\frac{1}{4}$ inches wide. These when young and tender are sliced and boiled as a vegetable, being also used in pickles. According to Firminger, “it is considered by some Europeans the nicest of native vegetables in India.” The plant requires strong durable supports, such as a fence or low spreading tree. Propagated by seeds.

Cicer arietinum. Chick Pea ; Bengal-gram ; “Konda-kadala,” S.—An annual about one foot high, much cultivated in India as a food crop. The small pea-like angular seeds are largely imported into Ceylon, and sold in the bazaars, being used either fried, or boiled in curries, and are considered very nutritious. Roasted and ground, they are sometimes used as a substitute for coffee. Sow in drills about 2 feet apart.

Cyamopsis psoralioides. Guar, or Cluster Bean ; “Kotaranga,” S. or T.—A small bushy plant, recently introduced from India into Ceylon, and now becoming commonly cultivated in the low-country, chiefly through the medium of the School gardens. The small straight hairy pods (about 3 inches long, and produced in clusters), are very popular as a vegetable in curries and other preparations, both the tender pods and ripe seed being used. The plant is cultivated in India for fodder and for green-manuring, and

occurs in several varieties, these being distinguished by white, black, and grey seeds.

Dolichos bracteata. "El-dhambala," S.—A climbing bean, bearing purplish flowers and narrow, well-filled pods, about 3 inches long. The tender pods are boiled and eaten.

Dolichos Lablab, var. "Ho-dhambala," S.—A strong-growing climbing bean with purple flowers and flat broad pods; the latter are 3 to 4 inches long, and when tender are boiled and eaten; the mature seeds are not considered edible. The plant is often seen cultivated at cooly lines in the low-country in Ceylon. There are several varieties of this bean, the following being given by Dr. Roxburgh for India :—

- a. "albiflorum : " Flowers white, rather small ; seeds not eaten.
- b. "rubiflorum : " Flowers red.
- c. "purpurescens : " Flowers large, purplish.
- d. "purpureum : " Stems and the large flowers purple ; pods deep purple.

"Sudu-dhambala" of Ceylon, with white flowers and short, broad, two-to three-seeded pods, is probably the same as var. *a*. This is grown chiefly about cooly lines and Natives' houses, and the seeds as well as the pods are eaten.

Lens esculenta (=Ervum lens).—Lentil ; " Misurupur," T.—This valuable pulse has been cultivated and used as food from time immemorial, and Lentils are to this day an important article of food to the inhabitants of Egypt, Palestine and the Mediterranean region. As a winter crop, the plant is grown all over India, especially in the Central Provinces and Madras. The land having been ploughed, the seed is sown broadcast, one maund (about 80 lb.) of seed on an average being sown per acre. If sown in drills, half that quantity will suffice. The seed is eaten as "dhal," and considered the most nutritious of pulses. The dry leaves and fodder are esteemed as a food for cattle, and the plants are a valuable green-manure. Lentils thrive on clay soils, but with irrigation may also be grown on sandy soils.

Mucuna nivea. "Wanduru-mé," S.—A strong-growing perennial climbing bean, with stout pods about 3 inches long, and black oval seeds. It is suited to low and medium elevations, but is seldom cultivated in Ceylon. Here the seeds only appear to be eaten, but in India the fleshy tender pods, after the removal of the outer skin, are also eaten ; these when dressed are, according to the late Dr. Roxburgh, "a most excellent vegetable for the table, the full grown beans being scarcely inferior to the large garden-beans of Europe." Sow seeds thinly any time after the commencement of the rains. The plants require strong supports to climb upon.

"**Velvet Bean**" is a name given to a variety of *Mucuna Nivea*, distinguished from the above by having smaller and more numerous black velvety pods, containing round mottled seeds. This came recently into popularity in the Southern United States as a forage and green-manure plant, the seeds also being eaten to some extent. Suited to low and medium elevations.

Glycine hispida. Soya Bean.—A small erect annual, about 15 inches high, native of China and Japan, where it has been cultivated for food from time immemorial. The short hairy pods contain 2 to 3 seeds each; the latter are cooked in various ways, being either boiled, roasted, or ground into flour. In India they are sometimes eaten in the form of "dhal." The famous Soya-sauce, said to be the basis of many popular sauces made in Europe, is made from these seeds. A useful domestic oil is also obtained from them, and the residual cake resulting from the expression of the oil forms a nutritious cattle-food. According to Sir George Watt, "Soya Bean is extensively cultivated in Eastern Bengal, Khasia Hills, Burma, &c." Yet I can find no mention of it in either Firminger's or Woodrow's works on gardening in India. Cultivation is very simple. A loose rich soil is preferable. Seeds may be sown in rows about 15 inches apart, about a bushel of seed being thus required to sow an acre. The seeds should germinate in 4 to 5 days, and the crop may be ready for picking in about six weeks from the time of sowing. The yield of seed varies, according to soil, &c., from 15 to 30 bushels per acre, while the amount of green fodder produced per acre may be about 10 tons. The plant has been successfully grown at Peradeniya, and should be suited to elevations up to about 3,000 feet. It is a valuable soil renovator, and would seem to be adapted for green-manuring on loose sandy soils.

Pachyrhizus tuberosus. Yam Bean.—A strong-growing climbing bean, native of the West Indies, producing a large edible tuberous root, introduced at Peradeniya in 1887. The tuber is cooked and eaten as a yam, and a good flour may be made from it. The pods also, which are about 8 inches long, are edible when in a tender state. The plant is said to be commonly cultivated in its native country, but is as yet scarcely known in Ceylon. Cultivation same as for yams. Sow seeds thinly in rows 3 to 4 feet apart, and support the vines with stout sticks, otherwise plant against trees or a fence. There are two varieties of this plant, one bearing blue flowers, the other white. The former is considered the better variety to cultivate.

Phaseolus lunatus. Lima Bean; Tonga Bean; "Pothu-dhambala," S.—The Lima-bean is held in high estimation in America, its original home, but is not much appreciated in Ceylon, nor apparently in India. It is best suited to high elevations, and is sometimes seen in up-country native gardens in Ceylon. The pods are short, flattish, broad and rather coarse; these are not edible, but the large flat seeds are boiled and eaten. They are considered to be "exceedingly agreeable, having a mealy roast-chestnut-like flavour." The plants are of a robust habit, and are distinguished by racemes of small white flowers and rather dense foliage. There are several varieties, some with white and others with pink flowers; the seeds also vary in colour from white to cream, pink, and purple. Sow in rows 3 to 4 ft. apart, with about 6 inches between the seeds in the rows. Place sticks along both sides of the row for supporting the vines.

Phaseolus vulgaris, var. Climbing, or Runner Beans; "Bonchi," S. "Bonchi-kai," T.—This slender climbing bean is perhaps the most useful of all beans for the low-country and medium elevations. Though less prolific than the dwarf erect kinds, it remains longer productive than the latter, which is of importance when grown only for one's own table. With a few successional sowings it can be had in fruit almost throughout the year. The young tender pods are the parts used, these being usually cut up into thin strips, boiled, and served in different ways. Sow the seeds thinly in rows, in well tilled and manured soil. The seedlings will be up in from four to six days, and when a few inches high they should have the earth drawn up to them. Stakes should then be fixed in the ground along both sides of the rows for support to the vines. Both this and the following bean are among the best vegetables found in the tropics, and may be grown in a variety of climates.

Phaseolus vulgaris, var. Dwarf, French or Kidney Bean.—See under *Temperate or Sub-tropical Vegetables*.

Psopocarpus tetragonolobus. Winged Bean; Goa Bean; Manila Bean; "Dara-dhambala," S.—A strong-growing climbing bean, native of Malaya, with large pale blue flowers, and bearing peculiar four-cornered pods. The latter are 6 to 8 inches long, and have a leafy fringe running along the length of each of their four corners. They are cooked when green, and usually much relished. In Burma the plant is largely cultivated for its fleshy tuberous roots, of which the yield is said to be from $1\frac{1}{4}$ to 2 tons per acre. When grown for the roots, seeds are not allowed to ripen.

Propagated by seeds, which may be sown in drills or where the plants are to remain. There are several varieties in cultivation, these being distinguished by length of pods, breadth of wings, and colour of seeds.

Vigna sinensis. Cow Pea ; Yard-long Bean ; "Mé-karal," "Diya-mekaral," or "Polon-mé," S.—An annual climbing bean, bearing long narrow, pliant cord-like pods, which reach from $1\frac{1}{2}$ to about 3 feet in length. These are used like French Beans, and the ripe seeds also are eaten. The plant is suited to low and medium elevations, and thrive in rather poor as well as rich soil. In Australia it is said to bear plentifully in seasons of drought. *Vigna Catiang*, *V. unguiculata*, and *V. sesquipedalis* are considered to be only varieties of *V. sinensis*.

SECTION 2 :—CUCURBITACEÆ

GOURDS, PUMPKINS, SQUASHES AND MELONS.

These comprise a group of climbing plants which yield excellent vegetables and sometimes dessert fruits. The plants are characterised by having *unisexual* flowers (the sexes in separate flowers), being in some cases *diœceous* (the sexes on separate plants). They are of rapid growth, and therefore require rich soil and abundant water at the root. As a rule, they yield larger and better fruits in a rather dry climate, under irrigation. Propagation is usually by seed, but in some cases it may be effected also by cuttings.

Benincasa cerifera. Ash Pumpkin, or White Gourd; "Alupuhul," S.; "Puchini," or "Pusanikai," T.—A large handsome oval-shaped gourd, grown throughout the Eastern tropics, China, Japan, &c. The fruit is covered with a whitish waxy bloom, (hence its popular names), and is used as a vegetable in curries, &c., also candied as a sweetmeat. The plant is an annual, with large angular leaves, and may often be seen growing over the roofs of Natives' houses. In India the fruit is said not to be so liable to be stolen as those of other gourds, owing to certain religious superstitions connected with it. Seed may be sown in the rainy season, and the vegetable may be fit for use about three months later. The plant will thrive in sheltered valleys up to about 3,000 or 4,000 feet.

Citrullus vulgares. Water-melon; "Komadu," S. (See under *Tropical Fruits*.)

Cucumis Melo. Melon; "Rata-komadu," or "Kekiri," S. (See under *Tropical Fruits*.)

Cucumis sativus, var. Native Cucumber; "Pipingha," S.; "Pipingkai," T.—A thick cylindrical, smooth fruit, 12 to 16 inches long, and about 3 to 5 inches in transverse diameter, usually with a brownish yellow thin skin when full grown. The flowers are yellow, about 2 inches across. The fruit is either cooked and used as a vegetable, or peeled and sliced in salads, being an excellent substitute for English Cucumbers, of which it is considered to be but a form. It is cultivated chiefly in the semi-dry districts for supplying the local markets and boutiques. Sow seed in ridges or mounds of rich soil. The vines may either be allowed to trail over the ground, or supported on trellis-work.

Cucumis sativus, var. "Tee-ambara," S.—A variety similar to Pipingha, but with smaller fruits, these varying in length from 6 to 8 inches, with a transverse diameter of about 2 inches. Flowers yellow, about 1 inch across. The fruit of this variety being of a tougher texture than the preceding one, it is only used in curries, not in salads.

Cucurbita maxima. ^{Squash} Pumpkin; "Wataka," or "Rata-labu," S.—A large globular, bluntly-ribbed, brownish gourd, very commonly cultivated by the Natives in the low-country of Ceylon, especially in the rather dry districts of Kurunegala, Dumbara, &c. It is everywhere sold in the markets and boutiques, either whole or in sections, and though rather insipid is one of the best of "native" vegetables. During the detention of the Boer prisoners of war in Ceylon a great demand for pumpkins sprang up, and the cultivation of the vegetable proved very profitable for a time. Seeds may be sown at any time during the rains. The plant is an annual, and may be allowed to run over the ground without supports. The fruits sometimes grow to an enormous size, instances being recorded of specimens having attained a weight of 300 to 400 lb. The hardened shells are sometimes made into vessels and ornaments. There are several varieties, which vary more or less in form and colour of the fruit.

Cucurbita Melo-pepo. Squash.—The name Squash is given in America to numerous varieties of gourd which bear variously-shaped fruits, the latter ranging from oval to almost flat or shell-like. Squashes are extensively grown in sub-tropical America, where they are much relished, but are not suited to a wet tropical climate. At Peradeniya the plants have been found to grow well, but the fruits, such as did set, usually damped off early. In a drier climate, however, they might succeed better. It is advisable to sow seeds in pots or pans, and transplant the seedlings, when

large enough to handle, to mounds of well-prepared earth. The plants may be left to trail over the ground like Vegetable Marrow, but during wet weather a piece of flat stone or tile should be placed under each fruit to prevent it from rotting. Squashes are boiled green like Vegetable Marrow, or mashed like Turnip, and served with milk, pepper and salt. When ripe they are made into pies. In France they are sometimes gathered when of the size of an egg, boiled in salt and water, laid upon toast, and eaten as Asparagus.

Cucurbita moschata. "Polong-wataka," S.—An oval or round gourd, with netted markings of pale green. Cultivation, &c., the same as for Pumpkins.

Cucurbita Pepo. Vegetable Marrow (See under *Sub-tropical Vegetables*).

Lagenaria vulgaris. Bottle Gourd; "Diya-labu," S.; "Sorakai," T.—One of the most popular of native vegetables, largely cultivated in the semi-dry districts of Kurunegala, Dumbara, &c., whence the local markets are chiefly supplied. The fruit is from 16 to 24 inches long, variously shaped, some forms resembling a decanter or water bottle. The unripe fruits, when boiled, are a palatable but insipid vegetable. When ripe and seasoned, the fruit-shell becomes very hard and durable, and in this state is commonly made into a vessel and used for carrying water, or for collecting palm toddy, &c. The plant is an annual, with white flowers (about 2½ inches across), and may be grown on the ground or supported on trellises, &c.

Luffa acutangula. "Veta-kolu," or "Dara veta-kolu," S. "Pekkankai," or "Peypichukku," T.—A climbing gourd, bearing fruit 10 to 12 inches long, with several longitudinal angular ridges. Dr. Roxburgh said of this vegetable-fruit: "Peeled, boiled, and dressed with butter, pepper and salt, it is little inferior to green peas." Too much reliance must not, however, be placed upon this statement. The plant is an annual, and is grown somewhat largely in Cotta and Dumbara for supplying the markets of Colombo and Kandy respectively, the fruit being much used by the Natives, both in curries and as a vegetable. The plant is easily raised from seed, and does best on supports.

Luffa aegyptiaca. Loofah; "Niyana veta-kolu," S.; "Pikku," or "Pichukku," T.—A large annual herbaceous climber with angular stems, indigenous to the low-country and commonly grown in native gardens. The fruit, which is cylindrical and from 8 to 12 inches long, is used when tender as a vegetable. Propagated by seed or cuttings.

Momordica Charantia. Carilla Fruit; "Karawila," S.; "Pakal," or "Pavakai," T.—A rather slender vine, bearing an oval warty fruit, 6 to 8 inches long. The latter in a tender state is much relished by the Natives as a curry vegetable; it is also frequently pickled, being one of the most common ingredients of Indian pickles. There is a variety with white fruits, which render the plant very ornamental. Propagated by seed, sown at the commencement of the rains. The plant may be allowed to trail on the ground, but during the wet season is best on supports.

Momordica dioica. "Tamba-karawila," S.; "Tumpai," or "Palupakkal," T.—A small oblong, green, warty-looking gourd, about 2 to 3 inches long, commonly used and much esteemed by the Natives as a curry vegetable, and is often sold in the boutiques or bazaars. The tender shoots and leaves are also edible. The plant is indigenous to Ceylon, being common in the dry districts. It is not suited to elevations much above 2,000 feet. Propagated by cuttings or seeds during the rains.

Sicania odorifera. Melocoton, or Casabanana.—A Mexican gourd, bearing stout cucumber-like fruits, from 10 to 15 inches long and 3 inches in diameter. In the green and unripe state these afford an excellent vegetable, and in a ripe state are suitable for preserves. When approaching maturity the fruit assumes a brownish or reddish tint, and possess a pleasant fragrance. The plant is a rapid grower, and attains a height of about 50 feet. It thrives best and is most productive when grown in rich soil, fully exposed to the sun and allowed to ramble over an arbour or trellis. It is suited to a rather dry climate, though it has flourished and fruited in Peradeniya Gardens, where it has been recently introduced.

Trichosanthes anguina. Snake-gourd; Club-gourd; "Patola," S.; "Podivilangu," or "Podalangai," T.—A quick-growing climbing gourd, bearing long cylindrical, green (sometimes greenish-white) fruits, which not infrequently reach the length of five to six feet. In an unripe state, these pod-like fruits are sliced and cooked in the manner of French beans, being also largely used as a curry vegetable in the low-country. Seeds are sown in the monsoons, either in rows in the open or against low branching trees or shrubs. It is customary to suspend a small stone to the end of each fruit whilst growing, so as to weight it down and induce it to grow straighter and perhaps longer than it would do otherwise.

Vegetable Marrow. See under *Temperate and Sub-tropical Vegetables*.

SECTION 3: ROOT OR TUBEROUS VEGETABLES
AND FOOD CROPS.

Calathea allouya. (Scitaminae). "Topee Tamboo," or "Tokee Tambo;" Lleren (S. American names).—A perennial, $1\frac{1}{2}$ to 2 feet high, with large oval Canna-like leaves, native of tropical South America. The plant has been grown at Peradeniya since 1893, when it was introduced. It produces regularly a quantity of tubers which resemble small potatoes, but as yet gives no promise of becoming here the popular vegetable it is said to be in its native country and the West Indies, where it is said to have been cultivated for a long period, though not extensively. The tubers though edible are of a somewhat gritty nature, and seem to require endless boiling to render them tender. To a novice they seem to have no flavour, but people who have acquired a taste for them pronounce them delicious. In the report of the Porto Rico Experiment Station for 1903, it is stated that this peculiar plant is highly prized by the Natives of the interior, and is even "sold in the streets of some of the large towns, the crisp nut-like tubers ranking with ground-nuts in popularity." A loose rich soil suits the plants best. They may be planted at intervals of about 2 feet in rows 4 feet apart, and cultivated like any other vegetable. Propagation is effected by division of the plants or crowns; the tubers will not usually grow. A crop may be harvested in about ten months from the time of planting.

Colocasia.—See *Xanthosoma*.

Canna edulis. (Scitaminae). Queensland Arrowroot; Indian-shot; "Tous-les-mois;" "But-sarana," S.; "Valay-sembu," T.—This well-known plant is considered to have been originally introduced from the West Indies. It is commonly grown in native gardens, more especially about Tamil cooly lines, and the starchy tuberous roots are either cooked and eaten as a vegetable, or made into flour. The plant is more or less cultivated extensively in Queensland, where it furnishes the "Queensland arrowroot" of commerce. Though not generally so productive as the West-Indian arrowroot, it is said to be superior to the latter, and more suitable for invalids and infants. The starch is also largely used for laundry purposes. The market price for this product has recently somewhat advanced, that in London being about 2s. 9d. per lb. or usually 3d. per lb. more than the price realised for Bermuda Arrowroot. The yield is said to vary from 15 to 20 cwt. of the prepared article per acre. According to the Porto Rico Experiment

Station Report for 1903, *Canna edulis* will yield a crop of 15 tons of fresh tubers per acre under favourable conditions. In Queensland the rhizomes are planted out in rows 6 feet apart, with a distance of 4 feet between the plants in the row. The crop takes from six to eight months to come to maturity.

Dioscorea. (Dioscoraceae). Yams; "Vel-ala," S.; "Kodikilengu," T.—Different species and varieties of the genus *Dioscorea* constitute the true Yams, which are climbing plants with large, edible, underground tubers. In Ceylon, however, almost any tuberous plant is called a "yam," as *Alocasia* ("Habarala"), *Manihot* ("Manyokka"), &c. The *Dioscorea* yams are largely cultivated in the West Indies and Tropical South America, where they form a standard article of diet with all classes, the best varieties being even preferred to good potatoes. In Ceylon and the Eastern Tropics, however, they have not as yet gained such popularity, either with the Natives or Europeans, and though often met with in native gardens as well as in markets and boutiques, they are not a common commodity. Yams are easily cultivated, and thrive best in loose deep soil, up to an elevation of 2,500 to 3,000 ft. They may be planted against fences, trees, &c., or serve as screens for covering unsightly objects. The best season for planting is February and March. The ground being dug to a depth of $1\frac{1}{2}$ to 2 feet and raised in drills or mounds 3 feet apart, pieces of the crown or "yam-head" are planted in these at distances of 2 feet apart. Poles or stout bamboo tops are fixed in the ground along the rows for support to the vines. The crop is ready for harvesting in from seven to nine months, the leaves then becoming spotted brown, and the stems dying down to the ground. The tubers may be lifted and stored in a cool shed under dry earth or sand, or they may be left in the ground and used as required, provided they can be protected from vermin and other enemies. Yams can be cooked and prepared for food in various ways, being either roasted, baked, or boiled and steamed, &c.

VARIETIES. There are numerous species and varieties of yams, some half-dozen species being indigenous to the moist low-country jungle of Ceylon. Most of the cultivated forms are somewhat variable in their vegetative characters, colour and shape of tuber, and a great number of these probably belong to the species *D. alata*. The local vernacular names are numerous and confusing, but those here given include the principal ones known in Ceylon. Among the choicest varieties are:—Kiri-kondol, Hingurala, Japana-ala, Java-ala, and Kukul-ala. Yampec or Cush-cush is a favourite yam in the West Indies.

The following yams are grown in the Royal Botanic Gardens, Peradeniya :
Stem three to five winged or angled, tuberiferous, without prickles;
leaves opposite, entire.—*Dioscorea alata*, var:—

“Angili-ala,” *S.* (=“Verralvalli-kelengu,” *T.*), “Bindhar” or “Binnar-ala,” *S.*, “Hingur” or “Ingur-ala,” *S.*, “Japana” or “Rathu-ala” *S.* (=“Sayuvalli-kelengu,” *T.*), “Kabarta-ala,” *S.* (=“Karavalli-kelengu,” *T.*), “Kiri-kondol,” *S.* (=“Arthuvalli-kelengu,” *T.*) or White yam; “Kirivel-ala,” *S.* (=“Vaithilay-valli-kelengu,” *T.*), “Niame-Chino,” and “Niame Pellu” (Cuban names), “Raja-ala,” *S.* “Rata-kondol,” *S.* “Ratavel-ala,” *S.*, “Vel-ala,” *S.* (=“Kodivalli-kelengu,” *T.*), and Yellow-yam (= *D. cayensis*).

Leaves 3 to 5 lobed, stem winged:—Yampee or Cush-cush yam (= *D. trifida*).
Stem round, tuberiferous, without prickles, leaves alternate:—“Udella,”
or “Uda-ala,” *S.* (=“Kodikarrana-kelengu,” *T.*) = *D. bulbifera*.

Stem round or slightly grooved, tuberiferous, with prickles, leaves
alternate or opposite, entire:—Hiri-tala, *S.* (=“Sheenivalli-kelengu,”
T.) = *D. obtuneata*. “Java-ala,” *S.*, “Natt-ala” or “Maha-kukul-ala,”
S. (=“Shoravalli-kelengu,” *T.*). “Katukukul-ala,” *S.*, and “Kukul-
ala *S.* (=“Shiruvalli-kelengu,” *T.*) = *D. fasciculata*. “Jambur-ala,”
S., (=“Podhalivalli-kelengu,” *T.*), “Kaba Japana-ala,” *S.* (=Guinea
Yam) = *D. aculeata*.

Leaves three to five digitate:—“Katu-ala,” *S.* (=“Mulluvalli-kelengu,”
T.) = *D. pentaphylla*.

Stem round, not prickly, without aerial tubers, leaves opposite:—“Gon-
ala,” *S.* (=“Kombuvalli-kelengu,” *T.*) = *D. spicata*.

Inedible Ceylon yams:—“Uyala,” *S.* (= *D. tomentosa*), “Panu-kondol,” *S.*
(= *D. sativa*), and *D. intermedia*.

Helianthus tuberosus. Jerusalem Artichoke; “Hartha-wariya.” *S.* (See under *Sub-tropical or Temperate Vegetables*).

Ipomoea Batatas. (Convolvulaceæ). Sweet Potato; “Batala,” *S.*; “Velkilengu,” *T.*—A creeping or trailing perennial, bearing succulent tuberous roots, which are a tasty and nutritious article of food, being sometimes preferred by Europeans to the common or Irish potato. The Sweet-potato is considered to have its native habitat distributed over the tropics generally. It is cultivated in all warm countries, and may be grown successfully in sheltered valleys up to about 4,000 feet in Ceylon, but does not usually thrive in the Hills. Any moderately good soil will suit the plant, provided it is of a light sandy nature. The ground should be well dug, manured, and formed into ridges about two feet apart; along the centre of the ridges cuttings about 12 inches long are planted a few inches apart, and these readily strike root. During dry weather, the plants should be watered, or when possible the ground irrigated once a week. The crop is ready for harvesting about three to four months from the time of planting, the leaves turning yellow when the tubers are mature. A yield of about 4 or 5 tons of tubers per acre may be expected under favourable conditions.



SNAKE-GOURD. *Trichosanthes anguina*. (See page 193).



LLEREN. *Calathea allouya*. (See page 194).

VARIETIES. The following are among the best varieties grown at Peradeniya:—"Boniato," "Sierra morena," "Boniato Amarillo," "Virginia," and "Nancimund." There are numerous varieties recognised in the West Indies and America, such as "Blue Belle," "Red Burbon," "White Gilkes," "Annie Vine," "Prince Henry," &c.

Manihot utilissima. (Euphorbiacæ). Tapioca; Cassava; "Manyokka," S.—A shrubby perennial, 6 to 8 feet high, native originally of Tropical South America, where its cultivation dates far back. It is supposed to have been first introduced into India and Ceylon by the Portuguese. There are two distinct kinds, known as the "Bitter" and "Sweet" Cassava (*Manihot utilissima* and *M. Aipi* respectively), and of these there are many varieties. All varieties are characterised by the presence of prussic acid, some possessing it to a greater extent than others, and this not infrequently results fatally to persons eating the Cassava carelessly prepared. The "Bitter" variety contains a greater percentage of the poison than the "Sweet," and as it exists chiefly in the outer portion of the root of the latter it is easier eliminated. The Cassava is cultivated in all tropical countries, either as food for man and stock, or for the manufacture of starch. It is most extensively grown in South America, the West Indies, and the Straits Settlements. In India and Ceylon its cultivation is limited, and generally confined to native gardens, being grown chiefly for home consumption. The large tuberous roots are cooked and used as a vegetable, or made into Cassava meal and bread. The tapioca of commerce is obtained by a process of grating and sifting of the tubers, the poisonous juice being removed by pressure, washing, and fire heat. Tapioca is largely exported from Brazil, and lately from the Straits Settlements, where the Chinese have advanced its cultivation. When the tubers are used as a vegetable, it is especially important that they be fresh. If kept for more than three days after being taken from the ground they become dangerous to eat, and it is probable that many of the fatal cases from eating Cassava are due to this cause. According to Dr. Nicholls, the natives of Guiana take red chillies steeped in rum as an antidote to Cassava poisoning. Cassareep, a powerful antiseptic "capable of preserving meat, &c.," is a by-product obtained by boiling down the poisonous juice of the "Bitter Cassava;" it is used in the making of many celebrated sauces, and in the well-known "Pepper-pot" of the West Indies.

Cassava is an exhausting crop, and cannot usually be grown profitably for more than three successive years in the same ground. In the Straits, it has in many cases been grown as a catch crop in young rubber plantations. The plant resists drought well, thrives

at all elevations up to about 2,000 ft., and prefers an open sandy soil. It is propagated by cuttings of the stem, which are planted at a distance of 16 inches in rows about 4 ft. apart. The tubers are ready for harvesting in seven to nine months from date of planting, and a good crop is considered to yield from 8 to 10 tons an acre, a single plant often producing from 30 to 50 lb. or more of tubers. There are numerous varieties of Cassava in cultivation, some six or seven occurring in Ceylon, none of which appear to be distinguished by vernacular names.

Maranta arundinacea. (Scitaminæ). West Indian, or Bermuda Arrowroot; "Araluk," or "Hulankiriya," S.—A small stemless herbaceous plant, with large leaves, native of Tropical America and the West Indies. The name "arrow-root" is derived from the fact that the rhizomes were used by the Indians as an application to wounds inflicted by poisoned arrows. The plant is cultivated in most tropical countries for the sake of its white starchy underground tubers, which are either used as a vegetable, or, by a process of washing, grating and sifting, made into arrowroot. The arrowroot of commerce is obtained chiefly from the West Indies, notably Bermuda and St. Vincent, where the plant is systematically cultivated. Propagation is effected either by means of the tubers (rhizomes) or by division of the crown, these (the sets) being planted 5 or 6 inches deep in rows or furrows 3 feet apart, with about 14 inches between the plants in the row. The commencement of the rainy season should be selected for planting. A light, loamy, well-drained soil is best, wet or clayey soil being unsuitable. The crop is an exhausting one, and the richer the soil the better. The plant will thrive from sea-level to about 3,000 ft. altitude in Ceylon. Shade is not essential, though in light exposed soils it is beneficial. The flowers should be removed from the plants as they appear. The tubers are usually ready for lifting in from eight to ten months from the time of planting, their mature condition being indicated by the leaves flagging and dying down. It is estimated that an acre of ground will produce on an average about five tons of fresh tubers, yielding about seven hundredweights of prepared arrowroot. The tubers contain about 15 to 20 per cent. of starch.

Oxalis crenata. (Oxalidacæ). "Oka."—A small Peruvian plant, allied to the Oxalis weed (*O. violacea*, so troublesome at the higher elevations in Ceylon), producing numerous small tubers, which are edible, and are said to grow to the size of small plums. The plant is cultivated as a vegetable in Peru, where the tubers are boiled for about twenty minutes, and eaten with pepper and

salt, &c. The acid succulent leaf-stalks are also used as a salad. The plant is said to thrive in almost any free soil, and is readily propagated by the tubers.

Plectranthus tuberosus. (Labiatae, Coleus family). Country Potato; "Innala," S.—A small herbaceous plant with succulent aromatic leaves, commonly grown in low-country native gardens for the sake of its small watery, but edible, underground tubers. The latter are often retailed in the markets and boutiques, being used as a vegetable in curries. Although they appear to have little to recommend them, their quality might possibly be improved by cultivation and selection. In Africa, Madagascar, Cochin China &c., this and other species of *Plectranthus* are said to be grown and relished by the Natives. The plants are easily propagated by cuttings or tubers, and may be grown like Sweet Potatoes, being planted about 8 inches apart in a bed of light rich soil.

Tacca pinnatifida. (Taccaceæ). "Garandi-kidaran," S.—A stemless tuberous plant, with leaves 1 to 3 feet long and parted into three segments, native of the dry region of Ceylon (Bintenne, Batticaloa and Jaffna), being found in open grassy places. It is also indigenous in India, Burma and Malaya, and is commonly cultivated in parts of India, Tropical Africa, Pacific Islands, &c. The plant has a large round tuberous root, which yields a considerable quantity of white nutritious fecula. This is considered to be equal to the best arrowroot, which substance it resembles, and is said to form an important article of trade in Travancore, Fiji, Hawaii and elsewhere. The tubers, dug up after the leaves have died down, are rasped and macerated for four or five days in water, when the fecula separates and is prepared in the same manner as sago. In the crude state it is intensely bitter and acrid, but these qualities are removed by frequent washing in cold water. The plant is suited to a rich porous soil, and may be planted in rows 3 or 4 feet apart. Propagated by division of the root-stock.

Xanthosoma. (Aroideæ). Tannias or Tanniers; Coccoes; Eddoes; Yautias; Taroes,—these are some of the numerous vernacular names applied in the Pacific Isles, S. America and the West Indies to species and varieties of *Xanthosoma* and *Colocasia*. In Ceylon, as elsewhere, much confusion exists in regard to the names of these plants, which are here all generally referred to under the vernacular names of "Habarala," "Gahala," &c. Mr. Barnett, of the Porto Rico Experiment Station, considers that the name "Taro" rightly belongs only to varieties of *Coclocasia esculentum*, a native of the Old World; whilst the rest of the names given above should be

exclusively applied to species or varieties of *Xanthosoma*, all cultivated forms of which may be considered as having been derived from the three species *X. sagittaeifolium*, *X. atrovirens*, and *X. violaceum*. Thus the Taro (*Colocasia*) and its varieties are distinct by having the leaf peltate, *i.e.*, with the petiole (leaf-stalk) attached to the under surface of the blade at a point more or less remote from the margin; whilst with the *Xanthosoma* (Tannias, Yautias, Cocoes, &c.) the leaf is never peltate, but has the leaf-stalk attached to the very margin of the blade, and the latter is usually prolonged into two lobes at the base.

This group of handsome tropical plants are among the oldest cultivated crops of the world, and are found everywhere in a more or less cultivated state throughout the tropics. They furnish edible underground tubers (rhizomes), not unlike artichokes, and the young tender leaves are boiled and eaten as spinach. Though a stand-by vegetable in Native gardens, this does not find much favour here with Europeans. In Hawaii and parts of South America, Yautias are grown somewhat extensively, either for food or for the commercial starch obtained from the tubers. The plants do best in a rich humous moist soil, and may be planted all the year round; they will thrive in Ceylon up to 3,000 feet, and to some extent in the dry districts if irrigated. Propagation is effected by means of the tubers or division of the crowns. In the West Indies Tannias are recommended for planting out as shade for young plantations of Cocoa, &c.

VARIETIES.—There are numerous varieties in cultivation, the following being the principal ones occurring in Ceylon.

Colocasia: leaves peltate, leaf-stalks and tubers eaten:—"Kiri-ala" (very pale green leaves), "Kandala," "Thadala," "Kalu-ala" (leaf-stalks purple), "Kalu-kandala" (leaf-stalks purple), "Yakutala," "Garendikandala," "Gahala," "Aja-kola" or "Gahala-kola," "Thumas-ala." The last named is considered one of the best, producing a crop of tubers in three or four months, as the name indicates.

Xanthosoma: leaves hastate or sagittate; tubers edible, leaf-stalks occasionally eaten—"Rata" or "Daesi-ala," "Habarala" (leaves very large), "Kalu-habarala" (leaf-stalks purple)."

Alocasia cucullata: "Panuhabarala." Leaves heart-shaped; used medicinally only.

Alocasia macrorrhiza variegata: "Eli-habarala; large handsome variegated leaves; used only in native medicine.

Alocasia Sp. "Mavil-habarala" also a medicinal species, distinct by a spotted leaf-stalk, the vernacular name being derived from the supposed resemblance of the latter to the "Mapila" snake.

SECTION 4: MISCELLANEOUS VEGETABLES AND FOOD CROPS.

Amaranthus oleraceus. (Amarantaceæ). "Thampala," S.—An annual herbaceous plant, which with several other species or varieties of *Amaranthus* is commonly grown by the Natives in the low-country. The tender leaves and succulent portion of the stem are boiled and used in curries and other ways. In India, the succulent tops of the stems and branches are said to be sometimes served up as a substitute for asparagus. The *Amaranthus* is easily cultivated, being readily raised from seed, and thrives in any ordinary soil. Some varieties come up spontaneously in the ground where they were previously grown.

Basella alba. (Chenopodiaceæ). Ceylon Spinach ; Malabar Nightshade ; "Niviti," S. ; "Pasali," T.—A slender climbing perennial, with slender succulent stems and leaves, which may be used as a pot-herb or spinach, for which it is a good substitute. It is often cultivated in the low-country of Ceylon, and is relished by Europeans. Propagated by seed sown during the rains, preferably in rows, sticks being provided for support to the vines.

Arachis hypogaea. (Leguminosæ). Ground-nut ; 'Earth-nut ; Monkey-nut ; Pea-nut ; "Rata-kaju," S. ; "Nella-kadala," T.—A small annual trailing plant, native of Brazil and now cultivated in all tropical countries. The plant is remarkable for its habit of burying its seed-pods in the ground to ripen, hence its popular names. The cultivation and export of ground-nuts is an important industry in West Africa, Southern India, Burma, and elsewhere. Recently in Ceylon, Groundnuts were strongly advocated as a suitable intercrop with stationary products, as Rubber, but have not proved a success. The plant is, however, often grown in native gardens in the low-country. In Tropical America, the West Indies and throughout Tropical Africa, Ground-nuts are commonly cultivated both as an article of food and for the valuable oil obtained from the seed. The nuts (seeds) are prepared and used for food in numerous ways. In the United States they are used largely in confectionery, being also roasted and eaten as a dessert. Ground-nut oil is considered to be equal to the finest olive oil, being supposed to be one of the best of salad oils, but its chief use is in the manufacture of toilet soaps, pomades, cold cream, &c. After the expression of the oil from the seed, the residue forms a valuable manure or cattle-food.

A light friable, well-tilled soil is the most suitable for the plant, the presence of lime being especially beneficial. The ground

should be well forked to a depth of 6 inches, and the seed, after being shelled, sown about 3 inches deep, in rows $1\frac{1}{2}$ to 2 feet or more apart. Just before the commencement of the rainy season is the proper time to plant. Three to five months, according to variety of nut and nature of soil, are required to produce a crop. When ripe, the plants are dug up and the nuts picked by hand. The yield per acre may vary from 1,000 to 4,000 lb. of nuts, though with high cultivation as much as 6,000 lb. per acre has been obtained. Several varieties are known in cultivation, being distinguished by differences in productiveness and by a spreading or erect habit of the plants. The "Mauritius" and "Brazil" varieties have been found the best of those tried at the Peradeniya Experiment Station.

Capsicum grossum, or C.—frutescens. (Solanaceæ). *Capsicum*; Chilli Bell Pepper; "Malu-miris," S.; "Karri-kochika," T.—There are numerous varieties of *Capsicum* or Bell Pepper, which are related and similar to the small pungent varieties or Pepper Chillies (see under *Spices*), but distinguished from them by the large pod-like fruits. The latter are hollow, usually oblong, $2\frac{1}{2}$ to 5 inches long, and vary in colour from orange, bright red, amber, to dark-purple. These are edible and pungentless, some varieties being greatly relished in salads or used as a vegetable. The plants are annuals, 2 to 3 ft. high, and thrive best in loose rich soil under light shade. Suited up to 4,000 ft., provided the rainfall is not excessive. Seed of excellent varieties may be obtained from Europe.

Edible Seaweed. Several species of Seaweed furnish an article of food to the inhabitants of certain tropical regions. In the Malay Archipelago, China and Japan, seaweed is said to be a staple article of diet, the sorts used coming under the heads of "blue-green," "grass-green," "brown," and "red" algæ. When soaked in hot water these become highly gelatinous, and are eaten in various forms, or used for thickening soups. The blue-green varieties are said to contain the highest percentage of protéids. Seaweed jelly is sometimes used for adulterating fruit jellies.

Edible birds' nests. Though scarcely a vegetable product, edible birds' nests rank as an important article of table delicacy in China, where they are made into soup. These nests are formed by species of swifts (*Collocalia*) inhabiting caves, and their nutritive value is derived from the dried salivary secretion of the birds. Young white nests are the most highly prized, and these are sold at very fanciful prices, varying from about £ 35 per thousand, the best

quality commanding their weight in silver. The annual import to Canton alone is said to be about 9,000,000 nests. Edible birds' nests have until recently been exported from Ceylon, being collected, under Government licence, chiefly in caves in the Southern Province.

Hibiscus esculentus. (Malvaceae). Okra, or Ochro; Gobba, or Gumbo; Lady's Fingers; "Bandakka," S.; "Bandak-kai," T.—An erect annual of the "Shoe-flower" family, 2 to 3 ft. high, bearing large leaves and erect horn-like pods. The latter grow from 5 to 8 inches long, and when tender are an agreeable vegetable; when boiled they are of a mucilaginous consistency, and are used for thickening soups, or in salads. This popular vegetable is grown throughout the tropics, and occurs in numerous varieties. The plant is not suited to high elevations in Ceylon, except in sheltered valleys. Sow seed at the commencement of the rains, thinly in rows about 3 feet apart, subsequently thinning out the plants to 12 or 14 inches apart; or sow in a bed, and afterwards transplant the seedlings into rows in well-prepared soil, allowing the dwarf kinds to be about 15 inches apart, and the larger kinds 18 to 20 inches. The plant does best in rich or heavily manured soil. The pods are best for use while they are soft and tender, before the seeds are half grown.

Ipomoea aquatica. (Solanaceae). "Kan-kun," S.—A small semi-aquatic creeper with tender arrow-shaped leaves, often cultivated in native gardens. The leaves and young stems are commonly used for vegetable curries. Thrives best in a shallow trench where moisture can be retained. Propagated easily by cuttings.

Ipomoea Bona-nox. (Solanaceae). Moon-flower; "Alanga," S. "Alangai," T.—A perennial climber, the fleshy calyces of which are often used as a vegetable for curries, soups, &c. It is sometimes cultivated, chiefly by Tamils, in small native gardens. Easily propagated by cuttings or seed. Will thrive up to 3,000 feet.

Moringa pterygosperma. (Leguminosæ). Horse-radish Tree; Drumsticks; "Murunga," S.; "Murunga-kai," T.—A slender tree with small tripinnate leaves, found cultivated in gardens throughout Ceylon, India, &c. The roots are used as a substitute for horse-radish, the leaves for vegetable curries as well as for seasoning and in pickles. The long unripe pods ("drumsticks") are very commonly used as a curry vegetable, being boiled and cut up like beans. The flowers and bark are used in native medicine, and a valuable oil known as "Oil of Ben" is obtained in India from the seeds. Propagated by seed or cuttings.

Passiflora quadrangularis. (Passifloraceæ). Granadilla; "Garandilla," S.—A large perennial climber, whose gourd-like green fruit in an unripe state may be boiled and served as a vegetable (See under *Tropical Fruits*).

Sesbania (Agati) grandiflora. (Leguminosæ). "Katurumurunga," S.; "Agatti-keerai," T.—A small, quick-growing, soft-wooded tree, about 15 to 20 feet high, bearing large pendulous flowers, the fleshy petals of which are much esteemed for use in curries and soups; both the flowers and tender leaves are very palatable when fried. The bark, leaves and flowers are medicinal. Propagated by seed.

Solanum Melongena. (Solanaceæ). Brinjal; Egg-plant; "Wambotu," S.; "Katri-kai," T.—A low bushy perennial (an annual in cultivation), commonly grown in native gardens for its smooth polished fruit, which is cooked and served in various ways, and forms a favourite vegetable. There are numerous varieties, differing chiefly in the shape, size and colour of the fruit. The latter is round in some varieties, egg-shaped or cucumber-shaped in others, whilst the colour varies from white to dark-purple, the latter colour being usually characteristic of the best varieties. Brinjals thrive best in a rather dry climate, and require a light rich well-tilled soil. They are grown most successfully in the Negombo and Dumbara districts of Ceylon, and are suited to fairly high elevations, provided the climate is not too wet. Sow seed in a well prepared bed, and transplant the seedlings when about three inches high into rows 18 inches apart, with 15 inches between the plants in the row. The plants should begin to bear in from three to four months, and continue to yield a crop for about three months.

Sorghum vulgare. (Gramineæ). Guinea Corn; Great Millet; Turkish Millet; "Cholam", T.—A tall annual plant of the grass family, 6 to 9 ft. high, cultivated from remote ages as a cereal food-crop. It requires the same conditions of climate and soil as Maize, and is largely cultivated in India, Burma, Africa, &c., but is seldom grown in Ceylon. It is not considered well suited to rice-growing regions. The small hard grain is very nutritious, and is made into flour, while the straw affords good fodder. In India the plant is often grown mixed with a pulse crop, as *Cajanus indicus*, the seeds being mixed and sown in drills 14 to 18 inches apart. About 7 or 8 lb. of Sorghum seed mixed with about 3 lb. pulse seed are thus sufficient to sow an acre. A crop is obtained in about five months from time of sowing, the yield obtained varying from 500 to 900 lb. or more per acre, according to variety and soil. Several varieties



QUEENSLAND ARROWROOT. *Canna edulis*. (See page 194).



CASSAVA. *Manihot utilissima*. (See page 197).

occur in cultivation, these being distinguished by white, cream, red, or black seeds.

Sorghum saccharatus. Sugar-sorghum; Imphee.—A plant similar to the preceding species, cultivated for sugar. Being much hardier than the Sugar-cane, it may be profitably grown in climates where the latter would not succeed. The plant has been long in cultivation in India and the Southern United States, and is now widely cultivated, in numerous varieties, for the manufacture of sugar and syrup. Like the Guinea-corn, Sugar-sorghum may be grown in most soils, but gives the best yield on a sandy loam. In dry weather it is much benefited by irrigation.

Voandzeia subteranea. (Leguminosæ). Vandzon; Madagascar, or Bambarra-groundnut.—A creeping annual with long-stalked leaves, the latter composed of three leaflets. Like the common ground-nut, its flower-stalks after flowering bend down to the earth, in which they develop and ripen their pods. The latter are a common article of food with the natives of Madagascar and different parts of tropical Africa, where the plant is cultivated. In Zanzibar, there is a small trade in the nuts. The plant has been carried by the Negro slaves to certain parts of Tropical South America, where it is said to have become naturalised. It is known in Surinam as "Gobbe," and in Natal as "Igiuhluba." Similar conditions of cultivation to that afforded the common Ground-nut will suit the plant.

Zea Mays. (Gramineæ). Indian-corn; Maize; (Mealies of S. Africa); "Bada-iringu," S.; "Cholum," T.—An annual monœcious grass, 6 to 8 ft. high, native of Mexico. The unripe tender heads or cobs are, when cooked, considered by most persons a delicious vegetable. They are cooked and prepared in numerous ways, as boiled in milk, roasted, and then served with butter, pepper and salt. The ripe grains are made into flour by the Sinhalese, buns made from this being known as "Iringu-roti." The plant is grown to greatest extent and perfection in the warmer parts of America, where it is an important article of diet, especially the "Sweet" or "Sugar" varieties. It has also been long cultivated in the Eastern Tropics, where however the best varieties soon degenerate; good seed should therefore be imported frequently from America. Among the best and most distinct varieties as recognised in America and Australia are:—"Pride of the North," "Jowa Silvermine," "Longfellow Dent," "Hickory King," "Golden Flint," "Mastadon," "Waterloo." Indian-corn is naturally subject to cross-fertilisation, so that it runs into numerous varieties if left to itself. It is suited to a rather dry

climate, like that of Dumbara, and may be grown at all elevations up to 5,000 feet or more. Sow the seeds at the commencement of the monsoons, in drills about 3 to 4 feet apart, with about 6 inches between the grains in the row, the drills being about 3 inches deep. When the plants are well up, they should be thinned out to about 12 inches apart.



CHAPTER XIII.

TEMPERATE OR SUB-TROPICAL VEGETABLES OR FOOD CROPS.

[S=SIHHALESE; T=TAMIL].

Suited to elevations of 3,000 feet upwards, with an annual rainfall of about 60 to 100 inches. Many may be grown with moderate success in the cool seasons at lower elevations, some even at sea-level.

[For convenience of reference it is considered preferable in this case to give precedence to the common or English name over the botanical, the former being better known. The botanical name and Natural Order are enclosed in brackets].

Aracacha or Peruvian Parsnip. (*Arracacia esculenta*. N. O. Umbelliferae).—This uncommon vegetable is a native of the Andes in South America, where it is cultivated up to 6,000 feet elevation. It is a low, Parsnip-like plant, producing large edible, starchy, carrot-shaped roots, which have the flavour somewhat of Parsnips. Mr. W. Nock, late of Hakgala Gardens, introduced it as seed from Jamaica in 1884. Dr. Trimen stated that "its peculiar flavour and cheesy consistence did not seem to be relished by Europeans, though much enjoyed by all Natives who had tasted it." It is propagated either by seed or by division of the small heads (leaf-stalks) which spread out from the crown, the sets being planted about 6 inches deep in rows about 3 feet apart. The plant requires from ten to twelve months to reach maturity, but the tubers may be gathered for use two months earlier than this if required. In the native country of the plant it is customary to gather the leaves together and twist them moderately, a process said to prevent the plants running to head while favouring the development of the root. The plant will thrive in any good soil, and is adapted only to the higher elevations, say from 4,500 to 6,000 feet. It is commonly cultivated as a vegetable at Bogota, in Colombia, up to 8,000 feet elevation.

Artichoke, Chinese. (*Stachys tuberifera*. N. O. Labiatae).—A dwarf herbaceous plant, bearing underground white spiral-like tubers, 2 to 2½ inches in length and about ½ an inch in thickness.

These are eaten either cooked as a vegetable, or raw like radishes, being said to somewhat resemble the latter in flavour with a suggestion of the Jerusalem Artichoke. The plant has been found to succeed at Hakgala Gardens, where Mr. W. Nock reported in 1889 thus : "the ground is literally full of the small edible roots." This vegetable is not much grown in England, but is popular in France.

Artichoke, Globe (*Cynara Scolymus*. N. O. Compositae).—The tender part of the globular unexpanded flower-head, after being boiled and eaten, is much relished as a vegetable. The plant thrives to perfection at Nuwara Eliya, growing sometimes in a semi-naturalised state, but is unsuited to elevations below 4,000 feet. Propagated by seed or suckers, preferably the former. Seed should be sown early in the year in boxes or pots under cover, but exposed as much as possible to the light, otherwise the seedlings are apt to damp off. The seed should germinate in ten or twelve days after sowing. Prick out the seedlings when strong enough into a well-prepared and sheltered bed, and when these are about 4 inches high, plant them out 3 feet by 4 feet apart in rows. Good heads should be produced in about eight months from the time of planting. The plants thrive best in a rich moist soil, as by the side of water channels or streams.

Varieties:—"Green Globe" and "Purple Globe" are both good.

Artichoke, Jerusalem (*Helianthus tuberosus*. N. O. Compositae).—This much relished esculent is one of the most successfully cultivated of European vegetables at low elevations (2,000 to 4,000 ft.), where curiously enough it thrives better than up-country. The plants like a rich free moist soil, and under congenial conditions grow 5 to 6 feet in height. In the tropics, however, they only reach a height of 2 to 3 feet, and the stems are inclined to a trailing habit. Plant the tubers in May, at intervals of 16 inches in lines about 2½ feet apart. Pick off any flowers that may appear on the plants. A crop of tubers may usually be obtained in five to six months from time of planting, and when these are taken up they should be stored in a cool dry place, and covered with earth. In the tropics the tubers deteriorate to some extent after each crop, so that new sets should be imported every year if possible.

Asparagus. (*Asparagus officinalis*. N. O. Liliaceae). "Harthawariya," S.—The cultivation of this delicious vegetable is seldom successful in the tropics. The plant is, however, occasionally grown with some measure of success in Ceylon at elevations of 4,000 ft.

to 5,000 feet. The young tender culms or shoots are the parts used. The plant requires a rich, friable and well-drained soil, which should be heavily manured; being a native of the sea-coast, it is considered to derive much benefit from a sprinkling of salt applied to the surface soil once a year. Propagated by seed, which should be sown in boxes under shelter. When the seedlings are a few inches high, they should be planted out in large and deep holes, when care must be taken not to injure the delicate roots. In Europe the seed is generally sown where the plants are to remain; a bed of Asparagus is considered in its prime at five years old, and lasts for a number of years. None of the shoots or branches should be cut during the first two years after sowing, so as to encourage the plant to make vigorous crowns or root-stocks.

Beans, Broad. (*Vicia Faba*. N. O. Leguminosae).—Broad-beans are grown successfully in only very few gardens at the higher elevations in Ceylon; the plants set fruit but sparsely, even in the cool dry months, and when pods are produced they are usually small and lacking in flavour. By pinching back the tops of the plants when in blossom, and artificially pollinating the flowers, the production of pods may, however, be considerably increased. The best time to sow seed is October or November. Seeds should be soaked in hot water for some hours, and then sown 4 inches apart in drills, with 18 inches between the latter; cover the seeds with 3 inches of soil. There are two distinct kinds, the "Long Pod" and "Broad Windsor"; the former is considered the better suited to cultivation in the tropics.

Beans, Kidney or French. (*Phaseolus vulgaris*. N. O. Leguminosae). "Bonchi," S.—This excellent vegetable can be grown in the moist and cool season at all elevations from sea-level, but to most perfection at 5,000 to 6,000 feet, being commonly grown in market gardens about Nuwara Eliya. The varieties come under two distinct classes, viz.—(a) "Dwarf" sorts, which attain a height of 12 to 16 inches and do not need stakes for supports; (b) the tall or "Runner-beans," which are climbers and grow 6 or 8 feet in length, requiring supports as Peas. The conditions of culture for the tall and dwarf sorts are the same. The latter come into bearing sooner and are more prolific than the Runner-beans, which however remain productive for a longer period. The seeds should be sown in rows, in well manured soil, with a distance of $1\frac{1}{2}$ to 2 feet between the rows. Frequent sowings should be made so as to keep up a succession of crop; sowings made towards the end of the monsoon rains should give the best returns.

The seed germinate quickly, and the plants usually come into bearing in about six weeks from the time of sowing. Among the best of the dwarf sorts are :—"Canadian Wonder," "Butter Beans" ("Mont d'Or"), "Sutton's Perfection," and "Veitch's Hybrid." Runner-beans:—"Chelsea Giant White," "Epicure," "Excelsior," "White Long Pod," &c.

Bean, Scarlet Runner. (*Phaseolus multiflorus*. N. O. Leguminosae).—A herbaceous perennial climber with scarlet flowers, native of South America. The tender pods are used like those of French-beans, &c. The plant is seldom cultivated in Ceylon, as it has been found unsuited to the climate at any elevation. It has been grown with fair success at Peradeniya, where it has blossomed, but seldom produced fruit.

Beet, or Beetroot. (*Beta vulgaris*. N. O. Chenopodiaceae). This grows extremely well in up-country gardens, while at low elevations it also yields very fair roots, which are the part used. The plant generally thrives best in a rather heavy moist soil, and being naturally a native of the sea-coast it is supposed to be benefited by an application of salt to the soil. The ground should be dug deeply, burying the manure well under. Secure an even and fine surface by means of an iron rake, and draw small drills about $1\frac{1}{2}$ inch deep, and 10 inches apart; into these sow the seed thinly and evenly, and cover with fine soil, afterwards pressing down the surface. The seed germinate in a few days. The seedlings must be thinned out when well above the surface, and these may be transplanted if desired.

VARIETIES.—"Electric," "Dell's Crimson," "Middleton Park," and "Turnip-rooted" are excellent sorts. On the plains in India, acclimatised seed is considered to give the best results.

Leaf-beet. (*Beta cicla*. N. O. Chenopodiaceae). This variety of Beet is grown for its leaves which are used in soups, &c., for flavouring. Cultural requirements similar to those given for the common Beet.

Borecole, Kale, or Curly Greens. (*Brassica oleracea acephala*. N. O. Cruciferae).—A variety of cabbage characterised by very crumpled or curly leaves, which spread out in plume-like fashion, and do not form a compact head. These are not considered fit for use in England until they have had some frost. Owing to their ornamental appearance, they are frequently employed for garnishing purposes. The plants can be grown successfully at medium and high elevations. Not commonly grown in market gardens in Ceylon. Cultural directions the same as for Cabbage.

Broccoli. (*Brassica oleracea Botrytis*. N. O. Cruciferae).—This is practically a kind of Cauliflower which is best suited to a winter climate in cool countries; unsuitable for cultivation in the tropics.

Brussels Sprouts. (*Brassica oleracea gemmifera*. N. O. Cruciferae).—This favourite vegetable is a variety of Cabbage which, instead of forming one single head, produces numerous small heads or "sprouts" crowded along the stem towards the top. It is a winter vegetable in Europe, but it thrives also at high elevations in the tropics, and is commonly grown in up-country gardens in Ceylon. Cultural requirements are similar to those of Cabbage. "Sutton's Matchless," "The Aigburth," and "Dwarf Gem" are all good varieties.

Cabbage. "Goa," S. (*Brassica oleracea*. N. O. Cruciferae).—This useful vegetable is now grown abundantly at high elevations in Ceylon, both in private and market gardens. At intermediate elevations also it thrives sufficiently well to yield at least a crop of green leaves, which are so much prized by the Natives for soups and vegetable curries. A rich, well-drained and manured soil is essential. The seed may be sown thinly on a sheltered border with finely worked loose soil; when the plants are 4 or 5 inches high they should be planted out about 15 inches apart in rows, the distance between the latter being about 18 or 20 inches. The young plants will require to be protected from the sun and wind until strong enough to take care of themselves. In the low-country, Cabbages are often propagated by cuttings or small shoots which appear on the stem; but here the plants do not form heads, and only the lower leaves are picked for use as required. The club-root disease to which all the Cabbage family (Cruciferae) are liable, is the greatest drawback to Cabbage cultivation in the Hill districts of Ceylon. (See *Fungus Pests*.) The spores readily infest the soil after the first crop of cabbages is grown, and a change of soil for each successive crop is essential. The only preventive that can be employed is fresh unslaked lime, applied at the rate of about 75 bushels per acre, or 15 lb. to 100 sq. feet. All diseased plants should be burnt. Wire-worms are also a very troublesome pest with Cabbages, and seem to be attracted by the club-root disease.

VARIETIES.—"Sutton's Earliest," "Sutton's Maincrop," and "Early Battersea" are among the best.

Cabbage, Red. (*Brassica oleracea capitata rubra*. N. O. Cruciferae).—This will thrive well at 4,000 to 6,000 feet, but is not much grown in Ceylon. It is used chiefly for pickling. Cultural

requirements are similar to those of the Cabbage. The principal varieties are "Red Drumhead," "Red Dutch," and "Dwarf Red."

Cabbage, Savoy. A dwarf variety of Cabbage with crimped leaves. Thrives well at high elevations, but is not much grown in Ceylon nor apparently in India.

Cabbage, Shantung. (*Brassica chinensis*. N. O. Cruciferae), also known as "Chou de Chine" and "Pé-tsai."—A species of Cabbage, shaped like a Cos lettuce, and weighing when well grown 5 to 6 lb. This has long been in high repute in China as a vegetable. Mr. Hughes, late Commissioner of Customs at Chefoo, stated: "When boiled it is nearly as good as Sea-kale; eaten raw, in a salad, it is of so delicate a flavour that I know of no vegetable in England to approach it." A sample of this Cabbage grown at Kew Gardens was pronounced to be excellent. Mr. W. Nock reported the plant to grow remarkably well at Hakgala Gardens, stating: "In appearance and habit of growth it resembles a gigantic Cos lettuce; it is bright pea-green in colour, and when cooked possesses a very agreeable and delicate flavour. It has also the advantage of standing the rains well, and growing quickly to a size ready for use. The succulent stalks of the leaves can be eaten like Sea-kale. Taken altogether, it may be considered a valuable addition to the list of vegetables suited for up-country." The Shantung Cabbage thrives best in moist rich soil. It is grown from seed, and the seedlings are planted in rows about 18 inches apart, with the same distance between the plants in the rows. When nearly full grown, the heads should be tied round so as to give them a good white heart.

Capsicum.—See *Tropical Vegetables*.

Cardoon. (*Cynara Cardunculus*. N. O. Compositae).—A perennial plant, much relished on the continent of Europe for the sake of the fleshy mid-ribs, but not much appreciated in England. I have nowhere seen this grown in Ceylon, and its cultivation in India also seems to be uncommon. Seedlings may be raised under cover, and planted out in trenches about 3 to 4 feet apart, with a distance of 18 inches between the plants in the rows. Later on, the earth is drawn up to the plants, as in Celery cultivation, for the purpose of blanching the leaves.

Carrots. (*Daucus carota*. N. O. Umbelliferae).—This popular vegetable can be grown very successfully at elevations of 4,000 to 6,000 feet or more in Ceylon, and also with some success at lower elevations. Carrots are commonly grown in up-country market gardens in Ceylon, which supply at all seasons the

low-country markets and the shipping at Colombo. A loose, rich, sandy soil, which has been manured well for the preceding crop (no fresh manure should be applied), is the most suitable for Carrots. The seed should be sown thinly in drills about 8 inches apart, the young plants being afterwards thinned out to a distance of two or three inches apart. Further thinning out may be continued by drawing for use the largest or most crowded plants. The best way of storing carrots is to place them in a heap of sand in an open shed.

VARIETIES.—These are divided into two distinct classes, *viz.*, the Long-rooted type, which comprises the “Altringham,” “Jame’s Intermediate,” “White Belgian,” &c. ; and the Short-rooted or Horn kind, including “Scarlet Dutch Horn,” “Early Short Horn,” &c.

Cauliflower. “Mal-goa,” *S.* (*Brassica oleracea Botrytis*. N. O. Cruciferae).—This delicious vegetable is a variety of Cabbage, the dense white flower-heads of which being the part used. The Cauliflower thrives well at elevations of 5,000 to 6,000 feet, and a rich, heavily manured soil suits it best. Plants from acclimatised seed are said to do best in Bengal, such seed being produced chiefly in Northern India. Cultural directions the same as for Cabbage.

VARIETIES.—Among the best are “Veitch’s Autumn-Giant,” “Walchereen,” “Dean’s Early Snowball,” and “Large Asiatic.”

Celeriac ; Turnip-rooted, or Knob-celery. (*Apium graveolens rapaceum*. N. O. Umbelliferae).—A variety of Celery the stem of which forms an irregular knob, which is used in salads, while the leaves are used for flavouring purposes. It can be grown from 2,000 feet upwards, but there is little to recommend its cultivation where Celery can be successfully grown.

Celery. “Seldry,” *S.* (*Apium graveolens*. N. O. Umbelliferae).—This can be grown with great success in up-country gardens in Ceylon. In the low-country also, very fair stalks can be produced, and the plant is well worth growing even for the sake of the leaves for flavouring purposes. The essential conditions for Celery culture are moisture and rich, well-manured soil. The small seed should be sown in a pan or box under cover, the seedlings being afterwards pricked out into beds or boxes ; when about 4 inches high, plant these out in a deep trench, the bottom of which has been filled to a depth of 10 inches with manure well-mixed with the soil. Blanching of the stems or leaf-stalks is effected by growing them in darkness, the usual method of carrying this out

being to draw up the soil to the plants at intervals as they grow, the leaves being loosely tied or held together by means of boards placed temporarily against them. A good method of earthing up Celery for blanching, is to take a piece of large bamboo 18 inches long, and slit it in two; having pointed the ends, drive these into the earth, one close on either side of the Celery plant. The plant thus encompassed by the bamboo is earthed up, the bamboo being afterwards removed. Celery takes about four to five months from the time of sowing to be ready for use.

VARIETIES.—Amongst the best are "Wright's Giant-grove," "Cole's Solid Red," "Golden Yellow," and "Mammoth White."

Cho-cho; Cayote, or Chayote. (*Sechium edule*. N. O. Cucurbitaceae).—A perennial robust creeper, with leaves like those of the Cucumber, native of the West Indies, whence it was introduced to Ceylon in 1884 by Mr. W. Nock of Hakgala Gardens. It is said to be much grown at the higher elevations in the West Indies, South America, and also in the Mediterranean region, being known in the latter country as "Chayote." The plant has become thoroughly established in Ceylon, especially in the Hill districts, and thrives from 1,500 ft. upwards. It is propagated by the fruit, which must be planted *in situ*, in mounds of well manured soil. It requires natural or artificial supports for the vines to grow over, and thrives up-country without shade, but is benefited by light shade at lower elevations. The pear-shaped, pale-green fruits are used like Vegetable-marrow, and are in season almost throughout the year, the plants commencing to bear three months after planting. Well-grown fruits weigh from 2½ lbs. to 3½ lbs. each, and these are sold in the local markets and boutiques at 1½ to 3 cts. each. The plant produces under-ground a large yam, which is much relished by the Natives as a vegetable. There is a white-fruited variety, which seems better adapted for the low-country than the ordinary green form. A superstitious belief exists amongst the Natives in certain low-country districts that eating the Cho-cho causes rheumatism, and this no doubt acts as a check on the cultivation of this useful vegetable.

Cress, Garden. (*Lepidium sativum*. N. O. Cruciferae).—A small annual, commonly cultivated in temperate countries for the sake of the young leaves, which are used in salads. It is a very quick-growing and short-lived plant, being ready to cut for use within a few days after sowing. Seed may be sown broadcast in boxes or beds, which should be shaded from the sun. Frequent sowings are necessary in order to keep up a succession of crops.

Cress, Indian. (*Tropæolum spp.* N. O. Geraniaceæ).—The flowers as well as the young leaves of several varieties of the annual *Tropæoleums* are by some people much relished in salads. The plants are readily grown from seed, and thrive at 4,000 to 6,000 feet elevation; they are also very ornamental, especially the climbing varieties, which are excellent for covering trellis work, fences, &c.

Cress, Water. "Kakkutu-pala," or "Wataressa." S. (*Nasturtium officinale*. N. O. Cruciferæ).—A low perennial herb, native of Europe, &c., and naturalised in Ceylon, being commonly met with in swampy situations and in the neighbourhood of rice fields at medium elevations. The young leaves form a favourite salad, but do not appear to be much relished by the Natives. The plant may be propagated from seed or by division of the old plants, and is easily grown in a patch of soil through which water is made to flow; stagnant pools are unsuitable. In New Zealand, where the plant has been introduced, it has become practically a scourge, having established itself in almost every water-course and spring.

Cucumber. "Rata-kekiri," S. (*Cucumis sativus*. N. O. Cucurbitaceæ).—The superior varieties of Cucumber, cultivated to such perfection in temperate countries, can only be successfully grown in the tropics where a greenhouse or a good heating frame is available. Such protection is necessary in order to enable equable conditions of temperature and moisture being maintained. The hardier "Ridge cucumbers" may however be grown in the open, in the same way as Pumpkins or Vegetable-marrow. Mr. Nock has grown very fair cucumbers in frames at Hakgala Gardens, but market gardeners around Nuwara Eliya seldom attempt the cultivation of these. Seeds should be sown in pots or boxes under cover, and the seedlings planted out, when large enough, where they are to grow. A grateful substitute for the "English" Cucumber is found in the native "Pipingha" (See under *Tropical Vegetables*).

Endive. (*Cichorium endivia*. N. O. Compositæ).—An annual of Northern China, cultivated for its stocky head of leaves, which when tender are used as a salad and in other preparations. The plant is of easy culture, and may be seen occasionally in up-country gardens in Ceylon. Propagated from seed.

Knol-Kohl, or Kohl-rabi. (*Brassica caulorapa*, N. O. Cruciferæ).—This useful vegetable holds a place intermediate between the Cabbage and the Turnip, and is supposed to combine the flavour of both. The stem above ground widens into a turnip-like head, and is the part used. The plant is often erroneously referred to as the

turnip-rooted Cabbage, which is a different plant, the tuberous *root* of which is used. Knol-Kohl thrives remarkably well in the low-country, being able to resist heat and drought better than any other vegetable of the Cabbage family. Seed should be sown in drills about a foot apart, the plants being afterwards thinned out to a distance of 8 or 9 inches in the row; or seedlings may be raised in boxes or sheltered beds, and transplanted as Cabbage. The best time for sowing is at the commencement of the monsoons. There are several *green* and *purple* varieties, the green sorts being by some people considered the best.

Leek. (*Allium Porrum*. N. O. Liliaceae).—This thrives to perfection at the higher elevations, but its cultivation is not worth attempting below 2,000 feet. Sow seeds on sheltered beds or in boxes, before the commencement of either of the monsoons; prick out the seedlings when large enough to handle, and transplant these at intervals of 6 inches into well-manured, deep trenches. As the plants increase in height, the trench should be filled in gradually with earth so as to encourage the production of thick succulent and well blanched stems which are the part used. Leeks require rich loose soil and constant moisture. The "London Flag" and "Musselburgh" are old favourite varieties which are still perhaps unsurpassed for quality.

Lettuce. "Salada," *S.* (*Lactuca sativa*. N. O. Compositae).—This takes first place as a salad plant, and fortunately can be grown at almost all elevations in the tropics, but to greatest perfection in the Hills. The plant is an annual, prefers a rich mellow, humous soil, and responds well to manuring. Sowings should be made at intervals of three weeks or a month, so as to keep up a succession of crops. It is best to sow the seed in shallow drills on a well-prepared bed, afterwards thinning the plants out to about 6 or 8 inches apart; or the seed may be sown in seed-pans or boxes, and the seedlings transplanted out when they have obtained their second pair of leaves, though it is well to remember that Lettuce does not always take well to transplanting. In the tropics the plants soon run into seed. I am informed that a method adopted in Madagascar to prevent them from seeding is to cut the roots below the surface of the soil, this also being considered to have the effect of causing the plants to form a heart.

VARIETIES.—These are divided into two classes, viz., "Cabbage lettuce" (so-called from the round-cabbage-like heads with broad leaves), and "Cos-lettuce," the latter being distinguished by

erect conical heads and narrow pointed leaves. The former is considered the better kind for wet climates. Of both these there are numerous sub-varieties, as "White Dutch," "Golden Queen," "Little Gem," "White Silesion," "Green Paris," &c.

Maize.—See under *Tropical Vegetables*.

Mushrooms. (*Agaricus campestris*. N. O. Fungi.)—In Ceylon the vernacular names "Bim-mal" (Sinhalese) and "Kalang" (Tamil) are applied to all fungi. While many of the Ceylon fungi, whether growing naturally on the soil or on decayed tree trunks, &c., are edible, others are undoubtedly very poisonous. It is not always easy, especially for inexperienced persons, to distinguish the former from the latter, though some people consider that they can always do so. The best forms of fungi are those which, when young, are like round white buttons; when a day or two old, they open out like an umbrella, and the gills or under-side are found to be of a delicate pink colour. Poisonous kinds, though somewhat resembling these characters, are said to turn to a bright yellow colour when cooked. Fungi which have a slimy skin, or which when broken or bruised show an intense blue colour, should be avoided. Mr. Petch, the Government Mycologist for Ceylon, prefers not to lay down any hard and fast rule by which a novice may attempt to identify an edible from a poisonous fungus, and considers that "actual experience is the only test between these." Nor does Mr. Petch attach much importance to the nutritive value of edible fungi, an opinion shared by many other botanists. English Mushrooms are, however, a popular article of diet with many people, and are commonly imported in hermetically sealed tins for consumption.

For persons who wish to grow their own mushrooms, the following hints may be useful. Any room or cellar in an unused building or outhouse, which admits but little light, will answer the purpose of a mushroom-house; excessively wet or dry atmosphere must be avoided, and a high temperature is unsuitable. Horse-dung, being freed from grass or straw, should be collected daily and kept under cover until a sufficient quantity has been secured. It should be spread evenly over the floor to prevent premature fermentation. A bed should be made about 3 feet deep, consisting of alternate layers of horse droppings and good friable soil, finishing with a layer of the latter on top. The whole being beaten down firmly, the bed should be allowed to settle and ferment for about a week. Small cubes, about an inch square, of the mushroom spawn are then

planted on the surface, about 6 inches apart and an inch deep. Water the whole thoroughly, and if the weather be dry sprinkle the surface of the bed every morning and evening with water. A crop of mushrooms may be expected in five weeks to two months from date of spawning. Mushroom spawn in brick form may be imported from any nurserymen at Home. In the tropics it should be stored away in an air-tight tin until required for planting. Imported spawn in this form is usually prepared from the mycelium of *Agaricus campestris*, the common field mushroom of England, which is not indigenous to Ceylon, and can only be cultivated successfully in the Hill districts.

Oca-Quira. (*Ullucus tuberosus*. N. O. Basellaceæ).—This plant is a native of Peru, where it is cultivated for its tubers, which are said to be largely consumed like potatoes. It was introduced as small tubers at Hakgala, in 1885, when the late Superintendent reported that it grew rapidly, the tops dying down in November. "The tubers produced were from 2 to 3½ inches long, and shaped like a kidney potato." Usually, however, they are of the size of Hazel-nuts. The plants trail over the surface of the ground, rooting and producing small tubers at each node. If planted in good soil they will mature a crop in about five months from date of planting. The plant is suited to up-country only, and Mr. W. Nock stated it was best to plant the tubers in April, in rows about 18 inches apart. Thus treated, he found that "one plant produced as many as 636 tubers, weighing in all 6 lbs."

Onion. "Lunu," S. (*Allium cepa*. N. O. Liliaceæ).—Onions thrive moderately well in up-country gardens in Ceylon, and with careful cultivation occasionally attain fair success at intermediate elevations. A dry rather than wet climate suits them, and the best crops are produced in moderately dry districts, as at Wilson Bungalow. The Onion requires a light soil, which should be enriched with well decomposed manure. The seed may be sown broad-cast on raised beds, or in shallow drills about 8 inches apart; after sowing, cover the seed lightly with a sprinkling of finely sifted soil, and beat the surface of the soil gentle with the back of a spade or a flat piece of board. Or the seed may be sown in pans or boxes, and the seedlings transplanted out when strong enough into well prepared beds. The plants should not be closer than 5 to 6 inches each way, while they should be as near the surface as possible so as to encourage the bulbs to increase in size.

VARIETIES.—"Ailsa Craig," "Blood-red," "Sutton's A 1," "Tripoli," and "Veitch's Main Crop" are leading sorts. In India,

acclimatised varieties such as "Silver-skin" or "Patna-onion," and the large "Red Onion" are recommended for the plains.

Onion, Egyptian.—This produces on the flower-stalks bulbils of the size of marbles, which are excellent for pickling. Offset bulbs are also formed underground, and propagation is effected both by these and the bulbils produced on the flowering stem. Not cultivated in Ceylon.

Onion, Potato.—This is propagated by offsets produced underground, which are comparatively small in size and irregular in shape. The bulbs are planted singly, and around these new ones are formed. This variety is not increased by seed.

Onion, Welsh. (*Allium fistulosum*).—This affords the popular "Spring onions" of temperate countries. The plant is quite distinct from the common onion; no bulb is formed, the young tender stems being the parts used.

Onions, "Small." See *Shallots*.

Parsley. See under *Condiments, Seasoning & Pot-herbs*.

Parsnips. (*Pastinaca sativa*. N. O. Umbelliferae).—This excellent vegetable can be grown most successfully in up-country gardens, especially in sheltered and moist situations with loose, deep soil. It does not thrive at elevations below 4,000 feet. Its cultural requirements are similar to those of Carrots, but the plant needs greater space than the latter. Seed is best sown in drills about 15 or 18 inches apart, the plants being thinned out when a few inches high to distances of 10 or 12 inches. Medium-sized roots are preferred to those that are very large and liable to be bad at the core.

Peas. "Bola-kadala," *S.* (*Pisum sativum*. N. O. Leguminosae).—Peas of very fair quality can be grown in the Hill districts, and at lower elevations also appreciable crops may be obtained if seed be sown at the proper season and in well manured soil. In India, acclimatised seed is often preferred to imported seed for sowing on the plains. A variety of Peas imported from India as a food-stuff, which may be obtained from boutiques in Ceylon, will, if sown, often give a better crop in the low-country than English Peas. It grows to a height of about 3 feet, and bears small but well-filled pods, with small round grey seeds. For up-country, however, none but imported seed from temperate countries should be sown. A wet season is unsuited to the crop, and in order to avoid this the best time for sowing the seed is before the end of the monsoon rains, *i.e.* approximately (for Ceylon) July to August, and November to December.

The ground should be well-manured, and the seed sown evenly (about 2 inches apart) in uniform drills, being covered with about an inch of soil. If the weather be dry, water the ground after sowing the seed. As the plants grow, fill in the earth occasionally along both sides of the row, and when they are about 4 or 5 inches high place twigs and branches along either side for support to the plants. The distance between the rows may be about 2 feet for dwarf varieties, and 4 feet for larger kinds. Where ground has to be economised the rows may be several feet apart, and the intervening space cultivated with smaller crops.

VARIETIES.—The number of these is legion, many of which differ but little, if any. The following are distinct and of first-rate quality: "Sutton's Excelsior" (about 18 in. high), "Sutton's Green Gem" (15 in.), "Veitch's Acme" (3 feet), "Sutton's Ideal" (3 feet), "Yorkshire Hero" (2 feet), and "Captain Cuttle" (4 feet). The dwarfer varieties are the most suitable for dry districts.

Potato. "Arthapel," *S. (Solanum tuberosum. N. O. Solanaceæ)*.—Although very fair crops of certain varieties of potatoes can be grown in the neighbourhood of Nuwara Eliya, especially in the drier districts of Udapussellawa and Wilson Bungalow, the quality of the tuber is seldom comparable to good potatoes grown in temperate countries. Yet many people prefer the new-grown potato to the usually dried-up imported potatoes obtainable at stores. The best soil for potatoes is a light friable loam, and good drainage is essential. The ground must be manured, but not too heavily, as that will conduce to disease. The best time for planting varies according to district, but usually from September to November, and March to May will be found the most satisfactory periods for planting in Ceylon. It is, of course, needless to attempt growing potatoes under 4,000 feet elevation. New potatoes may be expected to be fit for consumption in about three months from the time of planting. Propagation is effected by means of "sets" (tubers), these being planted 3 or 4 inches below the surface at distances of about 9 inches, in rows about 18 inches apart. Needless perhaps to say, a crop should not be grown for successive seasons in the same ground.

VARIETIES.—The following have been found among the most successful in the neighbourhood of Nuwara Eliya: "Sutton's Abundance," "Satisfaction," "Ringleader," "Nonsuch," and "Ideal."

Radish. "Rabu," *S. (Raphanus sativus N. O. Cruciferae)*.—Radishes can be easily grown at all elevations. The seed,

if sown broadcast on the smooth surface of a bed, will germinate in two or three days, and the radishes are ready for use in about three weeks to a month afterwards. Sowing should therefore be made at frequent intervals to keep up a succession. Radishes do best in a partially shaded situation which can be kept moist. The young plants should at first be thinned to 2 or 3 inches apart, further thinning being effected by taking up the largest as these become fit for use. There are numerous varieties, which differ mainly in the shape of the succulent root, this varying between long, turnip-rooted and oval-rooted. "Cabbage-radish" is a name that may appropriately be given to a large perennial kind of radish which has been introduced from India, and may occasionally be found cultivated in low-country gardens in Ceylon. The root is not eaten, but the large outer leaves are used as green vegetable by the Natives, being picked as required.

Rhubarb. (*Rheum raphaniticum*. N. O. Polygonaceæ).—This delicious and wholesome vegetable can be grown with much success in hill gardens, but is quite unsuited to low or even intermediate elevations. The use of the succulent leaf-stalks for tarts, stewing, &c., is comparatively of modern date. Formerly the leaves only were used as a pot-herb, like spinach. Rhubarb thrives best in rich deep, but rather light soil, and prefers a shady situation. It is usually propagated by divisions of the roots or crowns, but may also be raised from seed.

Salsify, or Oyster Plant. (*Tragopogon porrifolius* N. O. Compositæ).—This vegetable is of easy cultivation up-country, except during the heavy S. W. Monsoon rains, and is commonly grown in the neighbourhood of Nuwara Eliya for market purposes. The root, which is not unlike a thin parsnip, is the part eaten; it is about the thickness of a man's fore finger, 9 inches long, and is fit for use in three to four months from the time of sowing the seed. The plant thrives on a rich sandy soil. Seed may be sown in drills, after the heavy rains are over, the seedlings being afterwards thinned out to about 4 inches apart. The flavour of the roots has a fancied resemblance to that of an oyster. There are various ways of preparing the roots for the table; they may be parboiled, cut into large pieces and fried in butter; or they may be boiled, then grated and made into cakes to be fried with butter.

Scorzonera, or Viper's Grass. (*Scorzonera hispanica*. N. O. Compositæ).—A herbaceous perennial, native of Europe, very

similar to Salsify, but differing from it in having broader leaves and black-skinned roots. The latter are the part used, and these are considered by some to be superior to Salsify. The same cultural conditions as recommended for the latter plant will suit *Scorzonera*; but the roots take longer than those of Salsify to be ready for use. *Scorzonera* is seldom, if ever, grown in Ceylon.

***Scorzonera deliciosa*.**—A species characterised by a sweeter flavour than the preceding one, extensively cultivated as a vegetable in Sicily, &c.

Sea Kale. (*Crambe maritima*. N. O. Cruciferae).—This vegetable, the young blanched and crisp shoots of which are used, is not grown in Ceylon, where the climatic conditions even at the higher elevations are not suited to it. Neither does it appear to be grown on the hills in India.

Shallots. (*Allium ascalonicum*. N. O. Liliaceæ).—A small bulbous perennial, grown for its bulbs, which are used for flavouring purposes, much in the same way as garlic; the bulbs do not however possess so strong an odour or flavour as the latter. Shallots are imported into Ceylon from Bombay, and sold in almost every bazaar or boutique, being largely used for curries, pickling, &c. Shallots may be grown successfully in a rather dry climate, at medium elevations, in light rich soil. They may be planted in drills about 8 inches apart, with a space of 6 inches separating the bulbs in the drill. Plants may also be raised from seed.

Solanum Commersoni* (N. O. Solanaceæ).—A new tuber vegetable, allied to the common Potato, and recently introduced from Uruguay. This has been experimented upon in England at the instance of the Board of Agriculture, and the results have been reported upon as promising, the plant being "likely to become a useful edible tuber, yielding heavily and being entirely resistant to disease." It is further stated that the plant "appears very susceptible to cultivation, and rapidly improves when grown in fertile soils." A violet-coloured variety is said to resemble externally the common Potato, but appears to be much more prolific than the latter, especially on wet land. In 1902 a yield of about 6½ tons per acre is reported to have been obtained in England on a fertile soil, but "without any manuring or cultivation beyond a single hoeing when the shoots first appeared." The plant is considered best suited to wet soils.

Spinach, English. (*Spinacea oleracea*. Chenopodiaceæ).—A stemless annual, native of Northern Asia, and cultivated in cool countries for the sake of its soft edible leaves, which when cooked

* Introduced at Hakgala Gardens in 1909.

and dressed form an agreeable vegetable. Spinach is seldom seen in up-country gardens, where however it should thrive well during the fine weather season. As it takes up but little room, it is adapted for growing between slower-growing crops. Seed may be sown in November, in drills about a foot apart, the plants being afterwards thinned out as may be necessary. Spinach loves a rich soil, a shady situation, and liberal watering in dry weather.

Sorrel. (*Rumex Acetosa*. N. O. Polygonaceæ).—A perennial, native of Europe, sometimes grown for its acid leaves, which are used as an ingredient in salads, or boiled and used as Spinach. Sorrel is not suited to low elevations, but will thrive in hill gardens. It is propagated from seed, and prefers a shady situation. Sow seed in drills one foot apart, and thin out the plants afterwards as may be required.

Spinach, New Zealand. (*Tetragonia expansa*. N. O. Chenopodiaceæ).—A tall annual, native of New Zealand, the leaves of which are used in the same manner as English Spinach. It is coarser than the latter, and has rather hairy glaucous leaves; it is of easy culture, and grows luxuriantly in hill gardens in Ceylon, where it has become semi-naturalised. Seed may be sown in drills, about 18 inches apart, the seedlings being afterwards thinned out as required.

Tomato. “Takkali,” S.; “Takkali-kai,” T. (*Solanum lycopersicum*, N. O. Solanaceæ).—An annual, native of South America, commonly grown in most countries for its fruit, which are esteemed in salads, and for making sauces, flavouring soups, &c. The fruits of superior varieties, when well-grown, are also used for dessert. Tomatoes can be grown with much success in the tropics, especially in rather dry districts, at medium elevations. They do best in rich and well-drained soil, and should not be grown for more than one season consecutively in the same ground. The seed should be sown in pots or boxes, the seedlings being afterwards planted out when strong enough into pots, tubs, or a sheltered border. Supports for the plants are essential, and this may be provided in the form of firm stakes, a fence, or low trellises. If the fruits fail to ripen on the plants in wet weather, they may be picked green and kept in a dry sunny place for a few days, as this will considerably advance their ripening. The plants should be regularly pruned, superfluous growth being cut out, shoots pinched back or removed, and the leaves reduced so as to admit light to the fruit. In Ceylon, tomatoes are grown for market chiefly in the rather dry district of Dumbara, and the plants are

generally raised from seed grown locally; but the fruits do not usually bear comparison in size or flavour with those generally seen in temperate countries. Very fair specimen fruits may, however, be obtained up-country during the dry season. Seedlings should be raised under cover and planted out about 4 feet apart in mounds or ridges. A well-drained, rich porous soil is essential.

VARIETIES.—The “Conqueror,” “Sutton’s Peach Bloom,” “Sutton’s Perfection,” and “Hathway’s Excelsior” are all good. The “Cherry” and “Red Currant” varieties bear numerous small fruits in clusters, and are very ornamental.

Turnip. (*Brassica rapa* N. O. Cruciferæ).—Turnips of very good quality can be grown at the higher elevations in the tropics. In the Hill districts, they are regularly grown for home consumption or for market purposes, the best crops being obtained in the drier season. At medium elevations of 2,000 to 4,000 feet, very fair roots may be obtained in the cool season. Turnips thrive best on soils of a light sandy nature, which must be enriched with well decomposed manure; stiff retentive soils are ill-adapted for them. Seed may be sown broadcast on well prepared beds, or in shallow drills about 14 to 16 inches apart, the seedlings being thinned out when 2 or 3 inches high, leaving a space of about 5 inches between them; further thinning can be effected by picking the largest turnips for use as required. The best time for sowing is before the end of each monsoon.

VARIETIES.—Amongst the best are “Early Snowball,” “Early White Dutch,” “Veitch’s Red Globe,” and “Scarlet Perfection.” On the plains of India, acclimatised varieties are said to give the best results.

Udo, or Oudo. (*Aralia cordata*. N. O. Araliaceæ).—A shrubby perennial with large compound leaves, attaining a height of 5 to 6 feet. The young and blanched stalks, which are from 10 to 16 inches long, are eaten as a salad vegetable in Japan, where the plant is said to be extensively cultivated for the purpose of supplying these. It is stated that the cultivation of this plant forms an important branch of market-gardening in Japan.

Vegetable Marrow. (*Cucurbito pepo*. N. O. Cucurbitaceæ).—This agreeable vegetable is commonly grown, and with much success, in the Hill districts, being unsuited to elevations below 4,000 ft. The plant grows rapidly and trails over the surface of the ground, producing gourd-like oblong fruits, which are most palatable if cooked before they have attained full size. The seed may be sown singly in a pot, the stronger seedlings being afterwards

retained and, when a few inches high, transplanted to well-prepared mounds or small hillocks not less than 6 feet apart each way. The mounds should have good drainage, and consist of well manured soil. The plant is monœcious, *i.e.*, the sexes are in separate flowers on the same plant; the female flowers must therefore be fertilised with the pollen of the male flowers, otherwise fruit will not set. The female flowers can at once be distinguished by their large and round base (the ovary), and also, of course, by having no pollen.



CHAPTER XIV.

SPICES, CONDIMENTS, AND SEASONING HERBS.

SPICES OF THE TROPICS.

[S=SIHHALESE; T=TAMIL].

From remote ages the spices of the tropics have attracted traders from distant lands, and formed a lure for adventurous explorers. More especially can this be said of the spices of Southern Asia, as the cinnamon of Ceylon, nutmegs and cloves of the Moluccas, cardamoms, ginger, and pepper of Southern India. Some of the ancient cities of Europe are said to have been indebted for a large share of their wealth to the trade in tropical spices during the time of the Romans. Cinnamon, which has long made the name of Ceylon famous, was from the earliest times perhaps the most coveted of all spices. It is mentioned in the Songs of Solomon and in the Book of Proverbs; the Arabians supplied it to the Greeks and Romans, but jealously shrouded in mystery the sources of its origin and the manner of obtaining it. It is supposed that the spice, being first brought from Ceylon to the western coast of India, was carried to Arabia and Egypt by African and Arabian traders, finally reaching Europe after a journey of very many months. Cinnamon was for a long period a State monopoly in Ceylon, and its cultivation was not declared free until 1833. At one time, it is said, cinnamon was sold in London for £8 per lb., pepper at 10s. a lb., while other spices commanded similar fabulous prices. As recently as 1880 cardamoms were sold for over 9s. a lb. In 1826 the English import duty alone on pepper was 2s. 6d. a pound, on nutmegs and mace 3s. 6d. a pound each, on cloves 5s. 7½d., while vanilla was taxed to the extent of nearly 17s. per lb.

DISTRIBUTION OF SPICES.

For a long period the uncultivated or wild trees of the forests furnished the world's supply of spices, which consequently was confined to the natural habitat of spice-yielding plants. Moreover, the spread and cultivation of spice trees was for a long time retarded by

the system of State monopoly established by the Dutch in the principal spice-producing countries. So severe, for instance, was the Dutch censorship in regard to Cinnamon in Ceylon that an infringement was, it is said, punishable even by death. The history of Cloves, Nutmegs and Pepper at the hands of the Dutch in the Malay Archipelago might be told in similar language, the plants being either deliberately destroyed, or their cultivation enforced to suit the circumstances. An amusing story told in this connection is, that the Home Dutch Government once despatched orders to their Colonial Governor requesting him to *reduce the number of Nutmeg trees*, but to *increase the cultivation of Mace trees*, being of course ignorant of the fact that both spices were produced by the same tree. But this is an error which is not uncommon even nowadays. Sir Hugh Clifford informs us how the clove tree became extinct in certain islands of the Moluccas, through being deliberately destroyed by the Dutch in their endeavour to secure the monopoly of the spice by confining the tree to Amboyna. Notwithstanding the severe restrictions of the Dutch, however, the escape of the precious spice plants to other countries gradually took place, both by smuggling and by the agency of migrating birds. Of the latter, the principal culprit was a kind of pigeon, which extracted the nutmeg from its pulpy covering, digested the mace, and voided the seed uninjured. The French succeeded in 1770 in introducing the Clove tree into Mauritius and Reunion, from whence it soon reached Zanzibar, &c. A striking result of this is that the world's greatest supply of cloves now comes from the latter island, and not from the native home of the tree, the Moluccas. Similarly Jamaica obtained Ginger from India, and has long practically commanded the supply of that spice; and the same may be said of Reunion and Seychelles in regard to the production of Vanilla, whose native home is South America.

THE IMPORTANCE OF SPICES.

Spices form one of the most important classes of vegetable products. They possess valuable medicinal properties, and their presence renders agreeable articles of food which are otherwise unpalatable. When used judiciously in cooking, spices aid the digestion by their effect in increasing the secretion of the gastric fluids; to the confectioner they are particularly essential, and are largely used for his purpose, more especially on the continent of Europe; while in the preparation of superior beverages they are also important. In medicine certain spices, especially ginger,

cardamoms, and cloves, hold a very important place, and doctors find them indispensable also in disguising nauseous decoctions. The antiseptic properties of spices, especially cloves, due to their volatile oils, is well known, and for preservative purposes both in domestic and scientific uses, they are often unsurpassed. The appropriateness of spices to sacred uses has long been recognised, being always a favourite ingredient for burning in incense ; while in certain social customs of oriental countries, spices are to this day used as an emblem of happiness. It is recorded, I believe, that spices were used in the funeral piles of the Egyptian Kings, and that the extravagant Nero burnt at the obsequies of his wife " a quantity of cinnamon and cassia exceeding in amount the whole importation into Rome for one year. " Finally, not the least virtue of certain spices is their effect in sweetening the breath of persons who are addicted to masticating habits, popularly known in the East as " betel-chewing. " For this purpose cardamoms especially are esteemed in India and Ceylon, and star-anise fruits in China and Japan. Certain authorities consider that the presence of spices has a beneficial effect on climate, their volatile oils acting as a preventive against mosquitoes and other germ-carrying insects.

The following are the principal spices of the tropics in alphabetical order, with a brief description, and notes on their cultivation and uses, &c. The botanical name and Natural Order are within brackets.

Allspice ; Pimento. " Jamaica Pepper " (*Pimento officinalis*. Myrtaceæ).—A small tree with smooth, white bark, 25 or 30 feet high, native of the West Indies and Central America. The dried unripe berries, which are of the size of small peas, are the Allspice or Pimento of commerce. The name " all-spice " is due to a supposed resemblance of the spice to a combination of the odour and flavour of cinnamon, nutmegs and cloves. The tree has been introduced into Ceylon over a century ago, and established at Peradeniya, where it flowers in the dry weather and occasionally sets a few fruits, but outside the Botanic Gardens it is rarely met with in this country. It is considered to yield best in a hot and rather dry climate, and prefers a loose loamy or alluvial, well-drained soil. In Jamaica the berries are picked by hand while green, but just ripe, and are then dried in the sun, the latter process taking six to ten days. The fruits are known to be sufficiently dry when the seeds rattle on shaking and are of a dark colour. A crop cannot be expected within six or seven years from the time of planting, and when in full bearing a tree will yield a hundredweight of the dried spice.



A SPECIMEN PLANT OF "MYSORE" CARDAMOM.

A.—FLOWER AND FRUIT RACEME. B.—DRIED FRUITS OR CARDAMOMS.



CARDAMOM PLANTATION.

Jamaica is the only country that exports this spice, which is sold at present in England at about 2*d.* to 3*d.* per lb.

Pimento oil, which is obtained by distillation from Allspice leaves, is imported into London and sold for 2*s.* 9*d.* to 3*s.* 6*d.* per lb.

Allspice, lemon-scented. (*Pimenta citrifolia*. Myrtaceæ).—This distinct spice-tree was introduced from Dominica to Peradeniya in 1888, and has become perfectly established here, being now about 30 to 40 feet high, of an erect slender habit; but it has not yet fruited. The leaves upon being bruised have a delightful lemon-scented odour.

Allspice, Carolina. (*Calycanthus floridus*. N. O. Calycanthaceæ).—A hardy shrub of North America, the wood and roots of which are of a spicy nature, and smell strongly of camphor.

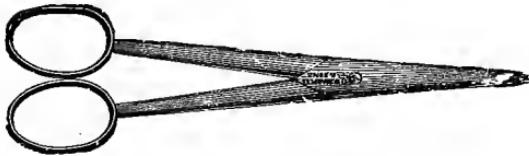
Allspice, Japan. (*Chimonanthus fragrans* N. O. Calycanthaceæ).—A shrub with small pale yellow flowers. Suited for high elevations only.

Bay-rum Tree, or "Wild Cloves" (*Pimenta acris*. Myrtaceæ).—A small West Indian tree, the aromatic leaves of which yield by distillation an oil which is used in the preparation of Bay-rum. The tree has been established at Peradeniya, and may be seen in the Spice collection there. The dried leaves are exported from Dominica and other West Indian Islands to America, &c.

Cardamoms; "Enasal," S. (*Elettaria Cardamomum*. Scitamineæ).—A perennial with large leafy shoots, 8 to 15 feet long, and strong creeping root-stock (rhizome), native of the moist forests of Ceylon and Southern India up to 3,000 feet. In cultivation it thrives best at 2,500 to 3,500 feet, and in partial shade. When starting a plantation, sufficient forest trees should be left to provide shade as well as to afford protection from strong wind and sun. The spice consists of the fruit, or rather the numerous small seeds enclosed by the green ovoid capsule. The fruits are gathered before being fully ripe, washed free from sand, &c., and then subjected to sulphur fumes, after which they are bleached in the sun; when dried and ready for export, they are of a pale straw colour. As they vary in size and shape, from $\frac{1}{2}$ to $\frac{3}{4}$ inch long, and from oblong to oval or almost round, they are graded for export. Cardamoms are a powerful aromatic and are used chiefly in confectionery, as an ingredient in curry powder, and also in medicine. The seeds are much esteemed by the Natives for use with masticatories, or for sweetening the breath. The plants are increased by division of the "bulbs" (rhizomes), or by sowing seed in well-prepared

nursery beds. In planting out, two to four "bulbs" or plants are placed in each hole or clump, these being 7 or 8 feet apart each way, or about 850 to the acre. A small crop may be expected in three years from the time of planting, and from the sixth year a return of 150 lbs. to 350 lbs. per acre may be obtained, according to cultivation, nature of the soil, &c. The plants are in bearing all the year round, the crop being gathered once every fortnight or three weeks. The fruits must be cut by scissors, not pulled by hand. Cardamoms fetch at present from 1s. 5*d.* to 3s. per lb. in London. Twenty years ago they were sold for as high as 9s. a pound. The total export from Ceylon for 1909 was 821,184 lbs., valued at Rs. 797,818. The highest price realised was about 2s. 7*d.* per lb.

VARIETIES.—"Malabar Cardamom" is distinguished by the leaves being softly pubescent on the under side, and the flower-racemes having a tendency to trail near the ground. "Mysore



CARDAMOM PLUCKING SCISSORS.

Cardamom" has the leaves glabrous on both sides, and the flower-racemes are of a more erect habit. The latter variety is therefore preferred for cultivation, as the fruits, being further from the ground, are not so liable to get damaged as those of the trailing racemes.

Cassia Bark. *Cassia Lignea*, or Chinese Cassia (*Cinnamomum Cassia*. Lauraceæ).—A small tree, 30 to 40 feet high, with long lanceolate brittle leaves, allied to the Cinnamon. The tree is a native of Southern China, and has been introduced in 1882 into Peradeniya, where it is now well established, bearing seed each year in July and August. The whole tree is pleasantly aromatic. In its native country it is cultivated for its fruit "buds" or for the bark; the former being picked by hand, and the latter peeled off much in the same way as cinnamon, and made up in bundles for export. The first crop of bark is said to be obtained when the trees are about six years old, the yield per acre being "about eleven piculs, (1 picul=132½ lb.), which is sold by the producers for about \$1.50 per picul." In addition to this, however, a yearly income is



CINNAMON PLANTATION.

made from the sale of leaves and the dried unripe fruits, the latter being exported as "Cassia Buds," which are esteemed as a spice, especially for confectionery. The tree is propagated from seed, and requires similar conditions of soil and climate to Cinnamon.

Chillies, or Capsicums; "Miris or Gasmiris," S.; "Kochika." *T. (Capsicum spp. Solanaceæ)*.—Small annual or biennial, herbaceous, shrubby plants, cultivated throughout the tropics for the sake of their pungent fruits, which are usually an indispensable spice in the food of people in tropical countries, more especially that of the Natives. The fruits are also used in pickles and sauces, in the manufacture of "Cayenne pepper," and in medicine. Though all are generally known as "chillies" or "capsicums," there are many species or varieties, such as *Capsicum annum* (Red pepper), *C. baccatum* and *C. minimum* (Bird pepper or Guinea-pepper), *C. frutescens* (Goat or Spur-pepper), *C. tetragonum* (Bonnet-pepper), *C. fastigiatum* (from Japan), &c. Some forms of chillies, known as "Bell Capsicums," are entirely free from the acrid and burning pungency peculiar to those named above, and may be eaten cooked as a vegetable or in salads. (See *Tropical Vegetables*). Chillies thrive best in loose humous soil, which must be well-tilled, and will grow up to 3,000 feet or more above sea-level. Seeds may be sown in beds or boxes, the seedlings being planted out in well prepared ground when 3 to 4 inches high, at distances of about 2 feet apart, or at the rate of 10,800 plants to the acre. A crop is obtained in about eight months from the time of planting, and the yield may be from 1,000 lbs. to 1,400 lbs. of dried chillies per acre. Chillies sell in London at 30s. to 45s. per cwt., the "Nepaul chillies" usually fetching the highest price, these being sometimes sold in London for £4 per cwt. Chillies are largely exported from Zanzibar, India, Natal, West Indies, &c.

Cinnamon; "Kurundu," S. "Kuruva," *T. (Cinnamomum zeylanicum. Lauraceæ)*.—A moderate or large-sized tree, 40 to 60 feet high, native of Ceylon and South India. In cultivation the tree is coppiced low so as to induce the growth of long straight clean shoots, which are cut periodically close to the ground in order to obtain the bark. The young clean bark is slit longitudinally and removed by the *peelers*; it is then piled into heaps to undergo a slight fermentation, a process which facilitates the next operation of removing the cuticle or epidermis, which is done by scraping with a curved knife. The bark then dries and contracts into quills, the smaller of which are placed inside the larger, forming smooth "canes" about 3 feet long which, when dry, are of a light yellowish brown

colour. These are made up into bales of about 100 lbs. for export. Two cuttings a year are obtained, each commencing with the rainy season, in May and October; the shoots cut are mostly of two years' growth. A return of a bale of 100 lbs. per acre may be expected from the first crop, in the fourth or fifth year from time of planting, the yield increasing each year until the eighth or tenth year, when two to three bales per acre may be obtained. About $6\frac{1}{2}$ million bales were exported from Ceylon in 1909, valued at Rs. 2,729,637. The price per lb. realised in London varies from 7*d.* to 10*d.* The tree is propagated by cuttings, layers, transplanted stumps, or by seed; seedling plants from nurseries, though usually taking longer to yield a return, are often preferred. The plants are put out in the field at a distance of about 10 feet apart, or approximately 435 to the acre. A light sandy porous soil produces the best cinnamon; the tree thrives up to about 2,000 ft. in the moist zone. *Cinnamon Chips* are the small waste pieces resulting from the cutting and peeling operations, and are exported chiefly for the distillation of *Cinnamon oil*. The latter is also manufactured in Ceylon to some extent and exported. There are several varieties of Cinnamon, the principal being "Penni" or "Rasa-kurundu," "Tittha-kurundu," and "Kahata-kurundu," all Sinhalese names. Cinnamon was the first article of importance exported from Ceylon, and at one time was sold in Europe for fabulous prices.

Clove; "Karâbu," *S. (Eugenia caryophyllata)*, Myrtaceæ.—A small conical tree, 30 to 40 feet high, native of the Moluccas, introduced and established in Ceylon before the arrival of the British. The cloves are the dried unexpanded flower-buds. These are picked green, usually during January and February in Ceylon, and being spread in the sun for a few days to dry they become brown. The tree likes a rich sandy soil on sloping land, and thrives up to 1,500 feet. It is propagated by seed, which takes five or six weeks to germinate. The seedlings, which are of very slow growth, may be planted out when 12 or 15 inches high, at distances of 20 feet apart. The first crop may be obtained when the trees are seven to eight years old, the yield increasing until they are about fifteen or twenty years old, when 8 lbs. to 10 lbs. of dried cloves per tree may be obtained. Zanzibar and Pemba furnish at present by far the greater part of the world's supply of cloves, Penang and Amboyna coming next in importance as sources of supply. The present price of cloves in London varies from 8*d.* to 1*s.* 2*d.* per lb.



CLOVE BRANCH.

A.—FLOWER-BUDS OR GREEN CLOVES. B.—DRIED CLOVES.



BRANCH OF MADAGASCAR CLOVE.
A.—GREEN FRUITS. B.—DRIED FRUITS OR "CLOVES."

Madagascar Clove, or Clove-nutmeg (*Ravensara aromatica*. Lauraceæ).—A medium-sized tree, 30 to 40 feet high, with small leathery leaves, native of Madagascar, introduced at Peradeniya in 1847. The whole tree is strongly aromatic. The round fruits, of the size of marbles, have a large hard kernel, which seems to combine the odour of nutmeg and clove, and is said to be used and esteemed as a spice in its native country, being also exported in small quantities to Europe. The tree is propagated by seed, and is suited to the moist low-country under 1,500 feet altitude.

Brazil Clove. (*Dicypellium caryophyllatum*. Lauraceæ).—A tree of Brazil, the "cloves" of which are said to be remarkable for their fine aroma, being largely employed in their native country for flavouring as well as for medicinal purposes. The bark furnishes what is known as "Clove Cassia."

Ginger; "Inguru," S., "Inji," T. (*Zingiber officinale*. Scitamineæ).—A herbaceous perennial, with leafy shoots which grow to a height of about 18 inches, native of Tropical Asia, but introduced and cultivated in all tropical countries. The underground tuberous stems (rhizomes), resembling thickened roots, are the ginger of commerce. These are called "hands" or "races," from their palmate shape, and are exported in two forms, *peeled* and *unpeeled* (or coated and uncoated) ginger. The former is prepared by scalding the tubers in boiling water, the epidermis being then removed by a narrow-bladed knife. Unpeeled or coated ginger (*i.e.*, not deprived of the epidermis) is merely washed, and then dried in the sun. The rhizomes are exported in bags or barrels, and sold in London at prices varying from 40s. to 70s. per cwt. according to quality. About 1840, ginger fetched as much as 180s. per cwt. in London. Jamaica ginger invariably commands the highest price, Calicut or Cochin ginger usually coming second. The plant requires an equable hot and moist climate, a shaded situation, a rich well-tilled, humous or loamy soil, and thrives up to 3,500 feet in Ceylon. It is propagated by division of the tubers or rhizomes, which are planted in rows 2 feet apart, with 16 inches between the plants in the rows. A harvest is yielded in about ten months from the time of planting, when the leaves begin to wither. Under favourable circumstances an acre will yield from 2,000 to 2,500 lbs. or more cured ginger, but the average return is about 1,200 lbs. per acre. Ginger has long been highly valued for medicinal purposes, especially in England; it is also esteemed in preserves and confectionery. Preserved ginger is prepared chiefly in China, where the plant is largely cultivated for this purpose.

Grains of Paradise, Guinea Grains, or Melegueta Pepper (*Anomum Melegueta*. Scitamineæ).—A herbaceous perennial, allied to the Ginger and Cardamom plants, native of West Tropical Africa. The small dark aromatic seeds are imported from the Gold Coast into Europe, where they are used chiefly in cattle medicine, for flavouring cordials, and for imparting an artificial strength to spirits, wine and beer. In Africa they are largely used by the Natives to season food, and are considered very wholesome. It is said that about 1,000 cwt. of this spice is imported annually into England, and sold for 80s. to 90s. per cwt.

Mace; “Wasâ-vâsi,” S., “Poolie,” T.—This consists of the net-like wrapper (*aril*) surrounding the nutmeg, inside the husk (see Nutmeg). At first scarlet, it becomes yellowish brown with drying and exposure. Mace is a much esteemed spice in Europe and America, being used in confectionery and for culinary purposes. In yield, the proportion of mace should be about one-fifth in weight of that of the nutmegs, and one hundred of the latter will produce about $3\frac{1}{2}$ oz. dried mace. *Good pale to fine red* mace fetches from 1s. 4d. to 2s. 3d. per lb. in London.

Nutmeg; “Sadhika” S. (*Myristica fragrans*. Myrtaceæ).—A medium-sized tree, 30 to 50 feet high, native of the Moluccas, introduced into Ceylon about 1804, now often met with cultivated in the low-country. The “nutmeg” of shops is the hard brown oval kernel of the fruit. Immediately surrounding it is the scarlet aril or *mace* in the form of a net, next to which is the thick fleshy juicy husk. The pale amber fruit much resembles a peach or an apricot in form and appearance. When ripe, the husk splits and discloses the nut covered with the mace. The nuts drop to the ground, when they are collected and separated from the mace; both are then dried separately in the sun or in heated sheds. The nuts are graded for export; 70 to 120 or more go to a pound, these fetching at present in London about 8d. to 1s. 4d. and $4\frac{1}{2}d.$ to $10\frac{1}{2}d.$ per lb. respectively, the largest size commanding the highest price. The tree thrives best in deep loamy and well-drained soil, in a hot and moist climate, and up to 1,500 feet elevation. Being diœcious—that is, the male and female flowers are borne on separate trees—it is impossible to tell to which sex a tree belongs until it flowers. The proportion of one male to ten or twelve female trees (or ten males to an acre) should be enough for ensuring fertilisation of the flowers of the latter. The trees become productive at the age of seven or eight years, and increase in yield till they reach about thirty years, when the

crop may be 3,000 to 5,000 or more nuts per tree. They produce two crops a year, and continue to be productive for very many years. Trees about seventy years old in Peradeniya Gardens bear heavy crops annually, and appear to be now in their prime. Propagation is usually by seed, which take about three months to germinate. Sow in pots or boxes under cover, or in a well-prepared bed in a shady corner; cover with an inch of fine soil, and water daily in dry weather; artificial shade is beneficial until the seeds have germinated. When the seedlings are old enough to handle, transfer them to baskets or bamboo pots, and plant out in permanent places when 8 or 10 inches high, at distances of about 30 feet apart. Owing to the uncertainty of the proportion of male to female plants when raised from seed, propagation by budding or inarching should as far as possible be resorted to.

Calabash Nutmeg, also called "Jamaica Nutmeg." (*Monodora Myristica*. Anonaceæ).—A small tree of Western Tropical Africa, with large oval leaves and sweet-scented flowers, introduced at Peradeniya in 1897. The large globular fruits contain a number of aromatic seeds, whose odour and flavour are considered to resemble those of the nutmeg proper. The tree is suited to the moist low-country, and thrives in moderately good soil. It has not as yet flowered or fruited at Peradeniya.

There are other so-called nutmegs, which are of little or no importance as spices, such as the "Brazil Nutmeg" (*Cryptocarya moschata*, Lauraceæ); "Clove Nutmeg" (See "Madagascar Clove"), the Papua Nutmeg (*Myristica argentea*), and the "Wild Nutmeg" of India and Ceylon (*Myristica laurifolia*).

Pepper. "Gammiris," S.; "Molavu," *T.* (*Piper nigrum*. N. O. Piperaceæ).—A creeping vine, indigenous to the moist low-country forests of Ceylon and South India. Both "black" and "white" peppers are obtained from the same plant. The berries (peppercorns) when of a reddish colour are picked and spread in the sun, when they become black and shrivelled. These when ground with the outer covering left on form "black pepper," or by depriving them of the black covering by maceration in water, "white pepper" is obtained. The pepper vine requires a moist heat with shade, and thrives up to 1,500 feet above sea-level. Artificial or natural supports, in the form of posts or trees, are necessary, the latter being preferable and more durable. Erythrina, Mango, Jak and other quick growing trees answer well for the purpose of supports, while they also provide a beneficial light shade. In Sumatra and Malaya, posts of some hard and durable wood are generally used

for supports. Propagation is best by cuttings, which should be selected from the ends of the best bearing vines, and may either be started in a nursery bed, or planted out *in situ* where they are to remain. A crop may be expected in the third year from planting, but the vines will not be in full bearing till the sixth or seventh year. The pepper vine yields two crops a year, and with good culti-



PEPPER BRANCH.

vation it is considered that a return of 2,000 to 3,000 lbs. per acre should be obtained, allowing for the plants to be planted 7 feet by 7 feet, or 880 to the acre. The most economical method of Pepper cultivation is to grow the vines on trees which are used as shade for other crops, as "Dadaps" in Tea or Cocoa. Pepper plants will continue to yield good crops for twenty-five to thirty years. The

present market price of pepper in London is from $3\frac{1}{2}d.$ to $4d.$ per lb., and the chief sources of supply are Penang, Sumatra, and Malabar.

Pepper, Cayenne—This is made by drying and grinding the smaller and most pungent kinds of chillies, the fruits of species of *Capsicum*, especially *C. annuum* and *C. minimum*. The Cayenne-pepper of shops is said to be usually adulterated with flour or other powders.

Pepper, Long—consists of the unripe fruiting spike of *Piper Longum*, dried in the sun. The plant is a native of India and



PEPPER VINES ON ERIODENDRON TREES, MATALE, CEYLON.

Ceylon, and is cultivated in parts of India. "Long pepper" is used chiefly in medicine, being less pungent than "black" or "white" pepper.

Pepper, Japan. (*Xanthoxylon piperitum*. Xanthoxylaceæ).—A deciduous tree of Japan, the black aromatic pungent fruits of which resemble pepper-corns, and are used as a spice in Japan.

Pepper, Negro; Ethiopian, or West African pepper (*Xylopia aromatica*. Anonaceæ).—A tall shrub, native of Western Africa, producing clusters of pod-like fruits which are about 2 inches long. These have aromatic and pungent properties, and when dried are used in West Tropical Africa instead of pepper.

Star Anise. (*Illicium verum*. Magnoliaceæ).—A shrub or small tree, native of Southern China, where it is cultivated for the sake of the fruits, which when ripe burst open and spread out in the form of a star. The whole fruit is agreeably fragrant and aromatic, and in China and Japan is much used as a condiment in cookery, also for chewing after meals to sweeten the breath, and as a digestive. It forms an important article of commerce in the Far East, and is imported into Europe and America to some extent for flavouring liqueurs and spirits, being the chief flavouring ingredient in the French “Anisette de Bordeaux.” An aromatic oil is obtained from the fruit by distillation resembling Oil-of-anise. Seeds have been imported on different occasions and sown at Peradeniya, but never germinated. It is said that the Chinese always boil the seed before it leaves the country, so as to maintain the monopoly of the spice. The “Japanese Star Anise” is the fruit of *Illicium anisatum*, which has somewhat the odour of Bay leaves.

Turmeric; “Kaha” S. (*Curcuma longa*. Scitamineæ).—A perennial herb, about 2 feet high, cultivated throughout Tropical Asia. The rhizome or tuberous roots are of a yellow colour and waxy resinous consistency; they are ground into a fine orange-yellow powder, which has an aromatic taste, somewhat resembling ginger. This is commonly used as a condiment in Native cookery, and is a prominent constituent of curry powders, being also employed in India for dyeing wool and silk. Turmeric is cultivated in India, whence it is chiefly exported to Europe, &c. Its price in London ranges from about 3*d.* to 6*d.* per lb. The plant is propagated by the rhizomes or by division of the crown, and is suited to loose rich soil under partial shade, in a hot and moist climate up to 2,000 feet. Under ordinary circumstances an annual yield of about 2,000 lbs. per acre may be obtained. Cultivation same as for Ginger.

Vanilla. (*Vanilla planifolia*. Orchideæ).—A creeping vine with long fleshy leaves, native of Mexico, and introduced into Ceylon in 1847. “Vanilla Beans” are the dried and cured pod-like fruits, so much esteemed from early times for flavouring purposes. *Vanillin*, the flavouring substance of Vanilla, has of late been produced artificially, and this together with over-production of the natural article has resulted in making the latter a less profitable cultivation. The vine thrives best in a hot and fairly humid climate, from sea-level to about 1,500 feet. It requires support in the form of light-foliaged trees, or trellises of bamboo, &c., and a mound of humous soil or leaf-mould should be placed round its roots at the base. Among the best live supports for Vanilla are Physic-nut

(*Jatropha Curcas*), Calabash (*Crescentia Cujete*), Erythrinas, and the Temple Tree (*Plumiera*). Cuttings of the vine from three to six feet long should be planted against the trees or other supports, and tied up to these until established. At the end of eighteen months the plants should be pruned back to induce accessible branches. A crop may be expected in three years from the time of planting. The principal flowering season of the vine in Ceylon is April to May. Owing to the construction of the flowers (which are naturally dependent on insect pollination), it is necessary to pollinate or "marry" them by hand, as otherwise few if any fruits will set.



VANILLA BRANCH. A—VANILLA PODS.

The marrying process must be done in the morning or forenoon, the operation consisting in lifting the adhesive pollen masses on a pencil, and bringing these in contact with the viscid stigmatic surface. An expert can pollinate from 600 to 700 flowers in half a day. Not more than six flowers in a cluster should be fertilised, and a vine should not be made to bear more than twenty-five to thirty pods, half that number being sufficient for a weak plant. The fruits are ready for gathering in six to nine months after fertilisation of the flowers, the proper state for harvesting being indicated by a slight yellowing at the end of the pods. The latter

when collected are dipped into almost boiling water, then placed in the sun to dry, after which they are "sweated,"—that is, rolled up in blankets every evening and placed in a closed box to ferment, being taken out and spread in the sun during the day. This process is continued for eight or ten days, when the pods will have become brown and pliable. When the curing is complete, vanillin accumulates as crystals on the pods. Pods which are



VANILLA VINES ON GLIRICIDIA TREES.

inclined to split should be tied up at the end with a piece of thread. If for export, it is necessary to further dry and occasionally turn the pods under cover for five or six weeks, when they may be graded, made up in pound-packets and packed in soldered tins. On an average 125 cured pods will weigh a pound. They are usually exported in boxes of 12 lbs. An acre of good Vanilla with about 680 plants is considered to give a return of about 200 lbs. of cured pods. The yield per acre in Hawaii has been

estimated at about 13,000 pods, producing about 120 lbs. of finished Vanilla beans, cured and ready for market. The price of Vanilla fluctuates considerably, ranging from about 6s. to 18s. per lb.

Vanillon, or Vanillos. (*Vanilla pompona*).—A native also of Mexico, yielding an inferior quality of Vanilla known by the names of "Vanillon" and "Vanillos." This is claimed, however, to have advantages over the Vanilla, its pods not having a tendency to split as well as being easily cured, whilst the vines are said to flower three or four times during the year.

Vanilla Essence.—According to the "Journal of the Jamaica Agricultural Society," this product is prepared in Jamaica from Vanilla beans, and is sold at 20s. per gallon, which is said to equal 10s. 6d. per lb. of cured beans.

Synthetic Vanillin. Notwithstanding the introduction of this article, there appears to be at present a fairly remunerative demand for Vanilla, the uses of which are numerous and increasing. It is stated that the Vanilla crop of Reunion for 1907, viz. 121,000 lbs., was sold at the average price of 16s. per lb.

Winter's Bark. (*Drimys Winteri*. Magnoliaceæ).—A small tree of temperate South America, the bark of which is aromatic, and sometimes used as a spice in medicine. The tree is well established at Hakgala Gardens, Ceylon, being suited only for up-country.

CONDIMENTS AND SEASONING HERBS.

Aniseed. (*Pimpinella anisum*. Umbelliferæ).—An annual, cultivated in the South of Europe for its small seed-like fruits, which are much used in confectionery and in the manufacture of a well-known cordial. The leaves are also used for flavouring purposes and garnishing. The plant requires a light rich soil, and may be grown from seed sown in drills 8 inches apart. Suited to a rather dry climate. It is said to be commonly grown on the plains in India, but is not cultivated in Ceylon.

Basil, Sweet ; "Suwanda-Tala," S. (*Ocimum basilicum*. Labiatae).—An annual about a foot high, native of India and naturalised or commonly grown in the low-country of Ceylon. It is cultivated in Europe and elsewhere for its highly fragrant and aromatic leaves, which are used for flavouring soups, &c., but their strong odour is disagreeable to some persons. The plant is sacred to the Hindus, and is commonly cultivated near their temples. Thrives best at low and medium elevations.

Borage. (*Borago officinalis*. Labiatæ).—A small annual with coarse hairy leaves and pretty, blue flowers, both of which are sometimes used in Europe for garnishing, but more frequently as an ingredient in claret-cup. It is not often grown in Ceylon, nor in India, though it will thrive, especially in the dry seasons, at the higher elevations.

Caraway. (*Carum Carui*. Umbelliferæ).—A biennial, native of Eastern Europe, 1½ to 2 feet high, cultivated for its well-known aromatic seeds which are much used in confectionery, also for flavouring spirits and perfuming soap. It does not seem to be anywhere grown in Ceylon, although it would probably succeed in dry districts at moderate elevations, as in Uva. The seed should be sown in drills one inch deep, with 12 inches between the drills, the plants being afterwards thinned out as may be necessary.

Chervil. (*Anthriscus cerefolium*. Umbelliferæ).—An annual, native of Europe, the young leaves of which are sometimes used as an ingredient in salads and for flavouring purposes. Suited to the higher elevations in India and Ceylon. Sow seed broadcast on a small bed.

Chives. (*Allium schoenoprasum*. Liliaceæ).—A small perennial, cultivated for its leaves, which are used in salads and soups instead of young onions. It is propagated by seed or division of the roots, and will grow in ordinarily good soil. The plant is little known in India or Ceylon, and the same is probably true of the rest of the tropics.

Clary. (*Salvia Sclarca*. Labiatæ).—A small biennial, the leaves of which are sometimes used for flavouring soups, &c. Seed may be sown in drills about 16 inches apart, or in boxes, the seedlings being afterwards transplanted to 9 or 10 inches apart. Sometimes grown in hill gardens.

Coriander. "Kothamallie," S. (*Coriandrum sativum*. Umbelliferæ).—An annual, cultivated in Europe as a seasoning herb; also commonly cultivated in India. The young leaves are used for flavouring soups and salads, and the seed in confectionery, medicine, &c. Succeeds in ordinary soils. Propagated from seed, which may be sown in drills, the plants being afterwards thinned out to 1 foot apart.

Curry-Leaf.—See "Karapincha."

Cummin; "Sudu-duru," S. "Shiragam," T. (*Cuminum Cyminum*. Umbelliferæ). An annual with Fennel-like feathery leaves, and seeds (fruits) like Caraway, but slightly larger and

lighter in colour than the latter. This appears to have been cultivated in Palestine from very early times, as it is mentioned in the Old and New Testaments. Cummin has similar properties to Caraway and Dill, and at one time largely took the place of these in confectionery and medicine. It is still very largely imported and used for seasoning purposes by the people of tropical South America generally, where, I am informed, it takes precedence of all other condiments. It is also imported into India, Ceylon, Straits, &c., and sold everywhere in the bazaars or boutiques as a condiment for meat-curries, and such like. Apparently it is nowhere cultivated within the Torrid Zone. The chief sources of production are Persia, Turkey and Morocco, though it is said to be also somewhat extensively grown in the Punjab and N. W. Provinces of India.

Dill. (*Peucedanum graveolens*. Umbelliferæ).—A biennial of Southern Europe, the aromatic leaves of which are used in soups, sauces, &c.; the seeds yield an oil of medicinal value and from which the well-known "Dill-water" for infants is made. The plant is of easy culture, and thrives in various parts of India. Seed may be sown in drills, and the plants afterwards thinned out.

Fennel; "Maha-duru" or "Bata-anduru," S. (*Foeniculum vulgare*. Umbelliferæ).—A herbaceous perennial, native of South Europe, commonly grown in Ceylon as well as in India. In North-Western India it is sometimes grown as a field crop for its fruit. The tall, finely-divided aromatic leaves are used in fish-sauces and for garnishing, the leaf-stalks are employed in salads, and the seeds in confectionery and for flavouring liqueurs. Propagated from seed, which may be sown in boxes, the plants being afterwards put out 12 inches apart in rows. The plant thrives best in moist situations, being suited to elevations of 2,000 feet upwards.

Garlic; "Sudu-lunu," S. (*Allium sativum*. Liliacæ).—A bulbous-rooted perennial, native of Central Asia, and naturalised in Southern Europe. It is much cultivated in India and the East generally for its small white, onion-like bulbs. These are sometimes used in Europe for flavouring soups, stews, &c. In India, Ceylon and certain other tropical countries they are universally sold in the bazaars or boutiques, being largely used in native cookery and medicine. The plant will thrive almost anywhere on the plains or hills, but succeeds best in a light, rich, rather dry soil. It is commonly cultivated by the Natives of Ceylon, but the market supplies are imported principally from India. Propagated by the bulbs.

Horehound. (*Marubium vulgare*. Labiatae).—A small perennial, sometimes cultivated in England as a pot-herb. A decoction of the leaves is a popular remedy for coughs, &c. Not commonly grown in Ceylon or India. Propagated by seed.

Horse-radish. (*Cochlearia Armoracia*. Cruciferae).—This well-known plant is commonly grown in hill gardens throughout India, Ceylon, &c., but is quite unsuited to the plains or low elevations. The bitter tuberous roots, which are scraped or grated, are used in soups, sauces, &c. The plant is propagated by planting pieces of the roots, preferably the crowns, and thrives best in a deep, rich and rather moist soil. Deep holes may be made about 15 inches apart, in rows, and filled in with well-manured soil. Four or five months are required to mature a crop. By clearing away the soil from the upper portion of the root and removing the fibrous side-roots, the main root becomes thicker and longer.

Horse-radish Tree ; "Murunga," S. (*Moringa pterygosperma*. Leguminosae).—A small tree, the main thick root of which is commonly used throughout India as a substitute for horse-radish, to which however it is much inferior in flavour. The long pods, produced chiefly in March and April, are very generally consumed in an unripe state as a curry vegetable by the Natives.

Hyssop. (*Hyssopus officinalis*. Labiatae).—An aromatic dwarf shrub, cultivated in European gardens. The leaves are sometimes used for flavouring, as well as in medicine. Propagated by seed. Succeeds in light rich soil ; not suited for low elevations, but may be grown in the hills.

"Karapincha," S. ; "Karivempu," T. ; Curry-leaf (*Murraya Koenigii*. Rutaceae).—A small tree of the Orange family, native of Ceylon and found chiefly in the dry region. It is familiar as the Curry-leaf plant, the pungent aromatic leaves being a constant ingredient in curries, mulligatawny, &c. It prefers light rich soil, and with cultivation will thrive up to at least 2,000 feet in Ceylon. Propagated from seed, which are in season in April.

Lavender. (*Lavendula vera*. Labiatae).—A dwarf shrub, native of South Europe, commonly grown for its pleasantly aromatic flowers, which are dried and put into wardrobes. The leaves are sometimes used as an ingredient in seasonings. The plant is cultivated commercially for the highly-esteemed perfume (Lavender-water) obtained by distillation of the flowers. Lavender succeeds in the hill gardens in India and Ceylon ; at Nuwara Eliya it flowers and seeds freely. Propagated from seeds or cuttings.

Lemon-grass; "Sayra," *S.* (*Andropogon citratus*. Graminæ).—The white fleshy heart of the leafy stalks of this well-known fragrant grass (cultivated for the Lemon-grass oil, obtained from the leaves) are very generally used by the Natives of Ceylon for flavouring curries, being also sometimes used in pickles. The stalks are commonly sold in the markets and bazaars at $\frac{1}{2}$ cent each.

Marigold, Pot. (*Calendula officinalis*. Compositæ).—An annual of Southern Europe, commonly grown as an ornamental flowering plant. Its flowers are edible, and on the Continent of Europe are generally used for flavouring soups, &c. The plant is commonly grown for its showy flowers at medium and high elevations.

Marjorum, Sweet. (*Origanum marjorana*. Labiatae).—A biennial, native of Northern Africa, &c., cultivated in European gardens for its aromatic leaves, which are used both green and dried for seasoning soups, &c. It is propagated by seed, and is adapted to cultivation in hill gardens in the tropics.

Marjorum, Pot. (*Origanum Onites*).—A perennial, native of Sicily. Propagated by division of the roots.

Mint; "Meenchi," *S.* (*Mentha viridis*. Labiatae).—A small herbaceous perennial with creeping rhizomes. It is one of the most valuable of all seasoning herbs, and is universally cultivated in temperate climates. The tops and young leaves are used for flavouring in numerous ways, as in soups, salads and sauces, or boiled with peas, potatoes, &c. The plant grows freely in Ceylon hill gardens, becoming acclimatised in places; it also thrives moderately well in damp and shady places in the low-country. It is easily propagated by division of the roots and underground stems, and is especially suited to a moist rich soil.

Mustard; "Aba," *S.* "Kadugu," *T.* (*Sinapis nigra*; *Brassica juncea*. Cruciferæ).—A small annual, introduced into Ceylon and now naturalised in waste places in the low-country. The small seeds, when powdered form, the well-known condiment mustard; they are also used whole for flavouring pickles and numerous preparations. In Europe the plants when very young are used as salad, usually with Cress. Propagation by seed; sow broadcast on a smooth surface of loose, friable soil.

Parsley. (*Petroselinum sativum*. Umbelliferæ).—From early times this has been cultivated as a medicinal plant. It is now universally grown for seasoning and garnishing purposes, and no garden is complete without it. It grows luxuriantly up-country and, with some shelter from sun and heavy rains, will also thrive tolerably well at medium and even low elevations. Seed is best

sown at the end of the heavy rains, or on the plains before the cold weather sets in, either in drills in the open, or in boxes under cover, afterwards transplanting the seedlings out with a good ball of the earth in which they germinated. Parsley thrives best in a rich soil ; in the low-country a damp shady situation suits it best. There are many varieties, among those well-known being "Myatt's Garnishing," "Sutton's Imperial Curled," "Fine Double Curled," &c.

Rosemary. (*Rosmarinus officinalis*. Labiatæ).—A dwarf shrub, native of South Europe, and commonly grown in European gardens for its pleasantly fragrant leaves. These are occasionally used for seasoning, and a decoction is made from them for relieving headaches and for hair-wash ; they are also used in the manufacture of Eau-de-Cologne and other scents. Propagated from seed. Suited for hill gardens.

Rue ; "Herb of Grace," (*Ruta graveolens*. Rutaceæ).—A small under-shrub with glaucous greyish leaves, commonly grown in European gardens. The leaves have an unpleasant smell and a hot bitter taste ; they are sometimes used for garnishing, but more frequently in medicine for their carminative properties. The plant grows in shaded spots at medium elevations, but does best in the hills. Propagated from seed or cuttings.

Sage. (*Salvia officinalis*. Labiatæ).—This well-known seasoning plant is successfully cultivated in hill gardens. By sowing seed at the end of October or early in November, it will succeed fairly well also at intermediate elevations. It is usually propagated by seed, sometimes by cuttings, and thrives best in light rich soil. The plant is a small evergreen shrub, native of South Europe.

Sapphire. (*Crittimum maritimum*. Umbelliferæ).—A small sea-coast perennial, native of Europe, sometimes cultivated for its leaves, which are used in salads, also as a seasoning and for pickling in vinegar. The plant requires a light sandy soil and a moist situation. Sprinkling it occasionally with salt water is said to encourage its growth.

Savory, Summer. (*Satureia hortensis*. Labiatæ).—An annual, native of Italy, frequently cultivated in European gardens as a seasoning herb. The whole plant is aromatic and the tops are used for flavouring salads and soups ; they are also boiled along with peas, beans, &c. Though suited to the hill gardens, the plant is seldom grown in Ceylon. Propagated from seed or by division.

Savory, Winter. (*Satureia montana*).—A small evergreen shrub, native of South Europe, often grown for seasoning purposes. Cultivation the same as for Summer Savory. Propagated from seed or by division.

Shallots.—See under *Temperate or Sub-tropical Vegetables*.

Sweet Basil.—See Basil.

Tarragon. (*Artemisia Dracunculcus*. Compositæ).—A small perennial, native of Siberia, cultivated for its aromatic leaves; these and the young tops are used in salads and soups, being pickled with cucumbers; an infusion of them forms the much-esteemed Tarragon wine, also Tarragon vinegar. The plant requires a light free soil, and is generally propagated by division of the roots. It does not seem to be well-known in the hill gardens of Ceylon or India, though there seems no reason why it should not thrive there.

Thyme. (*Thymus vulgaris*. Labiatae).—This small under-shrub is a favourite amongst seasoning herbs. The aromatic leaves are generally relished as a seasoning in soups, stuffings, &c. The plant thrives in up-country gardens, and prefers a light rich and rather dry soil, and a sheltered situation. It is propagated by seed, which may be sown broadcast on a bed with a smooth surface, or in shallow drills 8 inches apart. The seedlings should afterwards be thinned out to a distance of about 3 inches each way. Or seed may be sown in pots under cover, the seedlings being pricked out and transplanted when strong enough.



CHAPTER XV.

BEAUTIFUL FLOWERING AND FOLIAGE TREES OF THE TROPICS.

SUITABLE FOR LOW OR MEDIUM ELEVATIONS.

FLOWERING TREES :—

[S=SINHALESE ; T=TAMIL].

Properly speaking, all trees are *flowering trees*, that is, they normally produce flowers, whether these be showy or inconspicuous ; but for practical purposes only such as may come under the term commonly understood as “flowering trees” are here included. For trees whose beauty consist chiefly in their form or foliage, see *Ornamental Foliage Trees*. Many of the following species, however, combine to a large extent both beauty of foliage and flowers. Some flowering trees are deciduous, and develop their floral display when devoid of leaves, while others are in their full glory of foliage and blossom simultaneously. Flowering trees in the tropics may be employed for useful as well as for ornamental purposes, as (when suitable kinds are available) for planting for shade in thoroughfares, parks, or pleasure grounds. It is asserted, with sound reason, that the planting of bright flowering trees around bungalows situated in lonely districts and surrounded by monotonous plantations, would go far to relieve the depressing effect often inseparable from such situations.

Flowering trees for street-planting, &c.—An important quality of a flowering tree is its suitability for planting in public thoroughfares. For this it should obviously be an ever-green, or at least have the property of developing young foliage soon after the shedding of the old leaves. *Peltophorum ferrugineum* and *Inga Saman* (Rain Tree) for example, answer this purpose admirably. If the name of the tree employed is such as to lend itself to use as a street name, it might with advantage be so adopted ; for while thus tending to impress the charm of the tree, the name would obviously be an improvement on some of the street names now

in use. For example, "Amherstia-avenue" would be preferable to "Slave Island-road," "Cassia-terrace" to Jail-road," "Spathodea-grove" to "Paranawadiya-lane," and so on. The following are some of the most beautiful flowering trees of the tropics, given in alphabetical order. By coincidence, the first on the list is perhaps the finest flowering tree in the world.

✓ **Amherstia nobilis.** (N. O. Leguminosæ). Named in honour of Lady Amherst.—A medium-sized tree, native of Burma, and considered the most beautiful of all flowering trees. Its immense candelabrum-like sprays of red and yellow flowers, drooping from every branch among the handsome foliage, present an appearance of astonishing elegance and loveliness. It is in flower during the greater part of the year, but its chief flowering season in Ceylon is from January to April, *i.e.* the dry season. The tree thrives in the moist low-country up to 1,600 feet, and requires rich and well-drained soil. It does not seem to flourish near the sea, and is rarely met with about Colombo. It produces seed very scantily in Ceylon, a pod or two occasionally being all that can be obtained. Propagation by layering has, therefore, to be adopted. Introduced into Ceylon in 1860.

✓ **Bauhinia triandra.** (N. O. Leguminosæ). "Mountain Ebony."—A small tree with very showy large flowers, which are mainly of a pink shade merging into purple, and are borne in racemes. Each of the leaves is composed of two leaflets joined at the base; hence the genus takes its name from Bauhin, the twin brothers and botanists.

Brownea ariza. (N. O. Leguminosæ).—A small spreading tree with pinnate, drooping foliage, native of Tropical America, and introduced into Ceylon in 1884. It bears from the ends of the branches very large clusters of blossom, which weigh down the branches. The flowers are of a deep rose-colour, of great beauty, and resemble in form large Rhododendron flowers.

B.—coccinea. (Scarlet).—A short spreading tree, native of South America, and introduced into Ceylon in 1849. It is distinguished from the other Browneas by the small but numerous clusters of scarlet flowers, produced on the stem and older branches.

B—grandiceps. (Large-headed).—A larger and handsomer tree than either of the former two species, native of Venezuela, introduced into Ceylon in 1870. A very beautiful tree when in blossom, the bright-red flowers being borne in very large heads at the ends of the branches. The foliage, too, is very handsome, the young leaves being produced in long, drooping bunches, similar to those of Amherstia.

B.—macrophylla. (Large-leaved).—A strong-growing species, introduced at Peradeniya in 1894. It is of a less free-flowering habit than the three species above named, but the flower-heads are larger, and of a pleasing shade of rose-colour; the very long and bright-coloured stamens also distinguish the flowers from those of the other species of *Brownea*.

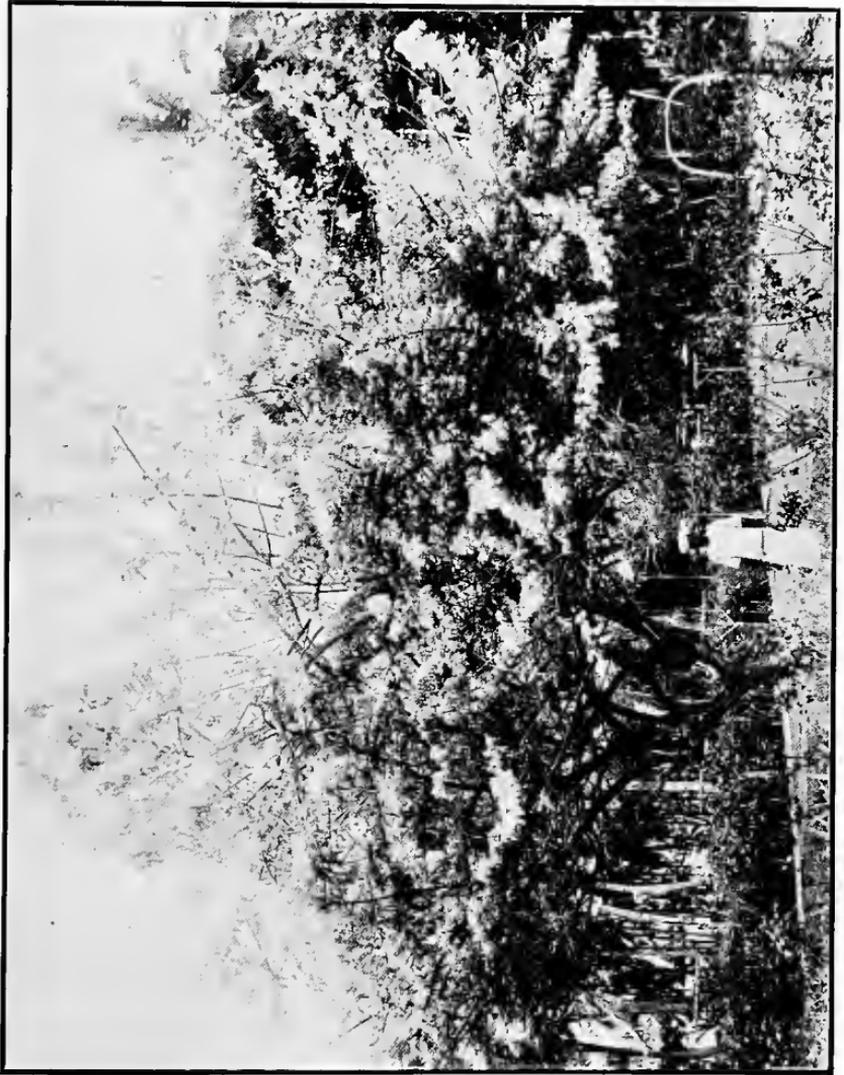
Butea frondosa. (N. O. Leguminosæ). Bengal Kino Tree. "Gas-kela." S. "Parasu," T.—An erect tree with trifoliolate leaves, indigenous to the forests of the dry region of India, Ceylon, and Burma; reaches a height of about 40 feet, and bears in the dry months a profusion of orange-scarlet flowers. The tree furnishes a resin ("kino") and a useful fibre; a lac is produced on the young twigs, and the flowers are used in India for dyeing yellow and orange-red.

Cassia Fistula. (N. O. Leguminosæ). Indian Laburnum; Pudding-pipe; "Ehela," S. "Tirukkontontai," T.—A small upright tree, common in the forests of the dry region of Ceylon and India. It forms a beautiful object when in blossom, the flowers being bright-yellow, borne in numerous long pendulous racemes. The latter are used in temple ceremonies, and the astringent bark for tanning and in native medicine. The black cylindrical pods grow to a length of from 20 to 30 inches; the pulp of these is a well-known purgative. Suited chiefly to the rather dry region, but with good drainage will thrive in the moist districts up to 2,000 feet.

C.—grandis. (Great). "Horse Cassia."—A native of South America, growing to a height of 40 to 50 feet; bears a profusion of pink inflorescence during the dry months of February and March, when the tree is completely deciduous. It produces in June an abundance of thick coarse-skinned and slightly curved pods, the pulp of which has an offensive odour.

C.—marginata. (Marginated leaf). "Ratu-wa," S., "Vakai," T.—A small graceful tree with spreading, drooping branches, common in the dry region of Ceylon and also in South India; very ornamental when bearing its racemes of rose-coloured flowers, produced in July and August.

C.—multijuga. (Many-yoked).—A slender quick-growing tree of Tropical America, introduced at Peradeniya in 1851. Remarkably beautiful when in full blossom, during August and September, being practically smothered with very large racemes of bright-yellow flowers, suggesting a magnified *Calceolaria*. The tree



"MADRE." GLIRICIDIA MACULATA.



JACARANDA MIMOSÆFOLIA.
(Showing leaves and flowers).

luxuriates in the moist climate of Peradeniya, but does not produce seed here. At Anuradhapura, however, in the drier region, it bears fruit. It may be propagated by cuttings.

√ **C.—nodosa.** (Knotted, referring to the knotted stems).—A moderate-sized tree, native of Eastern Bengal and Malaya, very beautiful when bearing its profusion of bright pink and rose-scented flowers, during May and June. The flowers are followed by cylindrical pods, 12 to 15 inches long. The tree is deciduous in the dry weather.

Cochlospermum gossypium. (N. O. Bixaceæ)—“Kinihiriya” or “Ela-imbul,” S. “Kongu,” T.—A rather small tree, native of Central India. It has become semi-naturalised in some dry districts of Ceylon, and is often found planted near Buddhist temples. A beautiful tree when in blossom (during February or March), with its large bright yellow flowers, which are esteemed as temple offerings. The tree is deciduous in the dry weather; thrives in either dry or moderately wet districts below 2,000 feet.

Colvillea racemosa. (N. O. Leguminosæ). Named in honour of Sir Charles Colville, when Governor of Mauritius.—A medium-sized tree, 30 to 40 feet high, with handsome pinnate leaves, native of Mauritius and Madagascar. It bears in September large, erect, close racemes of bright scarlet flowers, presenting a very showy appearance. Suited to the moist or moderately dry low-country.

Couroupita guianensis. (N. O. Myrtaceæ). Cannon-ball Tree.—Though not ordinarily a beautiful tree, it is very striking when bearing its huge woody racemes (4 to 6 feet long) of very curious pink and white flowers. These are followed by large brown globular fruits, which attain the size of the human head and contain a mass of very sour-smelling pulp. The tree is a native of Tropical South America; introduced at Peradeniya in 1881, and has flowered and fruited regularly since 1898, when it flowered here for the first time. Suited to the moist low-country. Propagated by seed.

Gliricidia maculata. (N. O. Leguminosæ). “Madre” of South America.—A small, quick-growing, elegant tree, introduced from the West Indies about 1889. It bears long, arching, feathery and leafy branches, which in the dry weather drop nearly all their leaves and produce along the greater part of their length masses of pinkish-purple flowers, making the tree a striking object for a time. It thrives up to 2,500 feet, and may be seen flourishing in the Victoria Park and elsewhere about Colombo. Its quick growth and light feathery habit commend it as an excellent shade tree for crops and green-manuring. For the latter purpose, it has also the

merit of belonging to the nitrogen-collecting tribe of Leguminosæ. The tree forms good support for Vanilla vines. It is considered to have been first introduced into Ceylon by Mr. C. Driberg, when Superintendent of the former Agricultural School.

✓ **Jacaranda mimosoefolia.** (N. O. Bignoniaceæ).—A very elegant tree, both on account of its leaves and flowers. It reaches a height of 40 to 50 feet, and bears at different seasons, but chiefly in the drier months, a profusion of blue bell-shaped flowers on the young shoots as well as on the older branches. The elegant bipinnate Mimosa-like leaves make the tree well worth growing as small ornamental foliage plants in pots.

Kleinhovia hospita. (N. O. Sterculiaceæ).—A large handsome Malayan tree, introduced into Ceylon about 1820. It bears large terminal panicles of pink or rose-coloured flowers, which appear during July or August. Thrives in the moist low-country.

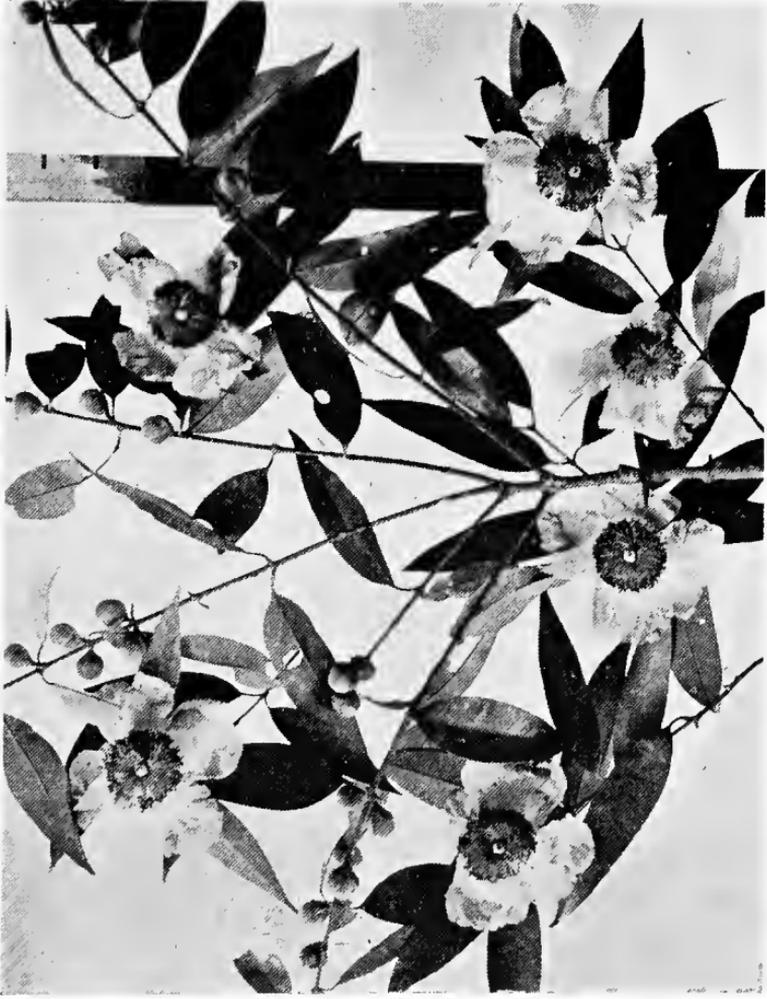
✓ **Lagerstroemia flos-reginæ.** (N. O. Lythraceæ). "Pride of India," "Murutu," S.—A tree of about 50 to 60 feet in height, native of Ceylon, India, and Malaya. It is undoubtedly one of the most strikingly showy of flowering trees, and from April to July or later it bears from the ends of the branches huge panicles of large beautiful mauve or pink flowers. The older trees are deciduous for a short period during the dry weather. There are two or more varieties; a variety which is common in Ceylon has lovely bright-pink flowers, and is exceedingly attractive.

L.—tomentosa. A moderate-sized handsome tree, native of hot and moist parts of Burma, introduced at Peradeniya in 1891. It blossoms twice a year, in April and October, bearing large erect panicles of lovely white flowers, produced from the end of every branch. A very ornamental tree when in blossom.

Ligustrum Walkeri. (N. O. Oleaceæ). Ceylon Privet.—A small shrubby tree, with fine foliage, producing after the rains large clusters of creamy-white scented flowers. It is indigenous to the lower montane zone of Ceylon (3,000 to 5,000 feet), and is propagated from seed.

Lysidloe rhodostegia. (N. O. Leguminosæ).—A large handsome tree, native of Southern China, introduced at Peradeniya in 1882. It thrives here and bears from December to February masses of pink or rose-coloured inflorescence, produced erect from the extremities of the branches. The persistent coloured calyces render the tree very showy for several weeks.

Mesua ferrea. (N. O. Guttiferæ). Iron-wood; "Na-gaha," S., "Naka," T.—A moderate-sized, broadly conical, slow-growing tree,



CEYLON IRON-WOOD TREE. *Mesua ferrea*.

native of the hot and moist regions of Ceylon, India, and Malaya. A very handsome tree, much in favour for planting near Buddhist temples. It blossoms profusely in the months of April or May, the large white flowers, with yellow stamens, being delicately scented. The young leaves, which appear twice a year, are of an intense blood-red colour, passing through delicate shades of pink into the dark-green of the adult growth.

Millingtonia hortensis. (N. O. Bignoniaceæ). Indian Cork-Tree.—An erect tree with deep-green finely divided leaves, reaching a height of 50 feet or more; bears in November and June a profusion of long, pure-white, fragrant flowers. The tree is a favourite in Indian gardens; thrives up to 2,000 feet in Ceylon.

Oncoba spinosa. (N. O. Bixaceæ).—A small bushy tree of Arabia, with light green, small ovate leaves. It bears during April, from the underside of the young branches, large, single, white flowers with yellow stamens, delicately scented and suggesting in appearance large dog-roses. Introduced at Peradeniya in 1883. It has not yet set fruit here.

Peltophorum ferrugineum. (N. O. Leguminosæ). "Iyavaki," T.—A large, quick-growing, symmetrical tree, with a spreading top and fine graceful feathery foliage, indigenous to Ceylon and Malaya. The young leaves and shoots are covered with a brown velvet tomentum, from which the tree takes its specific name. The tree flowers twice a year at irregular seasons, some specimens being in blossom while others by its side may be in ripe fruit. The flowers are rusty-yellow, sweet-scented, and borne in large erect panicles. Dr. Trimen stated: "It is a magnificent sight when in full blossom." It is especially suited to dry districts, but also thrives to perfection in the moist region up to 1,800 feet.

√ **Plumeria acutifolia.** (N. O. Apocynaceæ).—Temple Tree, Pagoda Tree, sometimes called "Frangi-pani;" "Evarriya" or "Araliya," S.—A low, spreading, succulent tree or large shrub, introduced from Tropical America and now naturalised in Ceylon, India, &c. It is a familiar tree in the Eastern tropics, especially throughout the low-country of Ceylon, being often planted near Buddhist temples. The tree is bare of leaves throughout the dry weather, when it bears large corymbs of white and highly fragrant flowers.

P.—rubra. (Red).—A tree similar to the latter, but of a less spreading habit, bearing bright-pink or crimson flowers. It is a native of Central America, and was first introduced at Peradeniya in 1900. Very showy, and remains in flower for several months.

✓ **Poinciana regia.** (N. O. Leguminosæ).—Flamboyante, Flame Tree, Gold Mohur.—A gorgeous tree when in full blossom bearing immense panicles of scarlet or orange and yellow flowers, native of Madagascar, and introduced into Ceylon before 1841. It is a very striking object in and about Colombo during the months of March to May. The tree grows from 50 to 60 feet in height, and has handsome, fine, feathery leaves.

Posoqueria longiflora. (N. O. Rubiaceæ).—A moderate-sized, quick-growing tree, with large deep-green leaves, native of Tropical America. It produces long, tubular, white and sweet-scented flowers, borne in pendulous clusters during May and September. Suited to moist districts up to 2,000 feet.

Pterocarpus echinatus. (N. O. Leguminosæ).—A moderate-sized spreading tree, native of the Philippines, introduced at Peradeniya in 1882; bears large racemes of pale-yellow flowers at the ends of the branches, during April or May. Very ornamental when in blossom. Suited to the low-country.

Saraca declinata. (N. O. Leguminosæ).—A small tree, native of Sumatra, introduced at Peradeniya in 1870. It forms a beautiful sight when bearing its huge heads of bright orange-yellow flowers, produced on the stems and older branches during February and March. Thrives best in partial shade in the moist low-country.

S.—indica. (Indian). “Diya-ratmal” or “Diya-ratambala,” S.—A small spreading tree, native of Ceylon and South India. On the stems and branches are produced, chiefly in the dry weather, large sessile clusters of sweet-scented flowers, which change from yellow to orange and red. The young leaves are pendulous, as in *Brownea* and *Amherstia*. Thrives in shady situations, especially near water, in the wet or semi-dry districts below 1,500 feet.

Schizolobium excelsum. (N. O. Leguminosæ).—A very large, quick-growing tree, with fine bi-pinnate feathery leaves, native of Brazil. Introduced in 1872 at Peradeniya, where it luxuriates, blossoming and producing fruits regularly. The flowers are borne in very large erect racemes, of a bright-yellow colour, during February or March, when the tree is quite bare of leaves. The flowers are at once followed by beautiful feathery young foliage. Thrives up to 1,500 feet in the moist region.

Solanum macranthum. (N. O. Solanaceæ). “Potato-tree.”—A medium-sized, quick-growing and soft-wooded tree of Brazil, reaching a height of 40 to 50 feet, introduced into Ceylon in 1844. It is a handsome object when in full blossom, the large blue and white flowers, with conspicuous yellow anthers, being produced at

most seasons of the year, but more especially after the dry weather. The large prickly leaves also render the tree very ornamental. Thrives best in partially shaded situations, at elevations below 3,000 feet. This is the only species of the Potato order that grows into a tree form.

Spathodea campanulata. (N. O. Bignoniaceæ).—A tall, erect tree from Western Tropical Africa, introduced into Ceylon in 1873, and now fairly commonly planted about Kandy and elsewhere as an ornamental shade tree. Its large, bright orange-red, erect flowers, produced at the tips of the branches throughout the wet season, render it strikingly handsome and conspicuous at a distance. The unexpanded flowers contain a quantity of water, hence the tree has been called the "Fountain-tree." Thrives up to 1,500 feet.

Stenocarpus sinuatus. (N. O. Proteaceæ). "Fire Tree," or "Tulip Tree" of Queensland.—See *Flowering Trees for Up-country*.

Sterculia colorata. (N. O. Sterculiaceæ). "Malaiparutti," *T.*—A moderate-sized tree of 40 to 50 feet in height, indigenous to the dry region of Ceylon, but thrives also in the moist districts. The brilliant orange-scarlet flowers, appearing in great profusion when the tree is leafless (February to March at Peradeniya), render the tree a handsome and conspicuous object. The Veddas (aboriginals of Ceylon) call the tree "Kenawila," and are said to sing odes to it.

Stereospermum xylocarpum. (N. O. Bignoniaceæ).—"Padri-tree" of India.—A large spreading tree, native of South India, deciduous for a short time in the dry weather. It bears for a week or two a profusion of white bell-shaped flowers. Thrives up to 1,500 feet.

Tabebuia spectabilis. (N. O. Bignoniaceæ).—A small tree of Venezuela and the West Indies, introduced at Peradeniya in 1881. For a short period in March or April, when bare of leaves, the tree is an exceedingly beautiful sight, being literally covered with masses of bright-yellow flowers, which as they drop form a golden carpet on the ground. Thrives at Peradeniya (1,500 feet), but as yet only rarely produces seed here.

ORNAMENTAL FOLIAGE TREES.

SELECTION SUITABLE FOR LOW OR MEDIUM ELEVATIONS.

Agathis (Dammara) robusta. (N. O. Coniferæ). Kauri Pine.—A tall stately tree with a round top, native of Queensland, introduced in 1865 to Peradeniya, where some very fine specimens may

now be seen. The tree bears cones occasionally here, but has not yet produced fertile seed. Thrives from 1,500 to 5,000 feet or more.

Ailantus excelsa. (N. O. Simarubaceæ). Tree of Heaven.—A large handsome, quick-growing tree, with long pinnate leaves (3 to 4 feet long), native of India, &c. A striking species for landscape effect. Propagated by seed.



A.—KAURI PINE. AGATHIS ROBUSTA.
B.—ARAUCARIA COOKII.

✓ **Araucaria Bidwillii.** (Coniferæ). Bunya-bunya Pine; "Monkey-puzzle."—A tall tree of Queensland, said to attain a height of 200 feet in its native country, introduced at Peradeniya in 1848. It bears branches down to near the ground; the small leaves are stiff and closely set, ending in a sharp point, hence the name "Monkey-puzzle." Thrives, but does not fruit, at Peradeniya.

A.—Cookii.—A very tall conical tree, with short, slender, horizontal branches, native of New Caledonia, introduced at Peradeniya in 1865. Here it has so far reached a height of about 135 feet; but does not produce fertile seed.

A.—Cunninghamii. Moreton Bay Pine.—A tall handsome tree of Eastern Australia and New Guinea, established at Peradeniya since 1848. It is distinguished from *A. Cookii* by its more spreading and horizontal branches and pyramidal shape. Not fruitful at Peradeniya.

Artocarpus incisa. (N. O. Urticaceæ). Bread-fruit; "Ratadel," S.—A beautiful quick-growing tree, with very large, palmately-cut, shining leaves, native of Malaya and Pacific Islands. It grows to a height of 50 to 60 feet, and few trees present a more noble appearance. Propagated by suckers, rarely from seed. See under *Tropical Fruits*.

A.—nobilis. Wild Bread-fruit, "Del," S.—A noble spreading tree, with wavy or crinkled leaves, peculiar to the moist low-country of Ceylon. It is of rather slow growth, but usually attains a height of 40 to 60 feet, sometimes with an enormous trunk. Propagated by seed.

Axinandra zeylanica. (N. O. Lythraceæ). "Kekiri-wara," S.—An ornamental tree, about 30 feet high, with a straight trunk and numerous short drooping branches almost to the base, the leaves being 7 to 10 inches long. Peculiar to the moist low-country forests of Ceylon.

Barringtonia speciosa. (N. O. Myrtaceæ). "Mudilla," S.—A medium-sized, handsome spreading tree, with large leathery shining leaves, and bearing large white flowers; the latter consist chiefly of a bunch of numerous long white stamens, and are followed by a large quadrangular one-seeded fruit, which, owing to its thick fibrous covering, is an excellent example of floating fruits, being commonly found floating in lagoons, rivers, &c. The tree is indigenous to the sea-shore, and is often planted for ornament. Propagated by seed.

✓ **Casuarina equisetifolia.** (N. O. Casuarineæ). She-Oak; Beef-wood; "Kassa-gaha." S.—A lofty quick-growing tree, with fine cord-like branchlets instead of leaves, native of Northern Australia. It is especially adapted to the sea-coast, but also thrives inland up to about 2,000 feet elevation, flourishing in dry or wet region. It has been largely planted in South India for fuel and for reclaiming sandy sea-shores, becoming in some places quite naturalised. The



BREAD-FRUIT TREE. *Artocarpus Incisa.*



SAUSAGE TREE, *Kigelia pinnata*.

tree is of an ornamental character, especially when young, and is grown in Europe and hot-houses for decorative purposes. Propagated by seed.

Carapa guianensis. (N. O. Meliaceæ). Carapa, or Andiroba Tree.—A quick-growing tree, 60 to 80 feet high, with handsome pinnate leaves composed of eight to ten pairs of shining leaflets. Thrives at Peradeniya, and is suited for the low-country generally.



MONUMENT ROAD, PERADENIYA GARDENS.

Columbia javanica. (Tiliaceæ.) A tall stately tree, 80 to 100 feet high, with smooth bark and large oval tomentose leaves, native of Java; flourishes up to 1,500 feet elevation in the moist region. Blossoms in August and January, the flowers being small and dull-yellow.

Cyathocalyx zeylanicus. (N. O. Anonaceæ). "Kekala" or "Ipetta," S.—A tall quick-growing tree, with a straight erect stem and slender graceful branches, native of the moist low-country of Ceylon. Leaves 6 to 10 inches long; fruit large, $2\frac{1}{2}$ to 3 inches long, ovoid in shape, yellow when ripe. Propagated by seed.

Dillenia indica. (Dilleniaceæ). "Hondapara" or "Wampara," S.—A very handsome, moderate-sized, round-headed, symmetrical tree, native of Ceylon, India and Malay. It is characterised by large oblong, glabrous, serrate leaves, which are 10 to 12 inches long. Fruit very large, globular, 5 to 7 inches diameter. See under *Tropical Fruits*.

Dimorphandra Mora. (N. O. Leguminosæ). Mora Tree of British Guiana.—A large handsome tree, introduced to Peradeniya in 1881. Noted for its excellent timber and enormous seed.

Diubanga moluccana. (N. O. Lythraceæ).—A handsome tree, attaining 100 feet in height, with very long graceful, drooping, slender and brittle angular branches and large shining leaves. It is a native of the Moluccas, and has been introduced in 1852 at Peradeniya, where it forms a striking object.

✓ **Durio zibethinus.** (Malvaceæ). Durian.—A noble tree of pyramidal symmetrical habit, attaining a height of 80 to 100 feet. (See under *Tropical Fruits*).

Enterolobium cyclocarpum. (N. O. Leguminosæ).—A tall erect tree with handsome feathery foliage, native of Venezuela, introduced at Peradeniya in 1884. Bears curious circular twisted pods in the dry weather. Propagated by seed.

✓ **Erythrina Parcellii.** (N. O. Leguminosæ).—A small, soft quick-growing tree with handsome variegated foliage, the leaves being marked by a creamy yellow band running along the main veins and centre. Native of South Sea Islands. Propagated by cuttings; easy of cultivation up to 3,000 feet.

Ficus cunninghamii. (Urticaceæ). "Java Willow."—A very large spreading tree, with graceful feathery branches and small leaves. It is a native of Burma, Queensland, &c., and has been introduced at Peradeniya in 1861.

F.—Canoni. A medium-sized tree of the Society Islands. In the young state the large oblong leaves are of a striking purplish bronze colour, on account of which young plants are cultivated for ornamental purposes in European hot-houses. Introduced at Peradeniya in 1906.

✓ **F.—elastica.** Rambong, or India-rubber Tree.—A very large, handsome spreading quick-growing tree, attaining a height of over

100 feet, with large oval leathery shining leaves, native of Assam, Burma and Malaya, introduced into Ceylon about 1835. A very remarkable tree on account of its enormous aerial or buttressed roots.

F.—regia. A tall erect tree, with smooth white bark and large leaves, bearing a profusion of fig-like fruits on the trunk and branches, native of Burma, Malaya, &c.

Filicium decipiens. (N. O. Burseraceæ). "Pehimbiya," S.—A medium-sized or large tree, of rather slow growth, with remarkably handsome fern-like foliage (as its name implies). It is a native of Ceylon, and produces in April quantities of soft vegetative seed, which are of short vitality.

✓ **Kigelia pinnata.** (N. O. Bignoniaceæ). Sausage Tree.—A moderate-sized spreading tree of Tropical Africa, bearing large pinnate leaves, and long-stalked panicles of flowers. Its remarkable oblong grey fruits are suspended by a strong cord-like stalk, being thus hung on the tree, dangling in the air; for several weeks; each fruit is 15 to 20 inches long, and 3 to 4 inches in diameter. In Nubia, the tree is said to be held sacred by the negroes.

✓ **Magnolia sphenocarpa.** (N. O. Magnoliaceæ). Evergreen Magnolia.—A moderate-sized spreading tree, with very large shining tapering leaves, the latter being 8 to 16 inches long. Native of the Eastern Himalayas, thrives at medium elevations in Ceylon, having been long established at Peradeniya.

Mesua ferrea. (N. O. Guttiferæ). Iron-wood Tree; "Nagaha," S. "Naka", T.—A moderate-sized much-branched tree, of pyramidal shape and very handsome appearance, native of the moist low-country forests of Ceylon. The young leaves are of a deep crimson, passing through delicate shades of pink into the dark green of the adult growth. The tree is a slow grower. (See under *Flowering Trees*).

Myxylon Balsamum. (N. O. Leguminosæ). Balsam of Tolu.—A large handsome erect tree, of Tropical America, attaining a height of 70 to 100 ft., with small pinnate, dark-green leaves. Good for roadsides, timber, and fuel. The fruit, consisting of a lance-shaped one-seeded pod, is produced in June and December. Introduced into Ceylon in 1870.

Ostodes zeylanica. (N. O. Euphorbiaceæ). "Wal-kekuna," or "Olupetta," S.—A very handsome tall tree with smooth bark and large numerous leaves, the latter being 6 to 12 inches long. Native of the moist low-country, up to 1,000 ft. Flowers strongly scented.

Palms. See under *Palms*,

✓ **Pandanus furcatus.** (N. O. Pandanaceæ). Screw-pine.—A large handsome species, 30 to 40 feet high, with long, prickly leaves, which are arranged on the stem in the form of a screw.

P.—Leram. Nicobar Islands Bread-fruit.—A striking species of Screw-pine, repeatedly forked, bearing enormous, heavy, green fruits, introduced at Peradeniya in 1883.



SCREW PINE. *Pandanus furcatus.*

Pangium edule. (N. O. Bixaceæ). Kapayang, or Pangi.—A quick-growing spreading tree with very large heart-shaped leaves, bearing oval reddish-brown fruits about 6 inches long. Native of Malaya, and introduced into Peradeniya in 1891. The fruit is edible when cooked.

Parkia Roxburghii. (N. O. Leguminosæ).—A huge and remarkably handsome quick-growing tree, attaining a height of 120 feet or more, with a clear smooth trunk, and beautiful fine feathery

pinnate leaves. It is a native of Malaya, Burma, &c., has been introduced into Ceylon, and is well established in the moist low-country up to 2,000 feet. The tree flowers in November to December, and bears fruit in February to March, producing clusters of long pods, which contain a quantity of white powdery farinaceous substance. Easily propagated by seed.

Parmentiera cerifera. (N. O. Bignoniaceæ). Candle Tree.—A small tree of Tropical America, with small light-green leaves,



CANDLE TREE. *Parmentiera cerifera*.

suggesting those of the Birch. It bears very remarkable candle-like yellow fruits, produced from the stem and branches in great profusion twice a year, during the drier months. These closely resemble the old-fashioned candles of shops. Propagated by seed.

Pisonia morindifolia. (N. O. Nyctagineæ). Lettuce Tree ; "Watabanga Kola," S., "Lechchai Kedda" or "Chandi," T.—A



TRAVELLERS' TREE. *Ravenea madagascariensis*.

small tree with attractive pale-yellow foliage, much cultivated on the coast, to which it is specially adapted. Propagated by cuttings. The leaves are edible, and cattle are fond of them.

Podocarpus cupressina. (N. O. Coniferæ).—A small or medium-sized ornamental evergreen tree, with fine graceful feathery foliage, native of Malaya, introduced at Peradeniya in 1880.

Pometia eximia. (N. O. Sapindaceæ). "Gal-mora" or "Bulmora," S.—A handsome tree with a straight erect trunk and large spreading head, native of the moist low-country of Ceylon up to about 1,500 feet; also indigenous to Malaya, &c. Grows to 80 or 100 feet in height. Seeds in July and August.

Pterocarpus echinatus. A handsome foliage tree. (See under *Beautiful Flowering Trees*).

P.—indicus. (N. O. Leguminosæ). "Padouk."—A huge tree of Burma, with a spreading rounded head and long drooping branchlets; very handsome. Bears a profusion of yellowish, sweet-scented flowers, in March or April, followed by circular button-like pods.

Ravenala madagascariensis. (N. O. Scitamineæ). ^{Chester!} Travellers' Tree.—A unique and remarkable-looking tree of Madagascar, introduced at Peradeniya before 1824. It thrives best in a hot and humid climate, and attains to a height of 30 to 40 feet, assuming approximately the shape of a gigantic fan. The immense distichous leaves are 12 to 15 feet in length and, like the Banana tree of the same family, are invariably torn into ribbons by the wind; but this does not detract from their gracefulness. The name Travellers' Tree is given to it on account of its capacity for storing up water in the receptacles formed by the sheathing bases of the leaf-stalks, being thus supposed to be of service to travellers in a desert. This statement, however, is rather discounted by the fact that the tree does not naturally grow in districts where water is scarce, and thrives only in regions where rainfall is more or less abundant. Moreover, during dry weather the water collected in the leaf-bases referred to becomes putrid, and infested with the larvæ of mosquitoes and other insects. Propagated by seed or root-suckers.

Sandoricum indicum. (N. O. Meliaceæ). "Santol."—A tall erect quick-growing tree, with handsome pinnate leaves, native of Malaya, and introduced into Ceylon in 1852. (See *Tropical Fruits*).

Schizolobium excelsum. (N. O. Leguminosæ).—A large quick-growing tree, with spreading branches and very graceful feathery foliage, the leaves being finely bi-pinnate. Thrives up to 1,500 feet, and flowers in the dry weather, bearing seed in June. (See under *Beautiful Flowering Trees*).

✓ **Swietenia macrophylla.** (N. O. Meliaceæ). Mahogany, large-leaved.—A handsome upright tree of Tropical America, with pinnate leaves, larger than those of the ordinary Mahogany.

Terminalia bellerica. (N. O. Combretaceæ). "Bulu," S.—A huge, handsome tree, with straight, often buttressed trunk, and long horizontal branches, native of the moist low-country, also of India and Malaya; often planted for use or ornament.

✓ **T.—Catappa.** Country Almond; "Kotamba," S.—A medium-sized tree with large handsome shining leaves, native of Malaya, but grown in most tropical countries. Its greatest disadvantage is that it sheds its leaves twice a year, causing a litter on the ground for a considerable time. (See under *Tropical Fruits*).

Trevesia palmata. (N. O. Araliaceæ).—A small, sparsely branched tree, with expansive palmate or digitate leaves. The young leaves are of a striking dark crimson.

Trichadenia zeylanica. (N. O. Bixaceæ). "Tolol," or "Tittatolol," S.—A large tree with very handsome foliage, the oblong or oval leaves being 6 to 12 inches long, borne on long slender branchlets. Peculiar to the moist low-country of Ceylon.

Vateria acuminata. (N. O. Dipterocarpaceæ). "Hal," S.—A large beautiful tree, with spreading branches and a round head. Leaves leathery and oblong, 6 to 10 inches long. Fruit large, pear-shaped. Peculiar to the moist low-country of Ceylon up to 2,000 feet. Propagated by sowing the large one-seeded fruit.



CHAPTER XVI.

SELECTIONS OF ORNAMENTAL PLANTS SUITABLE FOR LOW AND MEDIUM ELEVATIONS.

FLOWERING SHRUBS, &c :—

[C.=cuttings. S.=seeds. Div.=division. S.=Sinhalese].

Name and Native Country. [Hort.=Garden origin].	Natural Order.	Colour of Flowers.	How- Prop- agated.	Height in feet, &c.
✓ <i>Acalypha Sanderi</i> . New Guinea	<i>Euphorbiaceae</i>	Rose-pink	C.	3—5 Fl's in long tails.
<i>Acokanthera spectabilis</i> . "Arrow poison." S. Africa	<i>Apocynaceae</i>	White, scented	"	6—8 Poisonous
<i>Adhatoda cydoniæfolia</i> . Brazil	<i>Acanthaceae</i>	White & Purple	S. or C.	5—6
✓ <i>Allamanda Schottii</i> . Brazil	<i>Apocynaceae</i>	Yellow	"	3—4
<i>Alstonia sericea</i> . Java	"	White	"	3
<i>Aphelandra Facinator</i> . Colombia	<i>Acanthaceae</i>	Scarlet	"	5—6
<i>A.—tetragona</i> . Colombia	"	"	"	6—7
✓ <i>Ardisia crenata</i> . China	<i>Rubiaceae</i>	White	S.	2—3 Handsome scarlet berries
<i>Asclepias curassavica</i> . W. Indies	<i>Apocynaceae</i>	Orange	S. or C.	4
<i>Asystasia chelonioides</i> . Ceylon and S. India	<i>Acanthaceae</i>	Reddish-purple	"	4
<i>Baccharis rhexioides</i> . W. Indies	<i>Compositae</i>	White	"	4
<i>Banisteria fulgens</i> . Jamaica	<i>Malpighiaceae</i>	Yellow	C.	6
<i>B.—laurifolia</i> . India, Malaya, &c.	"	"	"	10
<i>Barleria cristata alba</i> . India, Malaya, &c.	<i>Acanthaceae</i>	White	"	4
<i>B.—cristata bicolor</i> . India, Malaya, &c.	"	White & Pink	"	4
<i>B.—cristata rosea</i> . India	"	Pink or Rose	C. or S.	4
<i>B.—Gibsoni</i> . India	"	Purple	C.	
<i>B.—strigosa</i> . India	"	Pale-blue	C. or S.	3
<i>Bauhinia candida</i> . India, &c.	<i>Leguminosae</i>	White	S.	4—5
<i>Beloperone nemorosa</i> . Jamaica	<i>Acanthaceae</i>	Pink	C. or S.	4—5
<i>B.—oblongata</i> . Brazil	"	Rose-pink	"	4—5
✓ <i>Brunfelsia americana</i> . Trop. America	<i>Solanaceae</i>	Pale-yellow	"	5—7
<i>B.—uniflora</i> . Brazil	"	Blue & White	"	4—6 Scented.

Name and Native Country. [Hort.—Garden origin].	Natural Order.	Colour of Flowers.	How Propagated.	Height in feet, &c.
Byrsonima ligustrifolia. S. America	<i>Malpighiaceae</i>	Orange-red	S.	8—12
✓ <i>Caesalpinia pulcherrima</i> . W. Indies, &c.	<i>Leguminosae</i>	"	"	5—6
<i>Calliandra haematocephala</i> .	<i>Leguminosae</i>	Pink	S.	5—6
C.— <i>Tweedii</i> . Brazil	"	"	"	5—6
<i>Capparis zeylanica</i> . Ceylon	<i>Capparidæ</i>	White & Red	"	6—7
<i>Cassia alata</i> . Tropics	<i>Leguminosae</i>	Yellow	"	6—8
C.— <i>auriculata</i> . Ceylon and India	"	"	"	6—8
C.— <i>corymbosa</i> . S. America	"	"	"	4—5
✓ <i>Cestrum fasciculatum</i> . Mexico	<i>Solanaceae</i>	Purplish-red	S. or C.	5—6
<i>Chiococca racemosa</i> . W. Indies	<i>Rubiaceae</i>	White	"	5—6
<i>Clavija ornata</i> . S. America	<i>Myrsinæ</i>	Orange-red	S.	8—15 Fl's borne on stem.
<i>Clerodendron inerme</i> . Ceylon and India	<i>Verbenaceae</i>	White, tipped red	C. or S.	3—4
C.— <i>infortunatum</i> . Ceylon, India, Malaya, &c.	"	White	C.	4—10 Fl's scented
C.— <i>macrosiphon</i> . Zanzibar	"	Snow-white	"	3
C.— <i>Minahasse</i> . Celebes	"	White	C. or S.	6—8
C.— <i>nutans</i> . Assam, &c.	"	"	"	5—6
C.— <i>Siphonanthus</i> . India	"	"	"	4—6 Naturalised in Ceylon.
C.— <i>squamatum</i> . Japan	"	Scarlet	"	6—8
<i>Clitoria cajanaefolia</i> . Malaya & Trop. America	<i>Leguminosae</i>	Pink	"	4—5
<i>Costus speciosus</i> . Ceylon, India, &c.	<i>Scitamineae</i>	White, yellow centre	Div.	6—9
<i>Crossandra undulæfolia</i> . Ceylon, India, &c.	<i>Acanthaceae</i>	Orange-red	S. or C.	1—2
<i>Crotalaria laburnifolia</i> . "Yakberiya," S.	<i>Leguminosae</i>	Pale-yellow	S.	2—4
<i>Cystacanthus turgidus</i> . Cochin China	<i>Acanthaceae</i>	Spotted-purple	C. or S.	5—6
<i>Daedalacanthus nervosus</i> . N. India	"	Blue	C.	4—5
<i>Datura chlorantha</i> , fl. pleno.	<i>Solanaceae</i>	Yellow	C. or S.	6—8 Fl's double
D.— <i>fastuosa</i> . "Attana," S. Ceylon, India, &c.	"	Bluish-white	"	2—3
D.— <i>Stramonium</i> . Thorn Apple	"	White	S.	2 } Naturalised in Ceylon
D.—(<i>Brugmansia suaveolens</i> . Trumpet Flower	"	White, scented	C. or S.	10—15
<i>Dombeya Mastersii</i> . Trop. Africa	<i>Malvaceae</i>	Cream	"	5—6
D.— <i>natalensis</i> . S. Africa	"	"	C.	4—5
✓ <i>Duranta Plumieri</i> . S. America	<i>Verbenaceae</i>	Blue	C. or S.	
✓ D.— <i>Plumieri alba</i> . <i>Ecbolium Linneanum</i> . Ceylon, S. India, &c.	"	White Light Blue	" C. or S.	8—15 3
<i>Eranthemum cinnabarinum</i> . Burma	"	Terra-cotta	C.	5
<i>Erythrochiton brasiliensis</i> . Brazil	<i>Rutaceae</i>	Bright red	S.	5

Name and Native Country. [Hort.=Garden origin]	Natural Order.	Colour of Flowers.	How Propagated.	Height in feet. &c.
✓ <i>Euphorbia pulcherrima</i> . Mexico	<i>Enphorbiaceae</i>	Scarlet bracts	C.	8—10
E.—heterophylla. S. America	"	Bracts pink at base	S. or C.	2
F rancisia bicolor. See <i>Brunfelsia uniflora</i>				
✓ <i>Galphimia glauca</i> . Mexico	<i>Malpighiaceae</i>	Bright yellow	S.	4 5
✓ <i>Gardenia florida</i> . "Cape Jasmine." China and Japan	<i>Rubiaceae</i>	White	C.	4—6
<i>Goethia strictiflora</i> . Brazil	<i>Malvaceae</i>	Orange-red	S.	6—7 Fl's borne on stem.
<i>Goldfussia rubescens</i> .	<i>Acanthaceae</i>	Blue	C.	3—4
<i>Gomphia decora</i> . Brazil	<i>Ochnaceae</i>	Bright yellow	S. or C.	4—5
<i>Hedychium angustifolium</i> . Ceylon, Assam, &c.	<i>Scitamineae</i>	Bright-red	Div.	4—5
<i>Heeria macrostachya</i> . Mexico	<i>Melastomaceae</i>	White	C.	4—5
<i>Helicteres Isora</i> . "Liniya," S. Ceylon, India, &c.	<i>Tiliaceae</i>	Brick-red	"	5—6
<i>Hibiscus mutabilis</i> . Alba China	<i>Malvaceae</i>	White	C. or S.	5—6
H.—mutabilis rosea.				
✓ H.—rosa-sinensis. "Shoe-flower." India	"	Scarlet	"	8—15
H.—schizopetalus. Trop. Africa	"	Orange-red	"	8—10
<i>Holarrhena antidyserterica</i> . "Conessi Bark." India, Malacca	<i>Apocynaceae</i>	White	C.	4—5 Fl's scented.
<i>Holmskioldia sanguinea</i> . N. India	<i>Rubiaceae</i>	Orange-red	C. or S.	6—8
<i>Humboldtia laurifolia</i> . "Gal-karanda." Ceylon	<i>Leguminosae</i>	White and Pink	S.	8—10 Fl's scented. Hollow internodes inhabited by ants.
✓ <i>Ixora coccinea</i> . Ceylon, India	<i>Rubiaceae</i>	Scarlet	C. or S.	4—5
I.—Fraseri. Hort.	"	Salmon-red	C.	4—5
I.—javanica. Java	"	Orange	"	5—6
I.—macrothyrsa. Sumatra	"	Deep Red	"	4—5
I.—odorata. Madagascar	"	White-pink	"	6—8
I.—Pilgrimi. Hort.	"	White	"	6—8
I.—rosea. Khasia	"	Rose coloured	"	4—5
<i>Jacobinia coccinea</i> . Brazil	<i>Acanthaceae</i>	Scarlet	C. or S.	5—6
J.—magnifica. Brazil	"	"	"	5—6
✓ <i>Jacquinia ruscifolia</i> . Mexico and W. Indies	<i>Myrsineae</i>	Bright-orange	S.	6—10
<i>Jasminum revolutum</i> . India	<i>Oleaceae</i>	Bright yellow	C. or S.	4 5
J.—Sambac. Ceylon and India	"	White	"	4 5
<i>Jatropha panduraefolia</i> . Cuba	<i>Enphorbiaceae</i>	Scarlet	"	3—4
J.—podagrica. Panama	"	Orange-red	"	2—3
<i>Jussiaea suffruticosa</i> . Ceylon, &c.	<i>Onagraceae</i>	Yellow	S.	2—3
<i>Justicia Betonica</i> . "Sudupuruk." Ceylon, &c.	<i>Acanthaceae</i>	Greenish-white	C. or S.	3—4

Name and Native Country. [Hort.=Garden origin].	Natural Order.	Colour of Flowers.	How Propagated.	Height in feet. &c.
<i>Justicia calycotricha.</i> Brazil	<i>Acanthaceae</i>	Yellow	C. or S.	2—3
<i>Kopsia fruticosa.</i> Burma, Java, &c.	<i>Apocynaceae</i>	Pink	C.	6—8
✓ <i>Lagerstroemia indica.</i> "Crape Myrtle" China, India	<i>Lythraceae</i>	Bright-pink		6—10
✓ <i>Lantana nivea.</i> Trop. America	<i>Verbenaceae</i>	White	S.	3—4
<i>L.—trifolia.</i> W. Indies	"	Orange yellow	C. or S.	3—4
<i>Malvaviscus arboreus.</i> S. America	<i>Malvaceae</i>	Scarlet	"	4
<i>Medinilla magnifica.</i> Philippines	<i>Melastomaceae</i>	Rosy-pink	C.	5—6
<i>M.—speciosa.</i> Malaya	"	Crimson	"	5
<i>M.—Teysmannii.</i> Java	"	White	"	5
<i>Melastoma malabathricum.</i> "Maha-bovitiya." Ceylon, India	"	Pink	C. or S.	4—5
<i>Memecylon capitellatum.</i> "Dodan-kaha." Ceylon and S. India	"	Deep blue	S.	6—8
<i>Montanoa bipinnatifida.</i> Mexico	<i>Compositae</i>	White	C.	8—12
<i>M.—tomentosa.</i> Murraya exotica. "Etteriya." Ceylon, Eastern Tropics	"	Pure white	S.	8—12 Fl's scented.
<i>Mussaenda erythrophylla.</i> Trop. Africa	<i>Rubiaceae</i>	Bright scarlet	C.	4—6
<i>Myrtus communis.</i> Myrtle. S. Europe	<i>Myrtaceae</i>	White	C. or S.	6—8
✓ <i>M.—tomentosus.</i> Ceylon	"	Rose-pink	"	3—5
<i>Nerium Oleander.</i> Oleander. Asia Minor	<i>Apocynaceae</i>	Bright-red	C.	4—6
<i>N.—Oleander alba.</i> Notonia grandiflora. India	"	White	"	4—5
<i>Osbeckia aspera.</i> "Bowitiya," S. Ceylon and India	<i>Compositae</i>	Yellow	"	5—6
<i>Ochna Kirkii.</i> E. Trop. Africa	<i>Melastomaceae</i>	Pink	S.	4—5
<i>Oxyanthus natalensis.</i> Natal	<i>Ochnaceae</i>	Bright red	"	3—4
<i>O.—tubiflorus.</i> W. Trop. Africa	<i>Rubiaceae</i>	White	C.	4—5
<i>Palicourea gardenioides.</i> Mexico	"	"	"	4
<i>Paulwilhelmia speciosa.</i> Trop. Africa	"	"	"	5—6
<i>Pavetta indica.</i> "Pawatta," S. Ceylon, India	<i>Acanthaceae</i>	Blue	"	4—5
<i>P.—lanceolata.</i> S. Africa	<i>Rubiaceae</i>	White	"	3—4
<i>P.—madagascariensis.</i> Hort	"	"	"	4—6
<i>Pentas carnea.</i> Trop. Africa	"	Pink	"	1½—2
<i>Peristrophe speciosa.</i> Himalaya	"	"	"	4
<i>Phlogocanthus thrysisiflorus.</i> India, Java	<i>Acanthaceae</i>	Carminé purple	"	4
<i>Plumbago capensis.</i> S. Africa	"	Purple	"	4—6
	<i>Plumbaginae</i>	Pale blue	"	2—4

Name and Native Country. [Hort.=Garden origin].	Natural Order.	Colour of Flowers.	How Prop- agated.	Height in feet, &c.
Plumbago rosea. "Rat-nitul," S. India	<i>Plumbaginac</i>	Rosy scarlet	C. or S.	2—3
P.—zeylanica. "Elanitul," S. Ceylon, &c.	"	White	"	2—4
Plumiera acutifolia. "Temple Tree." Mexico	<i>Apocynaceae</i>	Creamy-white	"	8—15
P.—rubra. Trop. America	"	Red	C.	8—15
Portlandia grandiflora. W. Indies	<i>Rubiaceae</i>	White	"	8—12
Quassia amara. Guiana	<i>Simarubaceae</i>	Scarlet	C. or S.	8—10
Randia maculata. Trop. Africa	<i>Rubiaceae</i>	Purplish white	C. or S.	6—10
R.—macrantha. Trop. Africa	"	White	C.	4—6
R.—Mussaenda. S. America	"	"	"	4—6
Ravinia spectabilis. S. America	<i>Rutaceae</i>	Pink	"	3—4
Reinwardtia tetragyna. India	<i>Lincae</i>	Yellow	S. or div.	3—4
R.—trigyna. India	"	"	"	"
Rhodochiton volubile. Mexico	<i>Scrophulariaceae</i>	Bright red	"	8—10
Rhodomyrtus tomentosus. Ceylon	<i>Myrtaceae</i>	Bright pink	C.	4—5
Rondeletia odorata. Mexico	<i>Rubiaceae</i>	Pink	"	4—5
R.—speciosa. S. America	"	Scarlet	"	3—4
Russelia juncea. Mexico	<i>Scrophulariaceae</i>	"	"	3—4
R.—sarmentosa. Trop. America	"	Pink	"	"
Salvia coccinea. Cent. America	<i>Labiatae</i>	Scarlet	"	2
S.—coelestina. Mexico	"	Lilac-blue	"	2
S.—farinacea. Texas	"	Blue	"	1½
S.—splendens. Brazil	"	Scarlet	"	3
Sanchezia longiflora. S. America	<i>Acanthaceae</i>	Magenta	"	6—8
Sophora violacea. Ceylon	<i>Leguminosae</i>	Violet-blue	S.	2—3
Stemmadenia bella. Mexico	<i>Apocynaceae</i>	Pure-white	C.	4—5
Stiffia chrysantha. Brazil	<i>Compositae</i>	Yellow	S.	10—15
Strobilanthes coloratus. E. Himalaya	<i>Acanthaceae</i>	Purple	C.	4—5
Stromanthe sanguinea. Brazil	<i>Scitamineae</i>	Crimson	Div or S.	3—4
Strophanthus dichotomus. India and Malaya	<i>Apocynaceae</i>	White & purple	C.	5—6
✓ Tabernaemontana coronaria. India and Malaya	"	Pure-white	"	3—4
✓ Tecoma Stans. W. Indies	<i>Bignoniaceae</i>	Yellow	C. or S.	10—15
T.—velutina. Mexico	"	"	"	8—12
Tephrosia grandiflora. S. Africa	<i>Leguminosae</i>	Red	S.	2
Thespesia tomentosa. Mexico	<i>Malvaceae</i>	Yellow	C. or S.	4—5
✓ Thevetia neriiifolia. Trop. America	<i>Apocynaceae</i>	"	C.	10—15
Thunbergia affinis. Trop. Africa	<i>Acanthaceae</i>	Violet	"	4—5

See
Beautiful
Flowering
Trees.

Name and Native Country. [Hort.=Garden origin].	Natural Order.	Colour of Flowers.	How-Propagated.	Height in feet, &c
✓ <i>Thunbergia alba</i> .	<i>Acanthaceae</i>	White		
T.— <i>erecta</i> . Trop. Africa	"	Dark-blue	C.	4—5
<i>Thysanacanthus rutilans</i> . Colombia	"	Lilac	"	5—6
<i>Tithonia diversifolia</i> . Mexico	<i>Compositae</i>	Yellow	S.	5—6
<i>Uroskinnera spectabilis</i> . Cent. America	<i>Scrophulariaceae</i>	Showy mauve	C.	2
<i>Woodfordia floribunda</i> . Ceylon, India, &c.	<i>Lythraceae</i>	Brick-red	"	5—6
<i>Wormia Burbidgei</i> . Borneo	<i>Dilleniaceae</i>	Yellow	"	8—10
<i>Wrightia zeylanica</i> . "Sudu- idda." S. Ceylon	<i>Apocynaceae</i>	Brilliant white	C. or S.	3—5

ORNAMENTAL FOLIAGE SHRUBS, &c.

SUITABLE FOR LOW AND MEDIUM ELEVATIONS.

[C.=cuttings. S.=seeds. Div.=division. S.=Sinhalese].

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Height in ft. and descriptive notes.
<i>Abroma fastuosa</i> . Trop. Asia	<i>Sterculiaceae</i>	C. or S.	8—12 Large roundish leaves.
<i>Acalypha godseffiana</i> . New Guinea	<i>Euphorbiaceae</i>	C.	3—4 L. white-margined.
A.— <i>illustris</i> .	"	C.	6—8 L. large, blotched with copper & crimson.
A.— <i>marginata</i> . India	"	C.	6—8 Margin of leaf pinkish.
A.— <i>obovata</i> . Hort	"	C.	5—8 L. inverted, oval-shaped.
A.— <i>tricolor</i> . Fiji Islands	"	C.	6—10 L. blotched with red & crimson.
A.— <i>triumphans</i> .	"	C.	6—8 L. large, crimson & green.
A.— <i>willinckii</i> . Hort	"	C.	6—8 L. very large, green blotched with yellow.
A.— <i>wilkesiana</i> . Fiji Islands	"	C.	5—6 L. twisted, copper-coloured.
<i>Alchornea ilicifolia</i> . Australia	"	C.	8—10 Holly-like leaves.
<i>Alpinia rafflesiana</i> .	<i>Scitamineae</i>	Div.	4—5 L. variegated.
<i>Amomum hemisphaericum</i> . Java	"	S. & div.	6—8 Large handsome herbaceous leaves, rising from base.
A.— <i>magnificum</i> . Mauritius	"	Div.	10—15 L. bronze tint, very handsome. Fl's in large pink heads on stalks 2 to 3 ft. high.
✓ <i>Aralia filicifolia</i> . Pacific Islands	<i>Araliaceae</i>	C.	8—10 L. large, pinnatifid, yellow when young.
A.— <i>Guilfoylei</i> . Pacific	"	C.	8—10 Stems erect. L. edged & blotched with white.
A.— <i>maculata</i> . Polynesia	"	C.	8—10 Stems and leaves of purplish hue with green spots.

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Height in ft. and descriptive notes.
<i>Arundo Donax variegatum.</i> S. Europe	<i>Gramineae</i>	C.	5—8 Ornamental variegated grass.
<i>Bambusa</i> , see <i>Bamboos and Ornamental Grasses</i>			
<i>Beaucharnia recurvata.</i> Mexico	<i>Liliaceae</i>	S.	4—6 Dracaena-like plant, stem swollen at base.
<i>Boehmeria pulchra.</i> Hort	<i>Urticaceae</i>	C.	5—6 L. velvety dark-green.
<i>Carludovica palmata.</i> Peru	<i>Cyclanthaceae</i>	S. or div.	5—7 Panama-hat Plant. Large handsome palm-like leaves.
<i>Chamæranthemum Beyrichii variegatum.</i> Brazil	<i>Acanthaceae</i>	C.	2—3 L. variegated, ornamental.
✓ <i>Codiaeum</i> , or <i>Croton</i> . Malaya, Polynesia, &c. (Numerous varieties).	<i>Euphorbiaceae</i>	C.	5—8 Highly ornamental shrubs with variously coloured leaves.
✓ <i>Cordyline (Dracaena) cannaefolia.</i> Australia	<i>Liliaceae</i>	} Portions of stem.	} Very elegant palm-like plants, usually erect and unbranched, many with highly coloured leaves.
C.— <i>Duffii.</i> Polynesia	"		
C.— <i>Fraseri.</i> do	"		
C.— <i>magnifica.</i> do	"		
C.— <i>terminalis.</i> Malay, China, &c.	"		
<i>Cycas circinalis.</i> " Madu," Ceylon, India, &c.	<i>Cycadeae</i>	S. or off-sets.	} Handsome slow-growing plants, bearing a crown of long pinnate leaves.
C.— <i>Rumphii.</i> Moluccas	"	"	
C.— <i>siamensis.</i> Cochinchina (Several other species).	"	"	
<i>Cyclanthus cristatus.</i>	<i>Cyclanthaceae</i>	Div.	5—6 } L. radical, long plantain-like ; stem-less plants.
C.— <i>discolor.</i> Columbia	"	"	5—6 }
<i>Encephalartos Hildebrandtii.</i> Zanzibar	<i>Cycadeae</i>	S. or off-sets.	5—7 } Slow-growing Cycas-like plants, with long pinnate spiny leaves.
E.— <i>horridus.</i> S. Africa	"	"	} 6—10 L. variegated, creamy-white
E.— <i>villosus.</i> (Several other species).	"	"	
<i>Erythrina Parcellii.</i> Hort	<i>Leguminosae</i>	C.	} 4—6 L. small, purple beneath.
<i>Excæcaria bicolor.</i> Java	<i>Euphorbiaceae</i>	C.	
<i>Goldfussia anisophylla.</i> Himalaya	<i>Acanthaceae</i>	C.	3—4 Dense bush ; small leaves.
<i>Graptophyllum hortense.</i> " Caricature Plant." Trop. Asia	"	C.	4—5 L. variegated, ornamental.
<i>Heliconia angustifolia.</i> Brazil	<i>Scitamineae</i>	Div.	5—6 L. large, plantain-like.
H.— <i>aureo-striata.</i> Solomon Islands	"	Div.	4—5 L. large striated with yellow.
H.— <i>brasiliensis.</i> Brazil	"	Div. or S.	5—6 Remarkable for large bright-red fruit spikes.
H.— <i>brevispatha.</i> S. America	"	"	3—4 L. long and narrow. Fl's white with orange-red spathes.
H.— <i>metallica.</i> New Grenada	"	"	4—5 L. bronze, drooping.

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Height in ft. and descriptive notes.
<i>Heliconia pulverulenta</i> . S. America	<i>Scitamineae</i> .	Div. or S.	4—5 L. with white powdery substance beneath.
<i>H.—spectabilis</i> .	"	"	4—6 L. bright bronze.
<i>Justicia grandiflora</i> .	<i>Acanthaceae</i>	C.	4—5 Handsome foliage plant.
<i>Leea amabilis</i> . Borneo	<i>Ampelideae</i>	C.	4—6 } L. pinnate, handsome.
<i>L.—coccinea</i> . Burma	"	C.	4—5 } some.
<i>Macrozamia Fraseri</i> . W. Australia	<i>Cycadcae</i>	S.	4—6 } Handsome fern-like plants, with long feathery graceful leaves.
<i>M.—Moorei</i> . Queensland	"	S.	4—6 }
<i>M.—plumosa</i> . Queensland	"	S.	2—4 }
<i>Miconia flammea</i> . S. America	<i>Melastomaceae</i>	C.	4—5 } Handsome plants, with large rugose leaves.
<i>M.—Hookeriana</i> . Peru	"	"	4—5 }
<i>Muehlenbeckia platyclada</i> . Solomon Islands	<i>Polygonaceae</i>	C.	4—6 Curious straggling shrub, with flattened branches and stems for leaves.
<i>Myriocarpa longipes</i> . Costa Rica & Mexico	<i>Urticaceae</i>	C.	8—10 L. large oval, rugose & hispid. Fl's in long pendulous threads.
<i>Nandina domestica</i> . China & Japan	<i>Berberideae</i>	Div. or S.	4—6 L. small, bi-pinnate, tinted red.
Palms, see under <i>Palms</i> .			
✓ <i>Panax fruticosum</i> . Trop. Asia	<i>Araliaceae</i>	C.	4—6 Quick-growing ; handsome feathery foliage.
<i>Pandanus Sanderiana</i> . Java	<i>Pandanaceae</i>	Offsets.	4—6 } Handsome variegated leaves.
<i>P.—variegatus</i> . Java	"	"	6—8 }
✓ <i>Pedilanthus tithymaloides</i> . S. America	<i>Euphorbiaceae</i>	C.	4—6 Erect succulent shrub.
✓ <i>Phyllanthus myrtifolius</i> . Ceylon	"	S.	5—6 Small myrtle-like leaves.
<i>Pisonia alba</i> . " Lettuce Tree." India & Malaya	<i>Nyctagineae</i>	C.	10—20 L. pale yellow.
<i>Ravenala madagascariensis</i> . " Travellers' Tree." Madagascar	<i>Scitamineae</i>	S. or div.	10—20 See <i>Ornamental Foliage Trees</i> .
<i>Rudgea macrophylla</i> . Brazil	<i>Rubiaceae</i>		5—6 L. large, obovate. Fl's cream, in dense heads.
<i>Sanchezia nobilis</i> . Ecuador	<i>Acanthaceae</i>	C.	5—6 } L. large, with white bands.
<i>S.—glaucophylla</i> .	"	C.	5—6 }
<i>Sesbania aegyptiaca</i> . Tropics	<i>Leguminosae</i>	S. or C.	6—8 Fine bi-pinnate leaves.
<i>Sophora tomentosa</i> . " Mudumurunga." S. Ceylon, &c.	"	S.	4—5 Whole plant woolly-white.
<i>Tococa imperialis</i> . Peru	<i>Melastomaceae</i>	C.	4—6 } Large elliptic, satiny leaves, very handsome.
<i>T.—latifolia</i> . Brazil	"	C.	4—6 }
<i>Vernonia macrophylla</i> . Brazil	<i>Compositae</i>		6—8 Large ovate leaves.



A

B

C

A.—TRAVELLERS' TREE (*Barringtonia madagascariensis*). B.—PANAMA-HAT PLANT (*Carludovicia palmata*).
C.—NICOBAR BREAD FRUIT (*Pandanus Loran*).



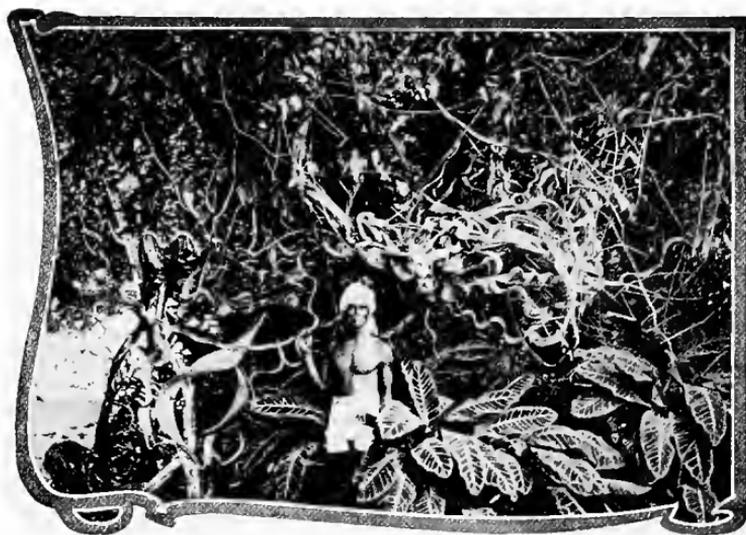
ANODENDRON PANICULATUM.

ORNAMENTAL FLOWERING CLIMBERS.

SUITABLE FOR LOW AND MEDIUM ELEVATIONS.

[C.=cuttings; S.=seed; Tu.=tubers; S.=Sinhalese. T.=Tamil].

Name and Native Country. [Hort.=Garden origin].	Natural Order.	Colour of Flowers.	How Prop- agated.	Descriptive Remarks.
<i>Acridocarpus natalitius.</i> Natal	<i>Malpighiaceae</i>	Bright Yellow	C.	L. leathery, oblong or obovate.
<i>Adenocalymna nitidum.</i> Brazil	<i>Bigoniaceae</i>	Yellow	"	L. trifoliolate, ten-drilled.
✓ <i>Allamanda cathartica.</i> " Willow-leaved Allamanda." Trop. America	<i>Apocynaceae</i>	"	"	} Quick-growing and free-flowering climbers.
A.— <i>Hendersonii.</i> Brazil	"	"	"	
A.— <i>Wardleana.</i> Hort	"	"	"	
✓ <i>Antigonon insigne.</i> Columbia	<i>Polygalaceae</i>	Rose-pink	"		} Elegant climbers, of moderate growth, suited for arbours, verandahs, &c.
✓ A.— <i>leptopus.</i> Mexico	"	Pink	C. or S.	
✓ A.— <i>leptopus albiflora.</i>	"	White	C.	
<i>Arauja grandiflora.</i> Brazil	<i>Apocynaceae</i>	"	"	{ Fl's tubular, scented.
✓ <i>Aristolochia elegans.</i> Brazil	<i>Aristolochiaceae</i>	Reddish-purple	S.	{ Fl's saucer-shaped, very elegant.
A.— <i>gigas, var. Sturtevantii.</i> Guatemala	"	Rich-brown, spotted	C. or S.	{ "Fly-catcher." Fl's very large, offensive odour.
A.— <i>hians.</i> Venezuela	"	Spotted-purple	S.	Fl's 2-lobed.
A.— <i>labiosa.</i> Brazil	"	Purple, green, &c	C. or S.	Large broad lip.
A.— <i>ridicula.</i> Brazil	"	Greenish-brown	S.	Fl's 2-horned.
A.— <i>ringens.</i> Brazil	"	Purplish-green	"	L. round, light-green.
A.— <i>saccata.</i> Himalaya	"	Purplish-red	C.	Fl's small, throat yellow. L. large, hairy.
<i>Asparagus falcatus.</i> " Hatawariya." S.	<i>Liliaceae</i>	Creamy-white	S or Tu	} Fl's in large panicles, sweet-scented.
A.— <i>racemosus.</i> " Hatawariya." S.	"	"	"	
✓ <i>Beaumontia grandiflora.</i> " Nepal Trumpet-flower." India	<i>Apocynaceae</i>	White	C.	Strong grower. Fl's large, tubular.
<i>Bignonia magnifica.</i> Columbia	<i>Bigoniaceae</i>	Magenta	"	Vigorous grower; very showy; frequent bloomer.
✓ B.— <i>unguis-cati.</i> Tropical America	"	Bright-yellow	S. or C.	Fl's profuse, very handsome.
✓ <i>B. Tuedora</i> B.— <i>venusta.</i> " Tangapoo," T. Brazil	"	Bright-orange	C.	{ Fl's in dry weather; very elegant.
✓ <i>Bougainvillea glabra.</i> Brazil	<i>Nyctagineae</i>	Purple	C. or S.	{ Large plant, fl's very showy.
✓ B.— <i>glabra var. Sanderiana</i>	"	"	C.	Dwarf variety.
✓ B.— <i>spectabilis, var. laterita.</i> Brazil	"	Brick-red	"	Straggling shrub, very handsome.
<i>Camoensia maxima.</i> Trop. Africa	<i>Leguminosae</i>	White & yellow	C. or S.	Fl's very large, scented.

THE SNAKE-LIKE CLIMBER. *Bauhinia anguina*.

Name and Native Country. [Hort.—Garden origin]	Natural Order.	Colour of Flowers.	How Prop- agated.	Descriptive Remarks.
✓ <i>Cereus triangularis</i> . "Night-flowering Cactus." W. Indies	<i>Cactaceae</i>	White	C.	Epiphyte. Fl's, large, tubular.
<i>Clerodendron Thomsonæ</i> . Trop. Africa	<i>Verbenaceae</i>	White & scarlet	"	Lovely plant, small growth.
✓ <i>C.—speciosum</i> . Hort	"	Scarlet	"	Very ornamental.
✓ <i>Clitoria ternatea</i> . "Kataroluvel," S. (Also a white-flowered variety)	<i>Leguminosae</i>	Blue	S.	Pretty, but not a free bloomer.
<i>Congea tomentosa</i> . Burma	<i>Verbenaceae</i>	Delicate pink	C.	Fl's in large sprays, lasting several weeks.
✓ <i>Cryptostegia grandiflora</i> . Trop. Africa	<i>Asclepiadaceae</i>	Pink	"	{ Climbing shrub, showy.
<i>Dipladenia amabilis</i> . Hort	<i>Apocynaceae</i>	Rosy-crimson	"	} Very showy climbers, not yet well established in Ceylon.
<i>D.—flava</i> . New Grenada	"	Yellow	"	
<i>D.—splendens</i> . Brazil	"	Rose	"	
<i>Gloriosa Rothschildiana</i> .	<i>Liliaceae</i>	Crimson & yellow	Tu.	} Beautiful herba- ceous twiners.
✓ <i>G.—superba</i> . "Niyangala," S. Ceylon Trop. Asia and Africa	"	Orange & yellow	"	
<i>G.—virescens</i> . Trop. Africa	"	Red	"	} Thrives on tree- trunks; medium elevations.
✓ <i>Hoya carnosa</i> . "Wax Flower." Trop. Asia.	<i>Asclepiadaceae</i>	Pink	C.	
<i>Ipomœa carnea</i> . Trop. America	<i>Convolvulaceae</i>	Light pink	"	{ Straggling shrub; fl's large.



SOLANUM WENDLANDII.



Petraca volubilis.

A beautiful climber with blue and violet flowers.

Name and Native Country. [Hort.=Garden origin].	Natural Order.	Colour of Flowers.	How Propagated.	Descriptive Remarks.
<i>Ipomœa Briggsii</i> . W. Indies	<i>Convolvulaceae</i>	Crimson	C.	Very showy, free bloomer.
I.— <i>Quamoclit</i> . Tropics	"	Scarlet	S.	{ Annual; fine pinnate leaves.
I.— <i>tuberosa</i> . " Spanish Arbour Vine." W. Indies	"	Yellow	"	Very handsome.
✓ <i>Jacquemontia violacea</i> . Mexico, &c.	"	Blue	"	{ Annual; free bloomer.
✓ <i>Jasminum flexile</i> . Ceylon	<i>Oleaceae</i>	White	C.	Scented. Leaves trifoliate.
J.— <i>pubescens</i> . India, Burma	"	Pure white	"	Very fragrant.
J.— <i>revolutum</i> . " Sabanpitcha," S. India	"	Yellow	"	Climbing shrub.
J.— <i>Sambac</i> . " Arabian Jasmine." Ceylon, India.	"	White	"	Fl's strongly scented.
✓ <i>Lonicera Hildebrandiana</i> . Burma	<i>Caprifoliaceae</i>	Yellow	"	{ The largest-flowered Honey-suckle.
<i>Macrosphyra longistyla</i> . W. Trop. Africa	<i>Rubiaceae</i>	Cream	"	Climbing shrub, long tubular fl's.
<i>Naravellia zeylanica</i> . Ceylon, India, &c.	<i>Ranunculaceae</i>	Dingy white	S.	{ Thrives best on tree trunks.
<i>Nyctocalos Thomsoni</i> . Assam	<i>Bignoniaceae</i>	White	C.	Beautiful plant.
<i>Odontadenia speciosa</i> . S. America	<i>Apocynaceae</i>	Yellow	L.	{ Fl's showy, fragrant.
<i>Oxera pulchella</i> . New Caledonia	<i>Verbenaceae</i>	Greenish-white	C	A handsome plant.
<i>Passiflora cœrulea</i> . Brazil	<i>Passifloraceae</i>	Bluish-purple	"	Leaves 3-5 lobed.
P.— <i>Jenmani</i> . Guiana	"	Creamy-white	"	Very distinct.
✓ P.— <i>laurifolia</i> . Trop. America	"	Red & violet	"	See <i>Foliage climbers</i> .
P.— <i>racemosa</i> . Brazil	"	Scarlet	"	L. glaucous beneath.
P.— <i>violacea</i> . Brazil	"	Pale-lilac	"	A beautiful species.
<i>Pergularia odoratissima</i> . " Tonkin Creeper." China and Sumatra	<i>Asclepiadaceae</i>	Greenish-white	S. or C.	{ Fl's fragrant. Fruit large and winged.
✓ <i>Petræa volubilis</i> . Trop. America	<i>Verbenaceae</i>	Blue and violet	C.	A lovely plant.
<i>Porana paniculata</i> . " Bridal Bouquet." India, Java.	<i>Convolvulaceae</i>	White	"	{ Large plant, handsome when in fl.
P.— <i>volubilis</i> . " Horse-tail Creeper." Malaya.	"	Greenish-white	"	Vigorous grower; fl's greenish white.
✓ <i>Quisqualis indica</i> . " Rangoon Creeper." S. India, Malaya.	<i>Apocynaceae</i>	Orange-red	"	Flowers in dry weather, showy.
<i>Raphistemma pulchellum</i> . Assam, Burma	<i>Asclepiadaceae</i>	White	"	L. heart-shaped.
Rose, " Maréchal Niel." —See <i>Roses</i>				
<i>Roupellia grata</i> . " Cream Fruit." W. Trop. Africa.	<i>Apocynaceae</i>	Purplish-white	S. or C.	{ Strong grower. Fl's in dense bunches.
<i>Schubertia</i> . See <i>Arauja</i>				
<i>Senecio hederæfolia</i> .	<i>Compositae</i>	Yellow	C. or S.	Herbaceous plant with Ivy-like leaves.

Ceylon morning glory yel. seeds.

Name and Native Country. [Hort.=Garden origin].	Natural Order.	Colour of Flowers.	How Propagated.	Descriptive Remarks.
Stephanotis floribunda Madagascar	<i>Asclepiadaceae</i>	Pure white	C.	Fl's tubular, scented. Very popular.
Thunbergia grandiflora	<i>Acanthaceae</i>	Blue <i>white</i>	S., C. or Tu.	Thrives best in tubs. A quick-growing immense climber; large blue fl's.
Wagatea spicata. India	<i>Leguminosae</i>	Scarlet	C. or S.	Vigorous grower, thorny pinnate leaves.

ORNAMENTAL-LEAVED CLIMBERS.

SUITABLE FOR LOW AND MEDIUM ELEVATIONS.

[C.=cuttings; S.=seed; Div.=division; Tu.=tubers; S.=Sinhalese].

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Descriptive Remarks.
Argyrea speciosa. "Elephant climber." India, Java.	<i>Convolvulaceae</i>	C. or S.	Vigorous grower. L. large, silvery underneath. Fl's purple.
Asparagus plumosus. S. Africa.	<i>Liliaceae</i>	S. or Tu.	Fine fern-like foliage. Suited for growing in pots.
A.—Sprengeri. Natal	"	S. or Tu.	Needle-like leaves. Pot-culture.
Aristolochia leuconeura. Colombia.	<i>Aristolochiaceae</i>	C. or S.	White-veined leaves; arbours, &c.
A.—trilobata. W. Indies	"	C.	Tri-lobed leaves.
Bauhinia diphylla. Malaya	<i>Leguminosae</i>	"	L. small, 2-lobed; a straggling shrub.
Bignonia argyreo-violascens. Hort.	<i>Bignoniaceae</i>	"	L. prettily marked with white or violet veins.
Buddleia madagascariensis. Madagascar	<i>Loganiaceae</i>	"	Climbing shrub; L. silky-white beneath.
Cardiospermum Corindum. Ceylon	<i>Sapindaceae</i>	S.	} Small climbers, with finely cut foliage and white fl's.
C.—hirsutum.	"	"	
Cisus (Vitis) discolor. Java	<i>Ampelideae</i>	C.	} Young leaves beautifully tinted violet and purple. Requires shade.
Echites rubro-venosa. Brazil	<i>Apocynaceae</i>	"	
Epipremnum mirabile. "Tonga-Creeper," Malaya, Fiji, &c.	<i>Aroidae</i>	"	L. with pink veins. Epiphytic creeper, large pinnatifid leaves.
Geitonoplesium cymosum. Queensland	<i>Liliaceae</i>	S. or Tu.	L. linear or strap-shaped.
Ipomoea sinuata. Trop. America	<i>Convolvulaceae</i>	S.	L. deeply cut.
Mimosa argentea. Hort.	<i>Leguminosae</i>	C.	Silvery white midrib.
Monstera deliciosa. Mexico	<i>Aroidae</i>	"	A noble vigorous creeper, huge perforated and pinnatifid leaves.



Thunbergia grandiflora.

— An immense climber with large blue flowers.



"HIMBUTU-WEL." *Salacia reticulata*.

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Descriptive Remarks.
<i>Nepenthes distillatoria</i> . Pitcher Plant. Ceylon	<i>Nepenthaceae</i>	C., Div. or S.	Leaf-tips formed into "pitchers." Moist shady situation.
<i>Passiflora laurifolia</i> . Trop. America	<i>Passifloraceae</i>	C.	L. ovate entire; excellent plant for screens, &c.
<i>P.—trifasciata</i> . Brazil	"	"	L. variegated, purplish beneath.
<i>Paullinia thalictrifolia</i> . Brazil	<i>Sapindaceae</i>	"	A small plant, with fine fern-like leaves.
<i>Pellionia Daveauana</i> . Cochin China	<i>Urticaceae</i>	"	} Small creepers, variegated leaves, suited for hanging pots and shaded corners.
<i>P.—pulchra</i> . Cochin China	"	"	
<i>Philodendron andreaenum</i> . Hort	<i>Aroideae</i>	"	Large handsome satiny leaves.
<i>P.—erubescens</i> . Venezuela	"	"	L. coppery beneath.
<i>Pothos argentea</i> . Borneo	"	"	L. ovate, silvery-grey.
<i>P.—aurea</i> . "Colombo Agent" Solomon Islands	"	"	Enormous epiphytic creeper. L. large, oval, yellowish. Moist shady places.
<i>Rhaphidophora decursiva</i> . "Dada-kehel," S. Ceylon, India, Java	"	"	L. large, pinnatifid. Creeper on trees in moist shady places.
<i>R.—pertusa</i> . Malaya, &c.	"	"	L. smaller than the above, perforated.
<i>Scindapsus argyræa</i> . Philippines	"	"	L. coriaceous, with silvery spots.
<i>Simlax argyræa</i> . Bolivia	<i>Liliaceae</i>	"	L. spotted white; prickly stems.
<i>S.—officialis</i> . Columbia	"	"	Large shiny oblong leaves, prickly stems.
<i>Vitis incisa</i> . Texas	<i>Ampelideae</i>	"	Leaves much cut.
<i>V.—voinerriana</i> . Tonkin	"	"	L. large thick, trifoliate, hairy.

SHOWY ANNUALS AND PERENNIALS.

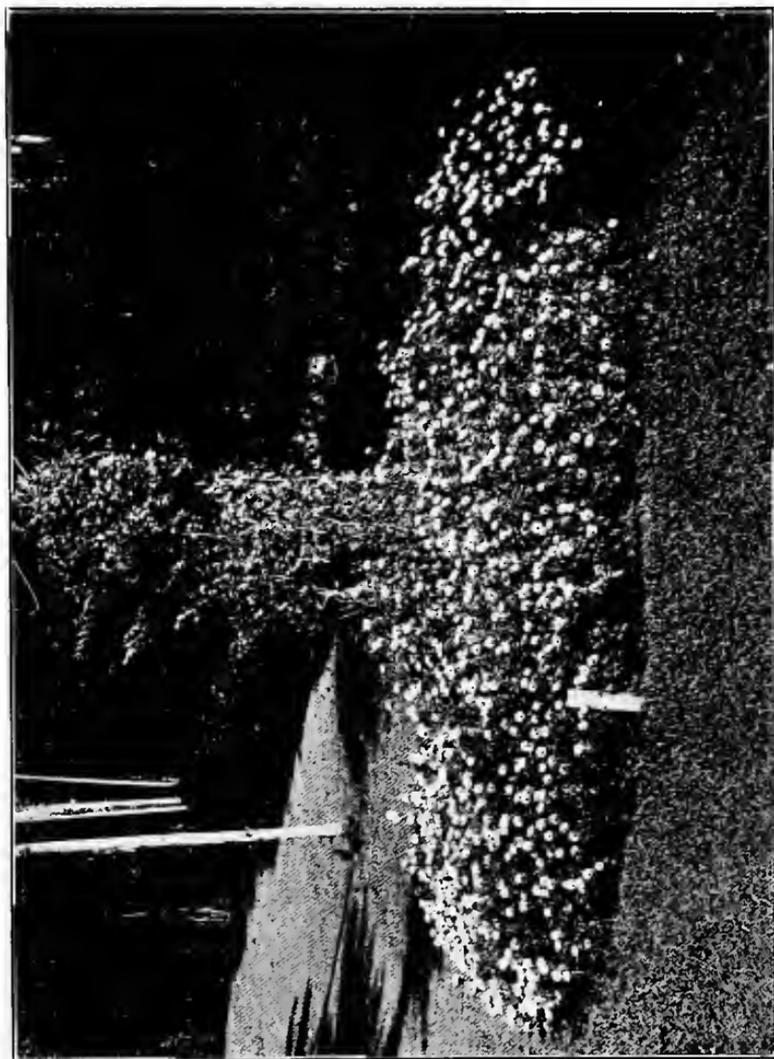
SPECIALLY SUITED FOR FLOWER-BEDS & BORDERS AT LOW & MEDIUM ELEVATIONS

[A.=Annual. P.=Perennial. Shb.=Shrub.]

C.=Cuttings. S.=Seed. Tu=Tubers. Div.=Division.

Name.	See above.	How Propagated.	Descriptive Remarks.
<i>Acalypha Sanderiana</i> .	<i>Shb.</i>	C.	6—8 ft. Fl's in long pendulous scarlet tails.
<i>Achimenes</i> , different varieties	<i>P.</i>	S. or Tu.	1 ft. Tuberos plants, free-flowering and showy.
<i>Ageratum</i> , several varieties	<i>A.</i>	C. or S.	1—1½ ft. Fl's blue.
<i>Alternanthera</i> , green and bronze var's	<i>P.</i>	C.	½—1 ft. Useful for edging and pattern work.
<i>Amarantus tricolor</i> , several var's	<i>A.</i>	S.	2—4 ft. Showy coloured leaves.
<i>Ananas variegata</i> . Variegated Pine-apple	<i>P.</i>	Su.	1½—2 ft. Variegated leaves.

Name.	See heading.	How Propagated.	Descriptive Remarks.
<i>Angelonia salicariaefolia</i>	<i>P.</i>	<i>C.</i>	2 ft. Fl's bluish purple, scented.
<i>Arundo Donax variegatus.</i>	<i>P.</i>	<i>Div.</i>	6—8 ft. Handsome variegated grass; does best in light sandy soil.
✓ <i>Aster, China.</i>	<i>A.</i>	<i>S.</i>	½—1 ft. Numerous shades of pink, red, white, &c.
Numerous var's			
✓ <i>A.—eminens.</i>	<i>P.</i>	<i>Div.</i>	1—1½ ft. Fl's pale blue.
✓ <i>Balsam, numerous var's.</i>	<i>A.</i>	<i>S.</i>	½—1 ft. Different shades, very showy.
<i>Bartonia aurea.</i>	<i>A.</i>	<i>"</i>	1½ ft. Handsome yellow fl's.
<i>Browallia grandiflora.</i>	<i>P.</i>	<i>"</i>	½—1 ft. Fl's dark-blue.
✓ <i>Caladium Humboldtii.</i>	<i>P.</i>	<i>Tu.</i>	6—8 in. Variegated white leaves. Excellent for edging, designs, &c.
Numerous species & var's			
✓ <i>Calendula officinalis.</i>	<i>A.</i>	<i>S.</i>	1—1½ ft. Fl's orange-yellow.
✓ <i>Candytuft. "White Spiral."</i>	<i>A.</i>	<i>"</i>	1 ft. Fl's pure white, in large heads.
✓ <i>Canna, numerous var's</i>	<i>P.</i>	<i>Tu. & Div.</i>	2—4 ft. Various shades of orange, yellow, red and pink. Some var's with purple or bronze foliage.
✓ <i>Celosia. "Cock's Comb."</i>	<i>A.</i>	<i>S.</i>	½—1 ft. Fl's in large heads, crimson, scarlet, &c.
✓ <i>Chrysanthemum, Chinese.</i>	<i>P.</i>	<i>Div. & C.</i>	1—2 ft. Fl's white, brown, or yellow.
✓ <i>Coleus, several var's</i>	<i>P.</i>	<i>C.</i>	1½—2 ft. Foliage beautifully coloured.
✓ <i>Coreopsis grandiflora.</i>	<i>A.</i>	<i>S.</i>	1 ft. Fl's yellow.
<i>C.—tinctoria.</i>	<i>A.</i>	<i>"</i>	1 ft. Fl's crimson, &c.
✓ <i>Cosmos bipinnatus.</i>	<i>A.</i>	<i>"</i>	2—3 ft. Fl's pink or yellow.
<i>C.—sulphureus.</i>	<i>A.</i>	<i>"</i>	2—3 ft. Fl's orange yellow.
✓ <i>Dahlia, "Cactus,"</i>	<i>P.</i>	<i>Tubers.</i>	
"Double." & "Single" var's			2—4 ft. Purple, scarlet, yellow, &c.
✓ <i>Dianthus chinensis.</i>	<i>A.</i>	<i>S.</i>	1 ft. Fl's white, pink, scarlet, &c., very showy.
Indian Pink.			
Single & Double var's			
✓ <i>Euphorbia pulcherrima.</i>	<i>Shb.</i>	<i>C.</i>	4—10 ft. Large brilliant scarlet fl's (bracts), suitable for grouping. Cut back after flowering.
Poinsettia			
<i>Exacum Zeylanicum.</i>	<i>A.</i>	<i>S.</i>	1—1½ ft. Beautiful violet-blue fl's.
"Bindara." <i>S.</i>			
✓ <i>Gomphrena globosa.</i>	<i>A.</i>	<i>"</i>	1 ft. Free flowering; fl's purple in round heads.
"Globe Amaranth."			
<i>Gynandropsis speciosa.</i>	<i>A.</i>	<i>"</i>	2—3 ft. Handsome pink fl's.
✓ <i>Helianthus annuus, several var's</i>	<i>A.</i>	<i>S.</i>	2—3 ft. Very showy yellow fl's.
<i>Hippeastrum, several var's</i>	<i>P.</i>	<i>Bulbs.</i>	1—1½ ft. Fl's large, scarlet, white, &c. Very showy.
✓ <i>Impatiens Sultani.</i>	<i>P.</i>	<i>C. or S.</i>	1—1½ ft. Showy scarlet or pink fl's.
"Sultan's flower."			
✓ <i>Marigold, African</i>	<i>A.</i>	<i>S.</i>	1½—2 ft. Fl's lemon-yellow, &c.
(<i>Tagetes erecta</i>).			
✓ <i>M.—, French.</i>	<i>A.</i>	<i>"</i>	1 ft. Fl's orange, crimson, &c.
(<i>Tagetes patula</i>).			
<i>Nasturtium. See Tropaeolum</i>			



TURNERA ELEGANS.

An attractive, free-flowering perennial.



AVENUE OF THE ROYAL PALM (*Oreodora regia*),
IN PERADENIYA GARDENS.

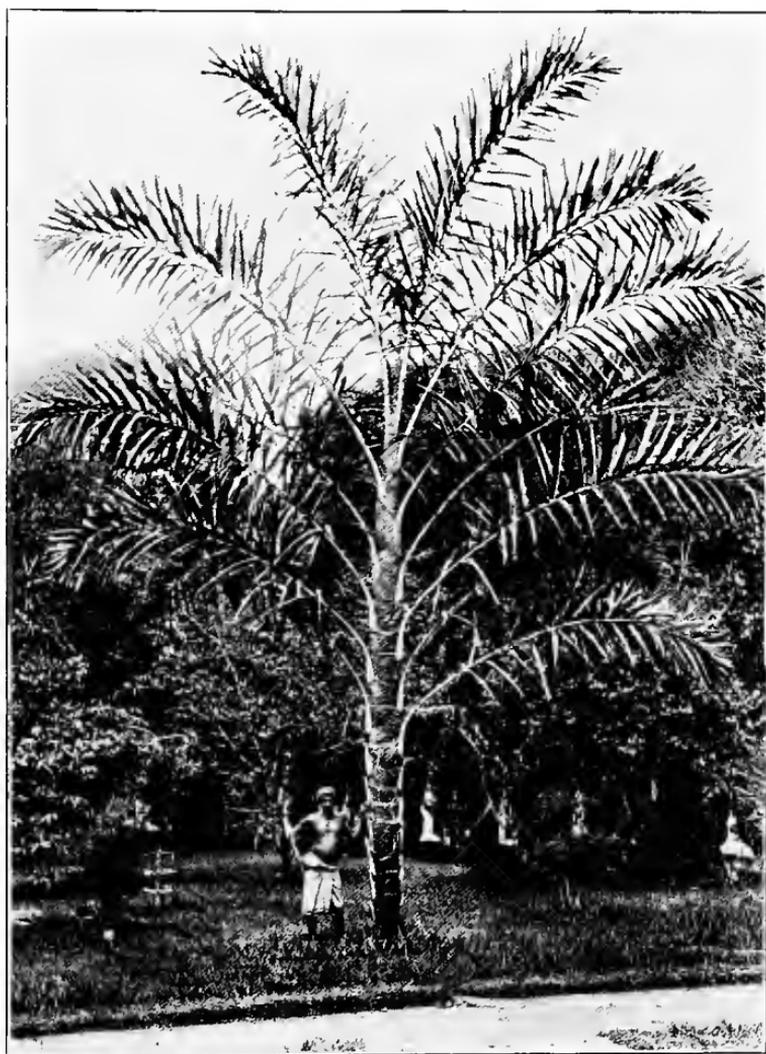
Name.	See heading.	How Propagated.	Descriptive Remarks.
✓ <i>Nicotiana</i> , numerous var's	<i>A.</i>		2—3 ft. Fl's white, pink, &c. Very showy.
<i>Pentas carnea</i> .	<i>A.</i>	<i>C.</i>	2 ft. Delicate pink.
✓ <i>Petunia</i> , numerous var's	<i>A. or P.</i>	<i>S. or C.</i>	1—1½ ft. Large showy white, purple or pink fl's.
<i>Phlox Drummondii</i> .	<i>A.</i>	<i>S.</i>	1 ft. Beautiful free-flowering plants; fl's different colours.
Numerous var's			
✓ <i>P.—suffruticosa</i> .	<i>P.</i>	<i>Div.</i>	1½—2 ft. " " "
Perennial Phlox			
<i>Phrynum variegatum</i> .	<i>P.</i>	<i>Tu. or Div.</i>	2 ft. Handsome variegated large leaves.
<i>Plumbago capensis</i> .	<i>Shb.</i>	<i>C.</i>	3 ft. Fl's beautiful delicate blue.
<i>Poinsettia</i> . See <i>Euphorbia</i>			
✓ <i>Portulaca</i> , several var's	<i>A.</i>	<i>S.</i>	3 in. Brilliant shades of pink, yellow, &c.
<i>Ruellia formosa</i> .	<i>P.</i>	"	2 ft. Fl's large, bright-pink.
<i>R.—tuberosa</i> .	<i>P.</i>	<i>S. or C.</i>	1½ ft. Fl's blue.
<i>Salvia farinacea</i> .	<i>P.</i>	<i>C. or S.</i>	1½ ft. Fl's pale-blue.
✓ <i>S.—"Scarlet Queen."</i>	<i>P. or Shb.</i>	<i>S. or C.</i>	2—3 ft. Fl's bright-scarlet.
Several species & var's			
✓ <i>Sedum sexangulare</i> .	<i>P.</i>	<i>C.</i>	3 in. Suitable for edging and rockery.
Stone Crop			
✓ <i>Sinningia speciosa</i> .	<i>P.</i>	<i>Tu.</i>	1 ft. Fl's large, mauve, bell-shaped. Likes shade and rich soil.
Wild Gloxinia			
<i>Siphocampylus Humboldtii</i> .	<i>P.</i>	<i>C.</i>	1 ft. Fl's scarlet.
<i>Torenia Baillonii</i> .	<i>A.</i>	<i>S.</i>	½ ft. Fl's yellow.
<i>T.—Fournieri</i> .	<i>A.</i>	"	½ ft. Fl's dark-blue and white.
✓ <i>Tropaeolum</i> , dwarf and climbing var's	<i>A.</i>	"	Fl's orange and yellow; require dry shady place.
<i>Turnera elegans</i> .	<i>P.</i>	<i>S.</i>	1½—2 ft. Fl's creamy-white, closing in sun; free bloomer.
<i>Uroskinnera spectabilis</i>	<i>Shb.</i>	<i>C.</i>	2—3 ft. Fl's mauve, very showy.
✓ <i>Verbena venosa</i> .	<i>P.</i>	<i>C. or S.</i>	1 ft. Fl's pinkish-purple, very showy.
Several varieties			
<i>Vinca rosea alba</i> .	<i>P.</i>	"	2 ft. Fl's pure white.
✓ <i>V.——oculata-rubra</i> .	<i>P.</i>	"	2 ft. Fl's white with pink centre.
✓ <i>Zinnia linearis</i> .	<i>A.</i>	<i>S.</i>	1 ft. Fl's orange-yellow.
<i>Z.—"Fireball."</i>	<i>A.</i>	"	1—2 ft. Free-flowering, scarlet pink, yellow, &c.
Numerous var's			

PINNATE OR FEATHER-LEAVED PALMS.

Those marked † are best suited to elevations above 3,000 feet.

<i>Acanthophoenix crinita</i> . Mauritius and Bourbon	✓ <i>Archontophoenix Cunninghamii</i> . Queensland. (= <i>Scaforthia elegans</i>)
<i>Acanthoriza aculeata</i> . Cent. America	✓ <i>Areca Catechu</i> . "Arecanut." Trop. Asia
<i>Acrocomia sclerocarpa</i> . "Macaw Palm." Trop. America	<i>A.—concinna</i> . Ceylon
<i>Actinorrhysis calapparia</i> . Malaya	✓ <i>A.—triandra</i> . Assam and Burma
<i>Archontophoenix Alexandræ</i> . Queensland	✓ <i>Arenga obtusifolia</i> . Java and Sumatra

- Arenga saccharifera*. "Gomuti," or "Sugar Palm." Malaya
A.—Wightii. Malabar
Astrocaryum rostratum. Brazil
Attalea Cohune. "Cohune Palm." Honduras
A.—excelsa. Brazil
Bactris major. Colombia
Bentinckia Condapana. Travancore
Calamus ciliaris. Malaya
 Numerous other species.
Calyptrocalyx spicatus. Moluccas
Caryota Cumingii. Philippines
C.—ochlandra. China
C.—rumphiana. Malaya and Australia
C.—urens. Trop. Asia
Catoblastus præmorsus. Venezuela
†Ceroxylon andicola. Colombia
Chamaedorea elegans. Mexico
C.—Sartorii. "
C.—Tepijilote. "
Chrysalidocarpus lutescens. Madagascar
Cocos flexuosa. Brazil.
C.—insignia. "
C.—nucifera. Coconut Palm. Hab?
C.—plumosa. Brazil
C.—schizophylla. Brazil
C.—weddelliana. "
C.—romanzoviana. "
Cyrtostachys Renda. "Sealing-wax Palm." Sumatra
Desmoncus major. Trinidad
Dictyosperma album. Mauritius
D.—fibrosum. Madagascar
Didymosperma distichum. Sikkim
D.—porphyrocarpum. Java
D.—tremulum. Siam
Diplothemium maritimum. Brazil
Drymophloeus appendiculatus. Malaya
D.—ceramensis. Moluccas
Dypsis madagascariensis. Madagascar
Elæis guineensis. "Oil Palm." Trop. Africa
Euterpe edulis. Trop. America
E.—oleracea. Brazil *Cabbage Palm*
Exhorrhiza Wendlandiana.
Geonoma gracilis. Costa Rica
G.—princeps. Colombia
G.—schottiana. Brazil
Hedyscepe canterburyana. Lord Howe's Island
Heterospatha elata. Amboyna
Howea belmoreana. Lord Howe's Island
H.—forsteriana. "
Hydriastele wendlandiana. "Queensland
Hyophorbe amaricaulis. Mauritius
H.—Verschaffeltii. Rodriguez
Jubaea spectabilis. "Coquito Palm." Chili
Kentia australis. Lord Howe's Island
K.—elegantissima. Hab?
K.—Sanderiana.
Korthalsia Junghuhnii. Java
Loxococcus ruficola. "Dotalu." Ceylon
Manicaria sacifera. Central America
Martinezia caryotaefolia. Colombia
M.—lindeniana. Colombia
Maximiliana regia. "Cocurita Palm." Brazil and Guiana
Metroxylon Rumphii. Prickly Sago Palm. Moluccas New Guinea
M.—Sagu. Sago Palm. Java, Sumatra
Myrialepis Scortechnii. Malaya
Nephrosperma van-Houtteanum. Seychelles
Nipa fruticans. "Nipa" or "Water Palm." Malaya, Ceylon, &c.
Oncosperma fasciculatum. "Katu-Kitul." Ceylon
O.—filamentosa. "Nibung Palm." Java
Orania regalis. Philippines. (Pericarp edible)
Orbignya Sagottii. Demerara
Oreodoxa oleracea. W. Indies
O.—regia. Cuba and Panama
Phoenix dactylifera. "Date-Palm." Africa
P.—paludosa. India and Cochin China
P.—reclinata. S. E. Africa
P.—Roebelinii.
P.—rupicola. Sikkim
P.—sylvestris. Wild Date-palm. India
P.—zeylanica. Ceylon
Pholidocarpus lhur. Malaya
Phytelephas macrocarpa. "Ivory-nut Palm." Colombia
Pinanga Kuhlii.
P.—paradoxa. Malaya
P.—spectabilis. Malaya
Plectocomia elongata. Sumatra, &c.
Prestoea trinitensis. Trinidad
Ptychandra glauca. Malaya
Ptychococcus paradoxa. New Guinea
Ptychoraphis angusta. Nicobar Islands
P.—singaporensis. Malaya
Ptychosperma Macarthurii. Trop. Australia
P.—perbreve. Fiji
Raphia Hookerii. Trop. Africa
R.—Ruffia. Madagascar
Rhopaloblaste hexandra. Moluccas
Roscheria melanochaetes. Seychelles
Scheela excelsa. Brazil
Synechanthus fibrosus. Guatemala
Veitchia Johannis. Fiji
Wallichia caryotoides. Burma, &c.
W.—densiflora. Himalaya
Zalacca edulis. Malaya



DIDYMOSPERMA DISTICHUM.
A curious Sikkim palm.



AVENUE OF TALIPOT PALMS (*Corypha umbraculifera*) IN PERADENIYA GARDENS.



COCO-DE-MER OR DOUBLE COCONUT PALM.

Lodoicea Seychellarum.

FAN-LEAVED PALMS.

- | | |
|---|--|
| ✓ <i>Bismarckia nobilis.</i> Madagascar. | <i>Licuala peltata.</i> Assam, Burma, &c. |
| ✓ <i>Borassus flabellifer.</i> Palmyra Palm.
India and Africa | <i>L.—spinosa.</i> Malaya |
| ✓ <i>Brahea nitida.</i> Mexico | <i>Linospadix Micholitzii.</i> Malaya |
| † <i>Chamaerops humilis.</i> S. Europe and
N. Africa | ✓ <i>Livistona altissima.</i> Java |
| ✓ <i>Copernicia cerifera.</i> Carnauba Wax-palm.
Brazil | ✓ <i>L.—australis.</i> Australia |
| ✓ <i>Corypha umbraculifera.</i> Talipot Palm
Ceylon and S. India | <i>L.—chinensis.</i> China and Japan |
| † <i>Erythea armata.</i> California | <i>L.—Hoogendorpii.</i> Java |
| ✓ <i>Hyphæne thebaica.</i> Doum Palm.
Trop. Africa | <i>L.—humilis.</i> Australia |
| ✓ <i>Latania Commersonii.</i> Mauritius and
Bourbon | <i>L.—Jenkinsiana.</i> Assam |
| <i>Licuala elegans.</i> Sumatra | <i>L.—olivaeformis.</i> Java |
| <i>L.—gracilis.</i> Java | <i>L.—rotundifolia.</i> Java |
| <i>L.—grandis.</i> Pacific Islands | <i>L.—subglobosa.</i> Java |
| | <i>Lodoicea seychellarum.</i> Double Coconut,
or <i>Coco-de-mer.</i> Seychelles |
| | <i>Phœnicophorium seychellarum.</i> (=Steven-
sonia grandiflora). Seychelles |
| | ✓ <i>Pritchardia aurea.</i> Fiji |
| | ✓ <i>P.—Martii.</i> Sandwich Islands |

✓ <i>Pritchardia pacifica</i> . Fiji	† <i>Serenoa serrulata</i> . Saw Palmetto. S. United States
† <i>Rhapis flabelliformis</i> . China and Japan	<i>Stevensonia grandiflora</i> . Seychelles
✓ <i>R.—humilis</i> . China	<i>Teymannia altifrons</i> . Sumatra, Perak
<i>Sabal Adansonii</i> . "Dwarf Palmetto." S. United States.	<i>Thrinax argentea</i> . W. Indies
✓ <i>S.—Blackburniana</i> . Bermuda	<i>T.—barbadensis</i> . Barbados
<i>S.—filamentosum</i> . Jamaica	<i>T.—excelsa</i> . Jamaica
<i>S.—glaucescens</i> . Trinidad	<i>T.—parviflora</i> . W. Indies
✓ <i>S.—Palmetto</i> . Palmetto Palm S. United States	† <i>Trachycarpus (Chamacrops) Fortunei</i> . China
	<i>Verschaffeltia splendida</i> . Seychelles.

CEYLON INDIGENOUS PALMS.

Those marked * are endemic, *i.e.* confined to Ceylon.

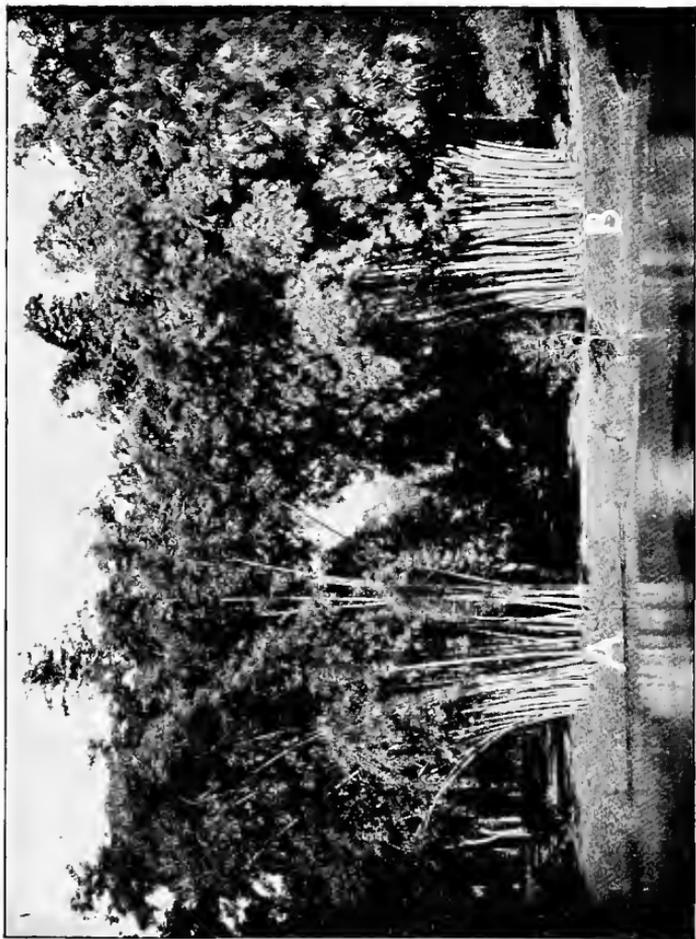
[S.=Sinhalese. T.=Tamil].

Botanical and Vernacular Names.	Natural locality.	Descriptive notes.
✓ <i>Areca Catechu</i> . Betel-nut; "Puwak," S.; "Kamukai," T.	Moist low country	Stems straight, slender, 30—50 ft. high.
* <i>A.—concinna</i> . "Lena-teri," S.	"	Stems straight, slender, 8—12 ft.
<i>Borassus flabellifer</i> . Palmyra; "Tal," S.; "Panai," T.	Dry region	Fan-leaved palm, 60—70 ft. high.
* <i>Calamus delicatalus</i> . "Narawel," S.	Moist low-country up to 1,000 ft.	Climbing palms, with spiny, elegant, pinnate leaves. The slender stems are the "Canes" of commerce.
* <i>C.—digitatus</i> . "Kukula-wel," S.		
* <i>C.—ovoideus</i> . "Thambutu-wel," S.		
* <i>C.—pseudo-tenuis</i> .		
* <i>C.—pachystemonous</i> .		
* <i>C.—radiatus</i> . "Kukula-wel," S.		
* <i>C.—rivalis</i> . "Ela-wel," S.	Dry region	
<i>C.—Rotang</i> . "Wé-wel," S.; "Perampu," T.		
* <i>C.—Thwaitesii</i> .	Moist low-country up to 1,000 ft.	
* <i>C.—zeylanicus</i> .		
<i>Caryota urens</i> . Toddy Palm; "Kitul," S.	Moist low-country up to 3,000 ft.	Trunk 40—60 ft. L. bipin- nate, very handsome.
<i>Cocos nucifera</i> . Coconut; "Pol," S. "Tennai," T.	Low-country up to 2,000 ft. cultivated	Pinnated-leaved; trunk 50—80 ft., never straight.
<i>Corypha umbraculifera</i> . Talipot; "Tal," S.	Moist region, below 2,000 ft.	Trunk stout, erect, 40—80 ft. L. immense, 10—20 ft. diam. Seeds large, ivory- like, made into buttons, &c.
* <i>Loxococcus rupicola</i> . "Dotalu," S.	Moist region, 1,000 to 5,000 ft.	Stems slender, erect, 20—30 ft. L. pinnate.
* <i>Oncosperma fasciculatum</i> . "Katu-kitul," S.	Moist region up to 1,500 ft.	Stems 40—60 ft. L. pinnate, long pendulous leaflets.
<i>Nipa fruticans</i> . Nipa, or Water- Coconut; "Gin-pol," S.	South-west Coast	Rootstock 1½ ft. diam. L. pinnate, 10—15 ft. long.
<i>Phoenix pusilla</i> . "Inchu," T.	Forests of dry region	Stem very short, L. 4—5 ft. long, lower leaflets re- duced to spines.
* <i>P.—zeylanica</i> . "Indi," S.	Moist low-country	Stem 6—20 ft. L. pinnate, with numerous long narrow leaflets.

check up!



TALIPOT PALM. *Corypha umbraculifera*.



A.—BUILDING BAMBOO OF JAVA. *Gigantochloa aspera*.
B.—GIANT BAMBOO. *Dendrocalamus giganteus*.

BAMBOOS, ORNAMENTAL GRASSES AND SEDGES.

Those marked † are suited for Up-country.

ORNAMENTAL GRASSES AND SEDGES:--

[S.=Sinhalese].

- Anthistiria gigantea*. Malaya.—A handsome grass, 5-7 ft. high, with large graceful, drooping flowering panicles.
- ✓ † *Arundo Donax variegata*. Mediterranean, Egypt, &c.—A bushy variegated grass, 6-10 ft. high, excellent for ornamental effect.
- ✓ *Carex brunnea variegata*. India. 1 foot high, suitable for growing in pots.
- ✓ *Coix Lacryma*. Job's Tears; "Kirindi-mana," S. Ceylon, India and Malaya.—A bushy annual, 3-4 ft. high, with hard bead-like fruit. See *Ornamental seeds*.
- ✓ † *Cyperus alternifolius*. Umbrella-plant. Australia.—An ornamental grass-like sedge, with narrow diverging leaves, about 3 ft. high.
- C.—*Papyrus*. Egyptian Papyrus. Egypt.—A large, very ornamental plant, with brush-like leaves, suitable for swamps or water margins.
- † *Isolepis gracilis*. Sub-tropics.—A favourite pot plant for greenhouse and conservatory decoration, with pendulous hair-like leaves.
- † *Euchlaena (Reana) luxurians*. "Teosinte." Guatemala.—An annual grass, 10-15 ft. high, very handsome when in flower.
- Oplismenus Burmanni variegatus*. New Caledonia.—A very ornamental creeping grass, the leaves being white with a central green or pink stripe.
- Panicum plicatum*. Ceylon, India, &c.—A handsome grass, with large broad leaves, 2-3 ft. high.
- † *P.—pulchrum*.—An ornamental species, 1½ ft. high.
- Pennisetum longistylus*. Abyssinia.—A handsome grass, 4-5 ft. high.
- ✓ † *Phalaris arundinacea*. "Ribbon-grass," or "Gardener's garter." S. Europe.—A small variegated grass, suitable for edgings, &c.
- † *Tricholaena rosea*. Natal Red-top Grass. Natal.—A handsome grass when bearing its masses of purplish-crimson flowers. 1-1½ ft. high.

BAMBOOS AND BAMBOO-LIKE GRASSES, &c.

- † *Bambusa aurea*. Japan.—Stems yellow; light open foliage, very ornamental.
- † B.—*Madake*. Japan.—10-15 ft. high, branches erect.
- B.—*nigra*. India.—An interesting species, 25-30 ft. high, with the lower part of the stems purplish black.
- B.—*Siamensis*. Burma, Siam.—20 ft. high. Leaves small in dense graceful plumes. An exceedingly graceful bamboo.
- B.—*vulgaris*. "Una," S.—Common Yellow-, or Golden-bamboo. Ceylon, Tropics generally.—A very handsome species, 30-40 ft. high, with pale yellow stems, 3-4 in. diam; most useful for making pots, scaffolding, &c. Thrives up to 5,000 ft. in valleys.
- ✓ *Dendrocalamus giganteus*. Giant Bamboo. Burma, Malaya.—A magnificent species, attaining a height of over 100 ft. and 40-50 ft. in diameter of clump; stems 8 in. or more in diameter.
- † D.—*Hamiltonii*. Tropical Himalaya.—A large species, suited to medium elevations.
- D.—*strictus*. "Male-", or "Solid-Bamboo." India, Java, &c.—A large handsome spreading species, 30 ft. high. Stems about 2 inches or more in diam., sometimes almost solid; used for shafts, lance staves, posts, &c.
- Gigantochloa aspera*. Building Bamboo. Java.—A large graceful species, resembling the Giant Bamboo, 70-80 ft. high, with stout strong stems.
- ✓ *Gynerium saccharoides*. Trop. America.—A tall handsome grass, 15-20 ft. high, with long ribbon-like leaves.

Pampasa grass



CLOSE VIEW OF GIANT BAMBOO.

Ochlandra maculata. Mottled Bamboo ; "Ranabata-li." S.—Leaves broad, stems blotched with brown.

O.—*Rheedii*. "Quill Bamboo." 12-15 ft. high. Leaves broad and long.

O.—*Travancorica*. S. India. 15-20 ft. high. Large handsome broad leaves.

†*Oxytenanthera Thwaitesii*. Ceylon and S. India. A large reed, 10-12 ft. high, with leaves 12 in. long by 1-1½ in. broad; 4,000 to 6,000 ft. elevation.

Thyrsanolaena acarifera. Tropical Asia.—A large bushy spreading reed, 8-10 ft. high, with large broad leaves.

ORNAMENTAL BULBOUS OR TUBEROUS PLANTS.

SUITABLE FOR GROWING IN POTS OR SHADY BORDERS

UP TO 3,000 OR 4,000 FEET.

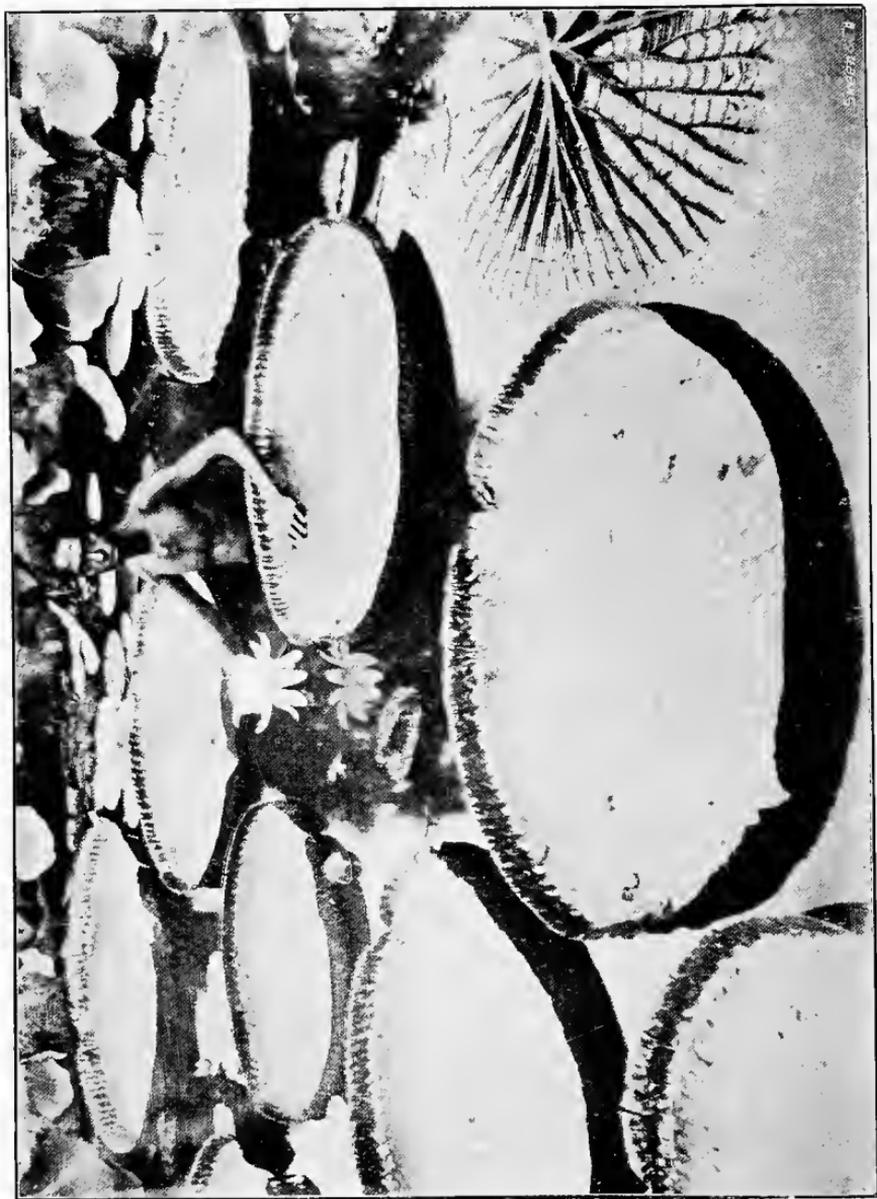
Propagated by bulbs, tubers, or division, and in some cases also by seed.

[S.=Sinhalese].

Name and Native Country. [Hort.=Garden origin.]	Natural Order.	Colour of Flowers.	Height, &c.
✓ <i>Achimenes grandiflora</i> . Mexico	<i>Gesneraceae</i>	Crimson	1 ft. } Very showy, for beds or pots.
✓ A.— <i>magnifica</i> . New Granada. Numerous varieties	"	Scarlet	2 ft. }
<i>Alocasia</i> , see <i>Foliage Pot Plants</i>			
✓ <i>Amaryllis</i> , "Mrs. Garfield." Hort	<i>Amaryllidaceae</i>	White & scarlet	1—2 ft. Very handsome.



GIANT BAMBOO (*Dendrocalamus giganteus*), IN PERADENIYA GARDENS.



GIANT WATER LILY (*Victoria regia*), IN PERADENYA GARDENS.

Name and Native Country. [Hort.=Garden origin.]	Natural Order.	Colour of Flowers.	Height, &c.
✓ <i>Amaryllis reticulatum</i> . Brazil	<i>Amaryllidaceae</i>	Scarlet	10 in. L. lined, white centre.
<i>Amorphophallus campanulatus</i> . "Kidaran," S. India and Ceylon	<i>Aroidaceae</i>	Lurid-purple	2 ft. Fl's large, foetid.
A.— <i>Titanum</i> . Sumatra	"	Dark-purple	10 ft., Fl. 5 ft. high and 3 ft. across.
<i>Arisaema speciosa</i> . "Wal-kidaran," S. India and Ceylon	"	Greenish-purple	2 ft.
<i>Belamacanda (Pardanthus) chinensis</i> . "China Leopard Lily."	<i>Iridaceae</i>	Orange, spotted-brown	1½ ft.
<i>Caladium bicolor</i> .	<i>Aroidaceae</i>	—	1—1½ ft. Leaves very showy.
✓ C.— <i>Humboldtii</i> . Brazil	"	—	2—10 in. Leaves small, variegated.
C.—"Madam d'Hambourg." Hort. Numerous varieties	"	—	1 ft. Leaves large, crimson.
<i>Callipsyche aurantiaca</i> . S. America	<i>Amaryllidaceae</i>	Orange	2 ft.
C.— <i>eucrosioides</i> . Mexico	"	Scarlet	2½ ft.
✓ <i>Canna, Orchid-flowered</i> :—	<i>Scitamineae</i>		
"Australia"	"	Lemon-yellow	3 ft. Leaves green.
"Australia"	"	Bright-red	" "
"Britannia"	"	Orange-yellow	" "
"Kronos"	"	Yellow & orange	" "
"H. Wendland"	"	Scarlet & yellow	" "
"Africa"	"	Orange-red	2½ ft. Leaves bronze
"Pluto"	"	Deep-red	" "
"Rhea"	"	Red	" "
✓ C.— <i>Gladiolus-flowered</i> :—			
"Circe"	"	Salmon-pink	3 ft. Leaves green.
"Ehemanni"	"	Crimson	" "
"George King"	"	Cerise	" "
"Janus"	"	Yellow	" "
"M'dme Crozy"	"	Scarlet, edged with yellow	" "
<i>Chirita Moonii</i> . Ceylon	<i>Gesneraceae</i>	Pale-purple	2 ft. " "
✓ <i>Crinum asiaticum</i> . "Tolabo," S. Trop. Asia	<i>Amaryllidaceae</i>	White	2 ft. Flowers scented.
C.— <i>angustum</i> . Mauritius	"	Pink	1 ft.
C.— <i>defixum</i> . India	"	White	2 ft.
C.— <i>erubescens</i> . Trop. America	"	White & purple	2 ft.
C.— <i>Moorei</i> . S. Africa	"	Rose	1½ ft.
C.— <i>Powellii</i> . Hort	"	Reddish	3—4 ft.
C.— <i>speciosissimum</i> .	"	Pure-white	2 ft.
C.— <i>zeylanicum</i> . Ceylon	"	White	2 ft.
<i>Dracontium gigas</i> . Nicaragua	<i>Aroidaceae</i>	Brownish-red	8—10 ft.
<i>Drimiopsis Kirkii</i> . Zanzibar	<i>Liliaceae</i>	Whitish	10 in. Leaves spotted brown.
✓ <i>Eucharis grandiflora</i> .	<i>Amaryllidaceae</i>	Pure-white	1½ ft.
E.— <i>Sanderi</i> . Colombia	"	White	1 ft.

Name and Native Country. [Hort.=Garden origin].	Natural Order.	Colour of Flowers.	Height, &c.
✓ <i>gladiolus</i> <i>Eurycles amboinensis</i> . Malaya, &c.	<i>Amaryllidaceae</i>	White	1—1½ ft.
<i>E.—Cunninghamii</i> . Australia	"	"	1 ft.
✓ <i>Gesnera cardinalis</i> . Brazil	<i>Gesneraceae</i>	Scarlet	1½ ft.
<i>G.—Hookeri</i> . Colombia	"	"	1½—2 ft.
<i>G.—magnifica</i> . Brazil	"	Purple	1—1½ ft.
<i>Gloriosa Rothschildiana</i> . <i>G.—superba</i> . "Niyangala." S. Trop. Asia	<i>Liliaceae</i>	Crimson	4—6 ft. Herbaceous climbers.
✓ <i>Gloxinia maculata</i> . S. America	<i>Gesneraceae</i>	Orange-yellow	4—6 ft. Herbaceous climbers.
<i>Godwinia</i> , see <i>Dracontium</i>			
<i>Griffinia hyacinthina</i> . <i>Haemanthus Lindenii</i> . Congo	<i>Amaryllidaceae</i>	Blue	1 ft. Very showy.
<i>H.—multiflorus</i> . Numerous species. Trop. Africa	"	Rosy-scarlet	1½ ft.
7 <i>Hippeastrum (Amaryllis)</i> equestre	"	Scarlet	1 ft.
<i>H.—Solandriflora</i> . Numerous garden var's	"	Bright-red	1½ ft.
<i>Hymenocallis amoena</i> . Trop. America	"	Pure-white	1½ ft.
<i>H.—ovata</i> . W. Indies	"	"	1 ft. Fl's delicate.
<i>H.—tenuiflora</i> . S. America And many others.	"	White	1 ft. "
<i>Isoloma (Tydæa) amabilis</i> . New Grenada	<i>Gesneraceae</i>	"	1 ft. "
<i>Isoloma (Tydæa) amabilis</i> . New Grenada	<i>Gesneraceae</i>	Dark-rose	1—2 ft.
<i>Kæmpferia Roscoeana</i> . Ceylon, India, &c.	<i>Scitamineae</i>	Bright-pink	1 ft.
<i>K.—rotunda</i> . Ceylon, India & Malaya	"	Red & White	1 ft.
<i>K.—speciosa</i> . S. Africa	"	Violet-purple	1 ft.
<i>Lowia grandiflora</i> . Malaya	"	White	2 ft.
<i>L.—longiflora</i> . Perak	"	White & purple	2 ft.
<i>Pancratium (Hymenocallis)</i> <i>caribaeum</i> . W. Indies	<i>Amaryllidaceae</i>	White	2 ft.
<i>P.—zeylanicum</i> . "Wal-lunu," S. Ceylon	"	"	1 ft.
<i>Polianthus tuberosa</i> . Tuberose. Mexico	"	"	2—3 ft. Fl's very fragrant.
7 <i>Sinningia (Gloxinia) speciosa</i> . Brazil	<i>Gesneraceae</i>	Bluish-purple	1 ft. Showy
<i>Sprekelia formosissima</i> . Guatemala	<i>Amaryllidaceae</i>	Bright-crimson	1 ft.
<i>Tacca cristata</i> . Trop. Asia and Africa	<i>Taccaceae</i>	Brownish-purple	1½—2 ft.
<i>Tulbaghia violacea</i> . S. Africa	<i>Liliaceae</i>	Purplish-violet	1 ft.
<i>Tydæa</i> , see <i>Isoloma</i>			
<i>Zephyranthes aurea</i> . Peru	<i>Amaryllidaceae</i>	Bright-yellow	10 in.
<i>Z.—carinata</i> . Rose Amaryllis	"	Pink	10 in.
<i>Z.—tubispatha</i> . W. Indies	"	White	10 in.

ORNAMENTAL WATER PLANTS

SUITED FOR THE LOW-COUNTRY.

Those in brackets, though not aquatics, are adapted for growing in water if in tubs or pots partly submerged.

[C.=cuttings; S.=seed; Tu.=tubers; Div.=division; S.=Sinhalese; T.=Tamil].

Botanical and Common Name.	Natural Order.	How Propagated.	Descriptive notes.
✓ <i>Acorus Calamus</i> . Sweet Flag. "Wadakaha," S.	<i>Aroideae</i>	Div.	L. 3—4 ft. high, erect.
<i>Aponogeton monostachyum</i> . "Koddi," T.	<i>Naiadeae</i>	"	L. floating; Fl's pale blue or white.
<i>Azolla pinnata</i> .	<i>Marsilaceae</i>	"	Small floating plants with pinnate leaves, forming a pretty sheet of light green.
(<i>Carludovica palmata</i>)	<i>Cyclanthaceae</i>	"	Large, palm-like leaves, 6—8 ft. high.
<i>Ceratopteris thalictroides</i> . Water Fern	<i>Filiccae</i>	Div. or spores.	{ Fronds pinnate, edible when tender, 1½—2 ft.
(<i>Chrysalidocarpus lutescens</i>)	<i>Palmeae</i>	S. or div.	Handsome, bushy feathery palm.
(<i>Cyclanthus cristata</i>)	<i>Cyclanthaceae</i>	Div.	Stemless plant, large leaves, 6—8 ft. long.
✓ (<i>Cyperus alternifolius</i>). "Umbrella grass."	<i>Cyperaceae</i>	"	Leaves diverging in a whorl, 2—3 ft.
✓ (C.— <i>Papyrus</i>). <i>Papyrus</i>	"	"	Large handsome brush-like leaves, 8—10 ft. high.
<i>Euryale ferox</i> .	<i>Nymphaeaceae</i>	S.	Large floating leaves with upright spines.
<i>Hedychium coronarium</i> . H.— <i>gardnerianum</i> .	<i>Scitamineae</i>	Div.	Flowers white, scented.
<i>Lasia spinosa</i> . "Kohilla," S.	"	"	Flowers yellow.
<i>Limnathemum indicum</i> . "Water Snowflake."	<i>Araceae</i>	Div. or S.	Leaves spinous, pinnatifid.
✓ <i>Limnocharis Humboldtii</i> . Water Poppy	<i>Gentianeae</i>	"	Floating heart-shaped leaves. Fl's white.
L.— <i>Plumierii</i> .	<i>Alismaceae</i>	"	L. oval, floating. Fl's bright yellow.
(<i>Ludovia crenifolia</i>)	"	Div.	L. erect, pale green. Fl's small, yellow.
<i>Marsilea quadrifolia</i>	<i>Cyclanthaceae</i>	"	Palm-like leaves, 3—4 ft. long.
<i>Monocharia hastaefolia</i> . "Diya-habarala," S.	<i>Rhizocarpeae</i>	"	Small clover-like plant, allied to Ferns.
<i>Myriophyllum proserpinacoides</i> .	<i>Pontederiaceae</i>	"	Fl's brilliant purplish-blue.
✓ <i>Nelumbium speciosum</i> . Lotus Lily. "Nelun," S.	<i>Haloragaceae</i>	"	Floating feathery leaves.
<i>Nipa fruticans</i> . Nipa or Water Palm	<i>Nymphaeaceae</i>	S. or Tu.	Large round peltate leaves; Fl's rose-coloured or white, scented.
✓ <i>Nymphaea Lotus</i> . Water Lily. "Olu," S.	<i>Palmae</i>	S.	Feathery-leaved palm, 8—10 ft. high, found in lagoons near the sea.
N.— <i>stellata</i> . "Manel," S.	<i>Nymphaeaceae</i>	Tu. or S.	Large floating leaves. Fl's pale-pink to bright-rose.
	"	"	Fl's whitish-violet to light-blue.

Botanical and Common Name.	Natural Order.	How Propagated.	Descriptive notes.
<i>Ouvirandra fenestralis</i> . Lattice-leaf plant. Madagascar	<i>Naiadaceae</i>	Tubers.	Curious lace-like floating leaves.
<i>Oxystelma esculentum</i> . "Kulap-palai," T.	<i>Asclepiadaceae</i>	S. or C.	Beautiful twiner with cream and pink fl's
<i>Pistia Stratiotes</i> . Water Lettuce	<i>Aroideae</i>	Div.	Floating stemless plant.
<i>Pontederia crassipes</i> . Water Hyacinth	<i>Pontederiaceae</i>	..	Floating plants, 1 ft. high ; high, beautiful blue or lilac fl's.
(<i>Rhapis flabelliformis</i>). Palm	<i>Palmae</i>	..	Cane Palm. 5—6 ft. high.
✓ <i>Sagittaria sagittifolia</i> . Arrow-head	<i>Alismaceae</i>	.	Large sagittate leaves.
✓ (<i>Schizocasia [=Alocasia] Portei</i>).	<i>Aroideae</i>	Div.	Very large, hastate, reddish leaves, with prickly leaf stalks.
<i>Susum anthelminticum</i> . "Induru," S.	<i>Flagellariaceae</i>	S. or div.	Long floating shoots, with large erect, handsome panicles.
✓ <i>Typha angustifolia</i> . Bull-rush	<i>Typhaceae</i>	Div.	Erect ribbon-like leaves, 4—6 ft. high.
✓ <i>Victoria regia</i> . Giant Water-lily	<i>Nymphaeaceae</i>	S.	L. floating, 6—8 ft. in diam, with a raised margin ; fl's large, cream or pink, strongly scented. A remarkable plant.

SELECTED SUCCULENT OR CACTUS PLANTS.

This class of plants is not generally suited to a humid climate, the great majority of them being indigenous to dry regions, as Mexico and South Africa. Those marked † flourish in a wet climate and up to 5,000 ft. elevation.

[Su.=suckers; C.=cuttings; S.=seeds; Tu.=tubers].

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Descriptive notes.
✓ † <i>Agave americana variegata</i> Hort A.— <i>densiflora</i> . Mexico A.— <i>heteracantha</i> , Texas, &c. † A.— <i>Morrisii</i> . Jamaica ✓ A.— <i>rigida</i> <i>Sisalana</i> . S. America Numerous other species.	<i>Amaryllidaceae</i>	Su. or S.	} Stemless plants with large succulent pointed leaves, the latter often spiny at the margin. L. rather spatulate.
	
	..	Su. or bulbils.	} <i>Sisal Hemp</i> , which see.
✓ † <i>Aloe saponaria</i> . S. Africa Numerous other species.	<i>Liliaceae</i>	..	
† <i>Bromelia Pinguin</i> . W. Indies	<i>Bromeliaceae</i>	Offsets.	} 6—8 ft. Stemless plants, with long spiny leaves.

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Descriptive notes.
† <i>Caralluma campanulata</i> . Ceylon and India	<i>Asclepiadaceae</i>	C.	Dwarf leafless plant, with square stems.
✓† <i>Cereus grandiflorus</i> . "Night-flowering Cactus." W. Indies	<i>Cactaceae</i>	..	Creeper, reaching the tops of tall trees. Fl's large, white.
C.— <i>jamacaru</i> . Brazil	.	Offsets or	Stout single stem, unbranched, 4—5 angled.
†C.— <i>peruvianus</i> . S. America	.	C.	20—30 ft. Large, branching, tree-like plant.
†C.— <i>serpentinus</i> . Mexico	..	C.	Creeper, with thin hairy stems.
Dyckia <i>altissima</i> . Brazil	<i>Bromeliaceae</i>	Offsets.	1 ft. Leaves narrow, wiry and recurving.
✓ <i>Echinocactus</i> , numerous species. Mexico	<i>Cactaceae</i>	..	Small unbranching, ovoid or globose succulent plants.
Echinopsis (<i>Cereus</i>) <i>multiplex</i> . Brazil	.	..	Erect unbranching plant, with numerous spine-covered angles.
✓† <i>Epiphyllum truncatum</i> . Brazil	..	C.	Small shrub, with handsome rose-coloured fl's.
? <i>Furcraea gigantea</i> . Trop. America	<i>Amaryllidaceae</i>	Su. or bulbs.	8—10 ft. See <i>Mauritius Hemp</i> .
Gasteria <i>trigona</i> . Salm-Dyck Aloe. S. Africa	<i>Liliaceae</i>	Offsets.	} ½ ft. Leaves very thick, distichously arranged.
G.— <i>verrucosa</i> . S. Africa	..	..	} Suitable for pots.
Haworthia <i>attenuata</i> . S. Africa	.	.	Small, Aloe-like plants, leaves in a rosette.
Numerous other species.	.	.	.
† <i>Kalanchoe laciniata</i> . Trop. Africa	<i>Crassulaceae</i>	C.	1 ft. "Life-plant." L. deeply cut.
† <i>Lomatophyllum borbonicum</i> . Bourbon	<i>Liliaceae</i>	S.	3 ft. Bears long spiny fleshy leaves on a short stem.
Mammillaria <i>glauca</i> . Mexico	<i>Cactaceae</i>	Offsets.	Dwarf plants, composed
M.— <i>megacantha</i> . Mexico	..	..	} of close tubercles, each
M.— <i>nobilis</i> . Mexico	..	..	} of which is terminated
Numerous other species.	..	..	} by a bunch of hairy spines.
Nopalea <i>coccinellifera</i> . Mexico	..	C.	4—5 ft. A branching leafless shrub, flat oval spiny tubercles.
✓ <i>Opuntia Dillenii</i> . S. America	.	..	} 4—5 ft. Branching leafless shrubs, with large
O.— <i>grandis</i> . Mexico	.	..	} circular or oval tubercles, clothed with tufts
O.— <i>robusta</i> . Mexico	..	..	} of hair-like spines.
✓† <i>Pedilanthus tithymaloides</i> . S. America	<i>Euphorbiaceae</i>	..	3—4 ft. An erect shrub.
✓† <i>Phyllocactus amabilis</i> . Hort.	<i>Cactaceae</i>	..	}
†P.— <i>crenatus</i> . Honduras	..	..	} Small shrubs, with flat-
P.— <i>grandis</i> . Honduras	..	.	} tened leaf-like branches: flowers showy,
†P.— <i>speciosissima</i> . Hort.	..	..	} bright pink, &c.
Numerous other species and hybrids	.	.	}

Name and Native Country. [Hort.=Garden origin.]	Natural Order.	How Propagated.	Descriptive notes.
† <i>Rhipsalis Cassytha</i> . Trop. Asia	<i>Cactaceae</i>	C. or S.	} Epiphytic leafless plant, cylindrical pendulous stems.
<i>R.—pachyptera</i> . Trop. America	..	C.	} Large flattened leaf-like branches.
<i>Stapelia grandiflora</i> . S. Africa	<i>Asclepiadaceae</i>	..	} Small leafless plant.
<i>Vitis quadrangularis</i> . Trop. Asia, &c.	<i>Ampelideae</i>	C. and Tu.	} Climber, with square suc- culent stems.



CHAPTER XVII.

POT PLANTS: SELECTIONS SUITABLE FOR LOW AND MEDIUM ELEVATIONS.

ORCHIDS :—

[Ep.=epiphyte ; Terr.=terrestrial ; S.=Sinhalese].

The cultivation of orchids affords one of the most interesting and pleasant occupations in the tropics, as elsewhere, and not a few enthusiasts in Ceylon, India, &c., expend a good deal of money on importing and growing showy kinds. Orchids may be divided into two types, (1) *terrestrial* or ground-orchids, and (2) *epiphytes*,—that is plants which are found growing naturally upon trees or rocks. In order to grow orchids successfully, it is essential to know which of these types they belong, also the elevation and conditions of climate under which they grow in their natural state. Orchids of a dry region generally fail when removed to a wet climate, and *vice versa* ; thus *Cattleyas* and other South American species, which are accustomed to a long dry period, soon deteriorate in the moist climate of the south-west part of Ceylon, especially if not protected during the long rainy season. Nevertheless, it is well to remember that in cultivation, orchids, like other plants, are often adaptable to altered conditions, and careful observation of the progress of the plants will generally suggest the more beneficial modifications to adopt in their treatment. Epiphytic orchids generally thrive better on trees than in pots, but for obvious reasons the former conditions cannot always be afforded. Many species thrive best when fully exposed to the sun, provided sufficient moisture is available at the roots, while others grow and flower most freely under light shade.

Potting orchids.—Special kinds of pots with several drainage holes and perforated sides are made for growing orchids in. When these are not procurable, very useful substitutes may be found in joints of large bamboos, which should be perforated in the same way ; or a longitudinal section of the bamboo joint, with the corners sloped off, may be used with advantage, thin copper

wire being strung through the margins to hold the plant and potting material in position. For epiphytes, a potting material consisting of old bark, broken crocks or pieces of porous brick, and sphagnum moss is essential. Peat is usually an excellent material for orchids, but is not procurable in Ceylon. Sphagnum moss is difficult to obtain, being only found in a limited area on Horton Plains. Bracken roots, a useful ingredient in orchid



GIANT ORCHID.

Grammatopteryllum speciosum.

mixtures, are however common up-country and easily obtained. Coir fibre, which should be well-leached, is a most serviceable material employed at Peradeniya for growing epiphytic orchids, and is indispensable for fixing them on boards, stems of trees, &c.; it is also used in composts for terrestrial orchids, the other ingredients being those mentioned above in addition to well-decomposed cow manure.



CŒLOGYNE ASPERATA.

Flowers creamy-yellow ground, very fragrant.



VIEW IN THE ORCHID HOUSE, PERADENIYA GARDENS.

The following are among the most showy and successfully grown orchids at Peradeniya (elevation 1,540 ft., rainfall about 80 inches) :—

Name and Native Country.	Class.	Descriptive notes.
<i>Aerides odoratum</i> . India and China	Ep.	Fl's scented, white, blotched with magenta
<i>Angraecum sesquipedale</i> . Madagascar	..	Fl's very large, ivory-white.
<i>Cattleya Eldorado</i> . Rio-negro	..	Fl's bluish-white and magenta.
<i>C.—Gaskelliana</i> . Venezuela	..	Fl's scented, white and amethyst-purple.
<i>C.—Gigas</i> . Colombia	..	Fl's very large, rose, crimson-purple and yellow.
<i>C.—labiata</i> . Brazil	..	
<i>C.—Mossiaë</i> . Venezuela	..	Fl's large, crimson and rose.
<i>C.—Skinneri</i> . Guatemala	..	Fl's rose-purple.
<i>C.—Trianaë</i> . Colombia	..	Fl's purple-crimson, very showy.
<i>Chysis bractescens</i> . Peru	..	Fl's large, creamy-white; stout fleshy stems.
<i>Coelogyne asperata</i> . Borneo	Terr.	Fl's in long drooping racemes, creamy yellow, scented.
<i>C.—Dayana</i> . Borneo	..	Pseudo-bulbs 3-8 in. L. 2-3 ft.; fl's creamy yellow.
<i>Cymbidium Lowianum</i> . Burma	Ep.	Fl's large, yellowish green, with a crimson blotch.

Name and Native Country.		Class.	Descriptive notes.
<i>Dendrobium Dalhousianum</i> .	Burma	Ep.	Stems 3-5 ft. long. Fl's large, tawny-yellow and rose.
<i>D.—densiflorum</i> .	India	"	Fl's pendulous, amber-yellow and orange.
<i>D.—Farmeri</i> .	India and Burma	"	Yellow, tinted with pink.
<i>D.—fimbriatum</i> .	Burma	"	Fl's pendulous, rich orange-yellow.
<i>D.—Macarthiae</i> .	" Wesak-mal," S. Ceylon	"	Stems slender, fl's rose-pink.
<i>D.—nobile</i> .	India and Burma	"	Fl's large and showy, white, tipped with rose-purple.
<i>D.—thyrsiflorum</i> .	Burma	"	Stems 18-30 in. high; fl's in large drooping clusters, white and yellow.
<i>D.—Wardianum</i> .	Assam	"	Stems 1 to 2 ft.; fl's white, purple and yellow.
<i>Epidendrum radicans</i> .	Mexico	"	Stems long, slender, scandent; fl's terminal, bright orange-scarlet.
<i>Grammatophyllum speciosum</i> .	Malaya	"	Stems 5 to 10 ft. long; fl's ochre-yellow, blotched with purple.
<i>Laelia purpurata</i> .	Brazil	"	Fl's large and showy, rose-white and crimson-purple.
<i>Oncidium luridum</i> .	West Indies	"	L. leathery, 1-2 ft. long; yellow blotched with brown.
<i>Peristeria elata</i> .	Orchid. Panama	Terr.	L. 2-3½ ft. fl's scented, waxy-white.
<i>Phaius (Thunia) Bensoniae</i> .	Moulmein	"	2 ft. high; fl's large, amethyst-purple.
<i>P.—Blumei</i> .	Java	"	Fl's buff-yellow, mottled with red.
<i>Phalænopsis amabilis</i> .	Malaya	Ep.	L. broadly oval, 6-15 in. long; fl's large, white, spotted with red.
<i>P.—Schilleriana</i> .	Philippines	"	L. 10-18 in. long, blotched with grey; fl's large, rose-purple.
<i>Renanthera coccinea</i> .	Burma & Cochin China	"	Stems 4-7 ft., creeping; fl's in large raceme, blood-red, spotted with yellow, very showy.
<i>R.—Imschootiana</i> .	Burma	"	Height 6-24 in. Fl's bright vermilion.
<i>Saccolabium guttatum</i> .	India, Ceylon, &c.	"	Fl's white, spotted with amethyst-purple; showy.
<i>Stanhopea grandiflora</i> .	Ecuador	"	Fl's large, fragrant, yellow, shaded with orange and crimson.
<i>S.—tigrina</i> .	Mexico	"	Fl's large, scented, blood-red, spotted with yellow.
<i>Vanda cærulea</i> .	North India and Assam.	"	Stems 1-3 ft.; fl's large, handsome, light blue.
<i>V.—Hookeriana</i> .	Malaya	"	Stem and leaves cylindrical; fl's purple-magenta and orange-yellow.
<i>V.—Roxburghii</i> .	Ceylon and Burma	"	Fl's pale buff or grey.
<i>V.—spathulata</i> .	Ceylon and South India.	"	Stems several ft. long; fl's large, bright yellow.
<i>V.—teres</i> .	India, Burma, &c.	"	Stems and leaves cylindrical, 2-7 ft. high; fl's rose-magenta and orange-yellow.
<i>V.—tricolor</i>	Java.	"	Fl's yellow, spotted brown, fragrant.

SELECTED CEYLON INDIGENOUS ORCHIDS.

ARRANGED ACCORDING TO REGIONS WHERE FOUND.

MONTANE ZONE (3,000 TO 6,000 FT.) :—

[Terr.=terrestrial; Ep.=epiphyte; S.=Sinhalese].

Name.	Descriptive remarks.
<i>Arunchina minor</i> .	(Terr.) Fl's pale pink, lip yellow.
<i>Bulbophyllum elegans</i> .	(Ep.) Fl's dull-purple tinged with green, lip orange.
<i>Calanthe purpurea</i> .	(Terr.) Fl's pale purplish-pink.
C.— <i>veratrifolia</i> (Terr.)	Fl's pure white, lip pale-pink or dull-yellow.
<i>Chrysoglossum maculatum</i> .	(Ep.) Fl's pale green with reddish blotches, lip white.
<i>Cirrhopetalum grandiflorum</i> .	(Ep.) Fl's yellow, veined and spotted with red; lip purple; rare.
<i>Cleisostoma tenerum</i> .	(Ep.) Fl's yellow, lip white, with pink wings.
<i>Coelogyne odoratissima</i> .	(Ep.) Fl's white, with a yellow stain on lip. Scented.
<i>Cymbidium ensifolium</i> .	(Ep.) Fl's dull yellow, lined with pink; sweet-scented.
<i>Dendrobium aureum</i> .	"Primrose orchid" (Ep.) Fl's pale yellow, sweet-scented.
<i>Eria bicolor</i> .	"Lily of the Valley Orchid" (Ep.) Fl's pure white, on purple red stalks.
<i>Ipsa</i> (<i>Pachystoma speciosa</i>).	Daffodil Orchid; "Nagamarapu-ala," S. (Terr.) Fl's bright yellow. Open patnas.
<i>Phajus bicolor</i> .	(Terr.) Open pastures; fl's purplish orange, or pale orange-yellow.
<i>Saccolabium roseum</i> .	(Ep.) Fl's pale-purple.

MOIST LOW-COUNTRY (1,000 TO 3,000 FT.) :—

<i>Acanthophippium bicolor</i> .	(Terr.) Fl's bright yellow, tipped with purplish-red.
<i>Aerides lineare</i> (<i>Saccolabium paniculatum</i>)	(Ep.) Fl's white, tinged with pale pink.
<i>Cymbidium bicolor</i> .	(Ep.) Fl's cream-coloured, stained with reddish-purple.
<i>Dendrobium cruminatum</i> .	"Sudupareiyamal." White-dove Orchid. (Ep.) Often on Coconut stems. Fl's pure white.
D.— <i>Macarthiae</i> .	"Wesak-mal." (Ep.) Fl's violet-pink, rarely white. Rare, moist forests below 2,000 ft.
D.— <i>macrostachyum</i> .	(Ep.) Fl's pale-green or yellow, tinged with pink. Up to 4,000 ft.
<i>Eulophia macrostachya</i> .	(Terr.) Fl's purplish-green, lip yellow.
E.— <i>sanguinea</i> (Terr.)	Fl's dull purplish-red, lip pinkish-green.
E.— <i>virens</i> .	(Terr.) See <i>Dry Region Orchids</i> .
<i>Phajus luridus</i> .	(Terr.) Fl's yellow, striped longitudinally with red, lip yellow. Endemic, rare.
<i>Pholidota imbricata</i> .	(Ep.) Fl's white, with a pinkish or yellowish tinge.
<i>Saccolabium ochraceum</i> .	(Ep.) Fl's yellow, with red transverse lines.
S.— <i>Wightianum</i> .	(Ep.) Fl's pale-yellow, tinged with red.
<i>Sarcochilus pulchellus</i> .	(Ep.) Fl's pure white, lip tinged with orange.
<i>Tainia bicornis</i> (Terr.)	Fl's pale olive-green, stained with purple.

INTERMEDIATE ZONE (2,000 TO 3,500 FT.) :—

<i>Aerides cylindricum</i> .	(Ep.) Fl's creamy white. Foliage like <i>Luisia</i> . (1,000 to 4,000 ft.).
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VIEW IN FERNERY, PERADENIYA GARDENS.



VIEW IN FERNERY, HAKGALA GARDENS.

- Anaectochilus regalis*. "Wana-rajā," S.; (Terr.) Beautiful velvety brownish leaves, with coloured veins. Among leaves in moist shaded forests.
- Cirrhopetalum grandiflorum*. (Ep.) See *Montane Zoue Orchids*.
- Cottonia macrostachya*. (Ep.) Fl's yellowish-green, veined with pink, resembling an insect. Rare.
- Geodorum dilatatum*. (Terr.) Fl's white, lip suffused with yellow and pink.
- Habenaria pterocarpa*. (Terr.) Fl's white, with the spur green. Endemic.
- Zeuxine regia*. "Iru-rajā," S.; (Terr.) Handsome leaves, with longitudinal white veins. Moist forests.

DRY (OR INTERMEDIATELY-DRY) REGION :—

- Habenaria plantaginea*. "Pigeon Orchid." (Terr.) Fl's large, pure white.
- Saccolabium guttatum*. "Fox-tail Orchid." (Ep.) Fl's in a brush-like hanging raceme; white, dotted with violet-pink. Very handsome.
- Vanda Roxburghii*. (Ep.) Fl's pale buff or grey, streaked with brown lines. Scented.
- V.—spatulata* (Ep.) Fl's bright-yellow, in long erect racemes. Showy.
- Eulophia virens* (Terr.) Fl's yellowish-green, lip white, with crimson lines.

FERNS.

These comprise an extensive family of plants, and are especially popular on account of the beauty and gracefulness of their foliage. Mixed with other plants in the embellishment of verandahs and plant-houses, ferns are always effective, while in floral decorations their cut fronds are often indispensable. Contrary to general opinion, ferns, with few exceptions, are not difficult of cultivation and thrive remarkably well in pots, &c., when the necessary conditions for their growth are afforded. By observing the conditions under which they grow in their natural state, an accurate idea may be formed of their requirements; thus they are usually found luxuriating on humous fibrous soil and limestone rock, occupying shady banks or gullies, by the side of streams or water courses. Therefore, it may be accepted as a general rule that three essential conditions in their requirements are shade, moisture and perfect drainage at the root. Though ferns generally are regarded as shade-loving plants, a striking exception is found in the case of the "Gold fern" (*Gymnogramme chrysophylla*), which thrives to perfection in Colombo in the full glare of the sun, attaining a large size when grown in tubs along paths or drives. Potting mixtures for ferns should consist mainly of fibrous loam and leaf-mould in equal proportions, to which should be added a small proportion of lime rubble or old mortar, and a similar quantity of fine river sand; broken pieces of porous brick mixed with the soil have also a beneficial effect. No manure should enter the potting compost unless it be in a thoroughly decomposed state. Thorough drainage being essential, the pots

should be filled to about a quarter of their depth with crocks. Many of the more delicate ferns, such as *Adiantums* (Maiden-hair ferns) resent too much water overhead, so that their fronds should not be unnecessarily wetted. Ferns are generally easily multiplied by division of the roots, and those that produce fertile fronds may be propagated by spores.—See under *Propagation*.

The following are some of the most ornamental ferns suitable for cultivation in the tropics.

FERNS SUITED FOR THE LOW-COUNTRY:—

<i>Adiantum concinnum.</i> Maiden-hair	* <i>Gleichenia dichotoma.</i>
A.— <i>cuneatum.</i> [Fern	<i>Gymnogramme chrysophylla.</i> Gold Fern
A.— <i>Farleyense.</i>	G.— <i>pulchella.</i> Silver Fern
A.— <i>Fergusonii.</i>	G.— <i>schizophylla.</i>
*A.— <i>hispidulum.</i>	<i>Lomaria gibba.</i>
A.— <i>Pacottii.</i>	<i>Nephrodium macrophylla.</i>
A.— <i>Peruvianum.</i>	*N.— <i>molle.</i>
A.— <i>trapeziforme.</i>	N.— <i>decurrens.</i>
A.— <i>venustum.</i>	* <i>Nephrolepis cordifolia.</i>
A.— <i>wiegandtii.</i>	N.— <i>davallioides.</i>
<i>Anemia Phyllitidis.</i>	*N.— <i>Duffii.</i>
<i>Asplenium falcatum.</i>	*N.— <i>exaltata.</i>
*A.— <i>lunulatum.</i>	N.— <i>tripinnatifida.</i>
*A.— <i>nidus.</i> Bird's nest Fern	* <i>Ophioglossum pendulum.</i>
A.— <i>sylvaticum.</i>	<i>Platycterium alicorne.</i> Elk's horn Fern
*A.— <i>tenerum.</i>	* <i>Polypodium quercifolium.</i>
* <i>Blechnum occidentale.</i>	P.— <i>verrucosum.</i>
* <i>Cheilanthes tenuifolia.</i>	<i>Pteris argyræa.</i>
<i>Davallia Fijiensis.</i>	P.— <i>cretica alba lineata.</i>
*D.— <i>pulchra.</i>	*P.— <i>ensiformis.</i>
D.— <i>tenuifolia.</i>	*P.— <i>quadriaurita.</i>
<i>Dicksonia flaccida.</i>	P.— <i>serrulata.</i>
<i>Didymochlaena lunulata.</i>	

PLANTS RELATED TO FERNS, SUITED FOR THE LOW-COUNTRY:—

* <i>Azolla pinnata.</i> See <i>Water Plants</i>	<i>Selaginella caulescens.</i>
* <i>Lycopodium cernuum.</i>	*S.— <i>crassipes.</i>
L.— <i>Phlegmaria.</i>	S.— <i>grandis.</i>
L.— <i>Hookeri.</i>	S.— <i>lævigata.</i>
*L.— <i>squarrosum.</i>	S.— <i>Martensii.</i>
L.— <i>zeylanicum.</i>	S.— <i>variegata.</i>
* <i>Marsilea quadrifolia.</i> See <i>Water Plants</i>	S.— <i>uncinata.</i>
<i>Selaginella amoena</i>	S.— <i>Wildenovii.</i>

FERNS SUITED FOR UP-COUNTRY (3,000 to 6,000 ft.):—

* <i>Adiantum capillus-veneris.</i> Maiden-hair Fern	* <i>Angiopteris evecta.</i>
A.— <i>dcuneatum.</i>	* <i>Aspidium aculeatum.</i>
A.— <i>Fergusonii.</i>	*A.— <i>anomalum.</i>
A.— <i>gracillimum.</i> Finest-leaved Maiden-hair fern	<i>Asplenium bulbiferum</i>
	*A.— <i>tenuifolium.</i>
	<i>Blechnum orientale.</i>

- **Cheilanthes farinosa*.
- **Diacalpe aspidioides*.
- **Davallia bullata*.
- **D.*—*majuscula*.
- **Lomaria Patersoni*.
- **Nephrodium flaccida*.
- **N.*—*Walkeræ*.

- **Nephrodium zeylanica*.
- **Nephrolepis cordifolia*.
- **Osmunda Javanica*.
- **Polypodium rufescens*.
- **Pteris incisa*.
- P.*—*Victoriæ*.
- **Stenoloma chinensis*. Parsley Fern



ANTHURIUM WAROCQUEANUM.

TREE FERNS :—

- | | |
|---|--------------------------------|
| * <i>Alsophila crinita</i> . Woolly Tree-Fern | * <i>Cyathea Hookeri</i> . |
| * <i>A.</i> — <i>glabra</i> . | * <i>C.</i> — <i>sinnata</i> . |
| * <i>Amphicosmea</i> . See <i>Hemitelia</i> . | <i>Dicksonia antarctica</i> . |
| <i>Cyathea dealbata</i> . Silver Tree Fern | * <i>Hemitelia Walkeræ</i> . |

* Indigenous to Ceylon.

ORNAMENTAL FOLIAGE POT PLANTS.

SUITED ALSO FOR SHADED BORDERS UP TO 2,000 OR 3,000 FT.

[C.=cuttings ; S.=seed ; Div.=division ; Su.=suckers ; Tu.=tubers ; S.=Sinhalese].

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Height and descriptive notes.
<i>Acalypha godseffiana</i> . New Guinea	<i>Euphorbiaceae</i>	C.	2—3 ft. Leaves margined with white.
<i>Aechmea fulgens</i> . Guiana	<i>Bromeliaceae</i>	Offsets.	1 ft. } Stemless plants
A— <i>mexicana</i> . Mexico	"	"	2 " } with clasping
A— <i>Skinneri</i> . Guatemala	"	"	1½ " } leaves.
A— <i>Weilbachii</i> . Brazil	"	"	1½ " }
<i>Aglaonema costatum</i> . Perak	<i>Aroidae</i>	Div.	6 in. } Herbaceous plants
A— <i>Haenkii</i> . Philippines	"	C.	2 ft. } with fleshy,
A— <i>Marantifolium</i> . Malaya	"	C. or Div.	2 " } variegated or
A— <i>pictum</i> . Malaya	"	"	1—2 ft. } blotched leaves.
A— <i>versicolor</i>	"	"	1 ft. }
<i>Alloplectus Lynchii</i> . Colombia	<i>Gesneriaceae</i>	C.	1½ ft. L. bronze-coloured.
<i>Alocasia argyrea</i> . Hab ?	<i>Aroidae</i>	Tu. or off-sets.	2 ft. L. with grey bands.
A— <i>cuprea</i> . Borneo	"	"	1—2 ft. L. coppery green.
A— <i>Johnstoni</i> . See <i>Cyrtosperma</i>	"	"	
A— <i>Lindeni</i> . Papua	"	"	2 ft.
A— <i>longiloba</i> . Malaya	"	"	6—10 ft. L. very large, deeply cut lobes. Stem 5 to 6 ft., erect.
A.— <i>macrorhiza variegata</i> . Ceylon, &c.	"	Div. or C.	5 ft. L. large broad, blotched with white.
A.— <i>princeps</i> . Malaya	"	"	2 ft.
A.— <i>sanderiana</i> . Philippines	"	"	2 ft. Margins and veins marked with prominent silver bands.
A.— <i>violacea</i>	"	"	2 ft. L. metallic blue.
A.— <i>zebrina</i> . Manila	"	"	3 ft.
<i>Anoetochilus setaceus</i> . "Wana-raja," S. Ceylon	<i>Orchideae</i>	Tubers.	½ ft. Velvety green leaves, with golden veins.
Several species			
<i>Ananas sativus variegatus</i> . Variegated Pine	<i>Bromeliaceae</i>	Offsets.	1½ ft.
<i>Anthurium andreanum</i> . Colombia	<i>Aroidae</i>	C. or off-sets.	3—5 ft. Large, satiny, very handsome leaves.
A.— <i>bogotense</i> . Colombia	"	"	2 ft. L. curiously 3 lobed.
A.— <i>crystallinum</i> . Peru	"	"	2—3 ft. L. large, white silvery veins.
A.— <i>digitatum</i> . Peru	"	"	2—3 ft.
A.— <i>Harrisii</i> . Brazil	"	"	2 ft.
A.— <i>longifolium</i>	"	"	1½ ft.
A.— <i>macrolobum</i> . Hort	"	"	3 ft.
A.— <i>pandulifolium</i> . Brazil	"	"	L. 5 to 8 ft. long by 6 to 8 in. broad.
A.— <i>radiatum</i> . Mexico	"	"	3 ft. L. radially digitate.
A.— <i>veitchii</i> . Colombia	"	"	2½ ft. long L. furrowed.
A.— <i>Warocqueanum</i> . Colombia	"	"	Leaves 2—3 ft. long.



ANTHURIUM VEITCHII.



ANTHURIUM PANDULIFOLIUM.

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Height and descriptive notes.
<i>Aralia Balfourii.</i> Hort	<i>Araliaceae</i>	C.	3—4 ft.
<i>A.—elegantissima.</i> Polynesia	"	"	2—3 ft.
<i>A.—filicifolia.</i>	"	"	4—6 ft.
<i>A.—triloba.</i>	"	"	2—3 ft.
<i>A.—Veitchii.</i>	"	"	2—3 ft.
New Caledonia			
<i>Asarum geophyllum.</i> China	<i>Aristolochiaceae</i>	Div.	½ ft. L. round, prettily marked.
<i>Aspidistra lurida variegata.</i>	<i>Liliaceae</i>	"	1½ ft. Large variegated radical leaves.
Japan			
<i>Begonia albo-picta.</i> Brazil	<i>Begoniaceae</i>	C.	1½ ft. L. spotted white.
<i>B.—gogoensis.</i> Sumatra	"	"	1 ft. L. peltate.
<i>B.—grandis.</i>	"	"	1—2 ft. L. velvety, with pale spots.
<i>B.—Haageana.</i> Brazil	"	"	3 ft.
<i>B.—heracleifolia.</i> Mexico	"	"	1½ ft.
<i>B.—metallica.</i> Mexico	"	"	3 ft. L. bronzy purple.
<i>B.—purpurea.</i>	"	"	2 ft. L. deep bronzy purple.
<i>B.—President de Bourenilles.</i> Hort	"	"	1½—2 ft. L. deep bronzy purple.
<i>B.—rex.</i>	"	"	1 ft. L. beautifully marked.
Numerous varieties			
<i>B.—sceptrum.</i> Brazil	"	"	2—3 ft. L. spotted grey.
<i>B.—tomentosa.</i> "	"	"	1½—2 ft. L. tomentose.
See <i>Flowering Plants for Pots</i>			
<i>Bertolonia marmorata.</i> Brazil	<i>Melastomaceae</i>	"	6—10 in. } Beautiful shade-loving plants, with delicate velvety leaves
<i>B.—superba.</i> Madagascar	"	"	1 ft.
<i>Bilbergia rosea.</i> Trop. America	<i>Bromeliaceae</i>	S. or off-sets.	2—3 ft. } Epiphytic plants with long convolute leaves; purple or bronze, blotched with grey.
<i>B.—sanderiana.</i> Brazil	"	"	1½ ft.
<i>B.—speciosa.</i> "	"	"	1½ ft.
<i>Bowenia spectabilis.</i> Queensland	<i>Cycadeae</i>	Su. or S.	2—3 ft. Feathery leaves.
<i>Caladium.</i> See <i>Bulbous and Tubercous Plants</i>			
<i>Calathea arrecta.</i> Ecuador	<i>Scitamineae</i>	Div.	3 ft. L. velvety bronze.
<i>C.—grandiflora.</i>	"	"	2 ft. L. large, round.
<i>C.—Leitzii.</i> Brazil	"	"	1½ ft. Erect habit, L. small.
<i>C.—Lindeniana.</i> Peru	"	"	2—3 ft. L. beautifully marked on both sides.
<i>C.—sanderiana.</i> Brazil	"	"	1 ft. L. lined with pink.
<i>C.—Makoyana.</i> Trop. America	"	"	½ ft. L. with curious rounded blotches.
<i>C.—medeo-picta.</i> Brazil	"	"	1½ ft.
<i>C.—Veitchii.</i> Bolivia	"	"	2—3 ft. L. blotched purple beneath.
<i>C.—Veitchiana.</i> Brazil	"	"	1 ft. L. variegated, purple beneath.
<i>C.—zebrina.</i> Zebra Plant. Brazil	"	"	2—3 ft. L. velvety, banded dark and light green.

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Height and descriptive notes.
<i>Caraguata andreana</i> . Colombia	<i>Bromeliaceae</i>	Su. & div.	2 ft. } Stiff convolute
<i>C.—musaica</i> . Colombia	"	"	1 ft. } leaves, prettily
<i>C.—Zahnii</i> . Chiriqui	"	"	1 ft. } marked.
<i>Carludovica palmata</i> . Panama-hat Plant S. America	<i>Cyclanthaceae</i>	Su. or S.	4—5 ft. Palm-like stemless plants.
<i>C.—plumieri</i> . S. America	"	"	"
<i>Centradenia rosea</i> . Mexico	<i>Melastomaceae</i>	C. or div.	1 ft. Pinkish leaves.
<i>Chamaeranthemum argenteum</i> . New Britain	<i>Acanthaceae</i>	C.	1½—2 ft. L. variegated.
<i>C.—pictum</i> . Brazil	"	"	1½ ft.
<i>Clinogyne grandis</i> . Malaya	<i>Scitamineae</i>	Div.	3—4 ft.
<i>Conocephalus suaveolens</i> . Malaya	<i>Urticaceae</i>	C.	4—6 ft.
<i>Cordyline australis</i> . New Zealand	<i>Liliaceae</i>	Su. or C.	10 ft. Palm-like plants.
<i>C.—indivisa</i> . New Zealand	"	"	10 ft.
<i>C.—terminalis</i> . Numerous varieties	"	"	5—8 ft. L. purple and crimson.
<i>Costus afer</i> . Sierra Leone	<i>Scitamineae</i>	Div.	3—4 ft. Fl's white.
<i>C.—elegans</i> . Costa Rica	"	"	2 ft. L. velvety with dark bands.
<i>C.—igneus</i> . See <i>Flowering Plants for Pots</i>	"	"	"
<i>C.—musaicus</i> . Trop. America	"	"	1½—2 ft. L. small, narrow, margined with grey.
<i>C.—pictus</i> . Mexico	"	"	4—6 ft. L. satiny green; glaucous beneath.
<i>Cryptanthus Beuckeri</i> . Brazil	<i>Bromeliaceae</i>	Su.	8 in. L. stiff, in rosette.
<i>C.—zebrinus</i> . "	"	"	8 in. Transverse bands of dark green.
<i>C.—zonatus</i> . "	"	"	6—8 in.
<i>Curculigo recurvata</i> . Trop. Asia	<i>Amaryllidaceae</i>	Div. or S.	3 ft. Palm-like plant.
<i>C.—recurvata variegata</i> . "	"	"	3 ft. Variegated form of above.
<i>Curmeria</i> . See <i>Homalomena</i>			
<i>Cycas circinalis</i> . "Madu," S. Ceylon and India	<i>Cycadaceae</i>	Offsets or S.	3—12 ft. Palm-like plants, with large feathery leaves.
<i>C.—revoluta</i> . China	"	"	3—4 ft.
<i>Cyclanthus cristatus</i> . Colombia	<i>Cyclanthaceae</i>	Div.	5—6 ft. Large radical leaves.
<i>Cyperus alternifolius</i> . "Umbrella Plant," Madagascar.	"	"	3 ft. } Quick-growing plants; feathery leaves.
<i>C.—alternifolius variegatus</i> . Hort.	<i>Cyperaceae</i>	"	3 ft. }
<i>C.—Papyrus</i> . Papyrus Grass. Palestine, &c.	"	"	6—8 ft. Requires much moisture, and thrives best in a swamp.
<i>Cyrtosperma Johnstonii</i> . Solomon Islands	<i>Aroidae</i>	"	4—8 ft. L. large, arrow-shaped, veined with rosy red, stalks mottled.
<i>Dichorisandra mosaica</i> . Peru	<i>Commelinaceae</i>	Div. or C.	6 in. L. white-lined, mosaic-like.



SILVER-LEAVED ANTHURIUM. *Anthurium cristallinum*.

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Height and descriptive notes.
<i>Dichorisandra undata</i> . Peru	<i>Commelinaceae</i>	C.	6 in. L. undulated, striped with grey.
D.— <i>thyriflora</i> . Brazil	"	"	See <i>Flowering Plants for Pots</i> .
D.— <i>vittata</i> . Hort.	"	"	6 in. L. purplish green, grey stripes.
<i>Dieffenbachia Bowmanni</i> . Brazil	<i>Aroideae</i>	Su. or C.	2—3 ft. } Dumb-canes. Handsome quick-growing, fleshy herbaceous plants, with leaves variously blotched or variegated.
D.— <i>eburnea</i> . "	"	"	1½ ft.
D.— <i>Jenmani</i> . Brit. Guiana	"	"	2 ft.
D.— <i>Leopoldii</i> . S. America	"	"	2—3 ft.
D.— <i>magnifica</i> . Venezuela	"	"	3 ft.
D.— <i>Memoria-Cortii</i> . Hort.	"	"	2—3 ft.
D.— <i>picta</i> . Brazil	"	"	"
D.— <i>splendens</i> . Colombia	"	"	"
<i>Dorstenia argentata</i> . Brazil	<i>Urticaceae</i>	Div.	1 ft. L. with central silvery band.
<i>Dracaena Godseffiana</i> . W. Trop. Africa	<i>Liliaceae</i>	C. of stem or S.	3—4 ft. Shrub with variegated leaves.
D.— <i>Goldiciana</i> . W. Trop. Africa	"	"	6 ft. L. with yellow bands.
D.— <i>Sanderiana</i> . W. Trop. Africa	"	"	1—1½ ft., slender. L. streaked with white.
D.— <i>Victoria</i> . W. Trop. Africa	"	"	2—4 ft. L. broad, recurved, white with green stripe in centre.
<i>Dracontium</i> (<i>Godwinia</i>), See <i>Bulbous & Tuberos Plants</i>			
<i>Elatostema lineolatum majus</i> . Ceylon	<i>Urticaceae</i>	C.	1 ft. Herb, with leaves much cut.
<i>Episcia cupreata</i> . Nicaragua	<i>Gesneraceae</i>	"	1½ ft. } Bronze-coloured
E.—(<i>Centrosolenia</i>) <i>tessellata</i> . Peru	"	"	1½ ft. } leaves.
<i>Eranthemum atropurpureum</i> . Polynesia	<i>Acanthaceae</i>	"	} Shrubs with beautifully coloured leaves, 3—6 ft. high.
E.— <i>eldorado</i> . Polynesia	"	"	
E.— <i>tricolor</i> . Polynesia	"	"	
E.— <i>versicolor</i> . Polynesia	"	"	
<i>Fittonia argyroneura</i> . Peru	"	"	6 in. L. white-veined.
F.— <i>gigantea</i> . Ecuador	"	"	1½ ft. }
F.— <i>verschaffeltii</i> . Brazil	"	"	8 in. } Leaves oval, purplish, with pink veins.
<i>Gymnostachyum zeylanicum</i> . Ceylon	"	"	8 in. }
<i>Heliconia aureo-striata</i> . New Britain	<i>Scitamineae</i>	Div.	4—6 ft. Plantain-like plants.
H.— <i>illustris</i> . Hort.	"	"	4—6 ft. L. with yellow veins.
H.— <i>spectabilis</i> . Trop. America	"	"	4—6 ft. L. large, bronze.
<i>Hoffmannia discolor</i> . Mexico	<i>Rubiaceae</i>	C.	½ ft. L. bronze, satiny green.
H.—(<i>Higginsia</i>) <i>Giesbreghtii</i> . Mexico	"	"	2—4 ft. Leaves variegated.

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Height and descriptive notes.
<i>Hoffmannia</i> (Higginsia) <i>refulgens</i> . S. America	<i>Rubiaceae</i>	C.	1—2 ft. L. deep bronze.
<i>Homalomena picturata</i> . Colombia	<i>Aroidae</i>	Div.	1 ft. } Ornamental
<i>H.—rubescens</i> . India	"	"	2 ft. } variegated leaves.
<i>H.—Wallisi</i> . Colombia	"	"	1½ ft. }
<i>Jacaranda filicifolia</i> . Panama	<i>Bignoniaceae</i>	C.	2—6 ft. Ornamental fern-like foliage.
<i>Kaempferia Gilbertii</i> . Burma	<i>Scitamineae</i>	Div.	½ ft. Leaves banded with white.
<i>Kalanchoe flammea</i> . "Life Plant." Somaliland	<i>Crassulaceae</i>	C.	1 ft. L. succulent, deeply cut.
<i>Karatas fulgens</i> . Brazil	<i>Bromeliaceae</i>	Offsets.	1 ft. } Sheathing leaves,
<i>K.—Innocentii Striata</i> . Hort	"	"	1 ft. } growing in the form
<i>K.—spectabilis</i> . Brazil	"	"	1 ft. } of a bird's nest.
<i>Ledenbergia roseo-aenea</i> . Central America	<i>Phytolaccaceae</i>	C.	1—2 ft. L. coppery-green, violet underneath.
<i>Leea amabilis</i> var <i>spendens</i> . Borneo	<i>Ampelidaceae</i>	"	3—4 ft. L. bronzy-green, white central band.
<i>Ludovia crenifolia</i> . Brazil	<i>Cyclanthaceae</i>	Div.	3—4 ft. Palm-like plant.
<i>Macrozamia Fraseri</i> . Australia	<i>Cycadeae</i>	Offsets or S.	3—5 ft. } Graceful fern-like plants.
<i>M.—Moorei</i> . "	"	"	3—5 ft. }
<i>Maranta imperialis</i> . "	<i>Scitamineae</i>	Div.	2—3 ft. }
<i>M.—insignis</i> . "	"	"	1 ft. }
<i>M.—makoyana</i> "	"	"	½ ft. } Stemless plants
<i>M.—Massangeanum</i> "	"	"	½ ft. } with large,
<i>M.—picta</i> "	"	"	½ ft. } beautifully
<i>M.—polita</i> "	"	"	1 ft. } marked leaves.
<i>M.—sangoreana</i> . Hort	"	"	1½ ft. }
<i>M.—tigrina</i> "	"	"	1 ft. }
<i>Nephtytis picturata</i> . Congo	<i>Aroidae</i>	"	1½ ft. L. large, handsomely marked with dark satiny bands.
<i>Ophiopogon intermedium</i> . Ceylon, India, &c.	<i>Haemodoraceae</i>	"	1 ft. } Grass-like leaves.
<i>O.—japonicus</i> . Japan	"	"	1 ft. } Specially suited for
<i>O.—japonicus variegatus</i> . Japan	"	"	1 ft. } shaded situations.
<i>Oxalis bupleurifolia</i> . Brazil	<i>Geraniaceae</i>	C.	1—1½ ft. Leaf-like petioles.
<i>Panax crispum</i> . Brazil	<i>Araliaceae</i>	"	2—3 ft. L. pinnate.
<i>P.—elegans</i> . Australia	"	"	2—3 ft. L. pinnate.
<i>P.—multifidum</i> . "	"	"	1 ft. L. Parsley-like.
<i>Pandanus Sanderi</i> "	<i>Pandanaceae</i>	Offsets.	3—6 ft. Handsome variegated leaves.
<i>P.—Veitchii</i> . Polynesia	"	"	2—3 ft.
<i>Panicum plicatum</i> . Trop. Asia, &c.	<i>Gramineae</i>	Div.	2 ft. A grass with long, furrowed broad leaves.
<i>Pandanophyllum</i> (Mapania) Wendlandii	<i>Cyperaceae</i>	"	Grass-like plant.
<i>Peliosanthes Teta</i> . India	<i>Haemodoraceae</i>	Div. or S.	1 ft.
<i>Pellionia Daveauana</i> . Cochin China	<i>Urticaceae</i>	C.	½—1 ft. } L. variegated.
<i>P.—pulchra</i> . Cochin China	"	"	½ ft. }

Name and Native Country. [Hort.=Garden origin]	Natural Order.	How Propagated	Height and descriptive notes.
<i>Peperomia argyreia</i> . S. America	<i>Piperaceae</i>	Div. or C.	1 ft. } Succulent varie-
P.—Fraseri. S. America	"	"	10 in. } gated leaves.
P.—magnifica. Hort	"	"	1 ft. }
P.—Saundersii. Brazil	"	"	10 in. }
<i>Phalaris arundinacea</i> variegatus	<i>Gramineae</i>	"	10 in. See <i>Bamboos and</i> <i>Grasses.</i>
<i>Philodendron andreaum</i> . Colombia	<i>Aroideae</i>	C.	3—5 ft. Large beautiful velvety leaves.
P.—gloriosum. Colombia	"	"	2—3 ft. L. large, cordate, white veins, and pink margins.
P.—Mamei. Ecuador	"	"	2—3 ft. L. variegated, large cordate.
P.—Selloum. Brazil	"	"	2—3 ft. L. handsomely cut.
<i>Phrynium variegatum</i> . Variegated Arrowroot	<i>Scitamineae</i>	Div. or tu.	2 ft. L. handsomely varie-
<i>Phyllanthus nivosus</i> . Polynesia	<i>Euphorbiaceae</i>	C.	2 ft. L. mottled with white.
<i>Phyllotænium (Xanthosoma)</i> Lindenii. Colombia	<i>Aroideae</i>	Div.	1½ ft. L. large, handsome, sagittate, with white veins.
<i>Pothos</i> . See <i>Ornamental</i> <i>Climbers for Pots</i>			
<i>Rhoeo discolor</i> . Central America	<i>Commelinaceae</i>	C.	1 ft. Leaves purple at edges, also underneath.
<i>Ruellia colorata</i> . Moluccas	<i>Acanthaceae</i>	"	½ ft. L. copper-coloured.
<i>Sansevieria cylindrica</i> . Trop. Africa	<i>Haemodoraceae</i>	Div. or leaf C.	3—4 ft. L. cylindrical, erect.
S.—guineensis. Trop. Africa	"	"	3 ft. } L. flat, sword-shap-
S.—zeylanica. Ceylon, India, &c.	"	"	3 ft. } ed.
<i>Schismatoglottis decora</i> . Borneo	<i>Aroideae</i>	Div.	½ ft. L. lanceolate, hand- somely variegated.
S.—neoguineensis. New Guinea	"	"	1 ft. L. large, oval, blotched with grey.
S.—picta. Java	"	"	1 ft. Dark-green, 2 grey bands.
S.—siamensis. Siam	"	"	1 ft. L. lanceolate, spotted grey.
<i>Schizocasia (Alocasia) Portei</i> . New Guinea	"	"	4—5 ft. L. large, handsome, sagittate.
<i>Stangeria paradoxa</i> . Natal	<i>Cycadeae</i>	Offsets	2 ft. Handsome fern-like plant.
<i>Stenandrium Lindenii</i> . Brazil	<i>Acanthaceae</i>	C.	1 ft. Variegated leaves.
<i>Stuednera colocasiaefolia</i> . Martaban	<i>Aroideae</i>	Div.	2 ft. Leaves peltate.
S.—discolor. India	"	"	2 ft. L. peltate, blotched with purple beneath.
<i>Strobilanthes dyerianus</i> . Burma	<i>Acanthaceae</i>	C.	1—2 ft. Crimson velvety leaves.
<i>Syngonium podophyllum</i> albo-lineatum	<i>Aroideae</i>	Div.	8 in. Leaves palmate.
<i>Tillandsia pulchella</i> . Brazil	<i>Bromeliaceae</i>	Offsets	1 ft. Epiphytes, ornamen- tal-coloured leaves.

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Height and descriptive notes.
<i>Tillandsia splendens</i> . Guiana	<i>Bromeliaceae</i>	Offsets	1 ft. L. with transverse violet bands.
<i>Tradescantia fuscata</i> . Brazil	<i>Commelinaceae</i>	C. or Div.	½ ft. L. clothed with dark red hairs.
<i>T.—reginae</i> . Hort	"	C.	1 ft. L. mottled white with violet centre.
<i>Zamioculcas Loddigesii</i> . Trop. Africa	<i>Aroidae</i>	Div.	1—2 ft. Pinnate leaves.
<i>Zebrina pendula</i> . Mexico	<i>Commelinaceae</i>	C.	Small herbaceous creeper with ornamental variegated foliage.
<i>Zeuxine regia</i> . "Iru-raja," S. Ceylon	<i>Orchideae</i>	Tubers	½ ft. L. dark green, with white line down centre.

FLOWERING POT PLANTS.

SUITABLE FOR SHADED SITUATIONS UP TO 2,000 OR 3,000 FT.

[C.=cuttings; S.=seed; Div.=division; Su.=suckers].

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Height. Colour of Flowers, &c.
<i>Acalypha sanderiana</i> . Papua	<i>Urticaceae</i> .	C.	4—5 ft. Fl's in long crimson pendant tails.
<i>Achimenes</i> . See <i>Bulbous and Tuberous Plants</i>			
<i>Æchmea fulgens</i> . Guiana	} <i>Bromeliaceae</i> .	Offsets.	2½ ft. Deep rich red.
<i>Æ.—paniculigera</i> . W. Indies		"	1—2 ft. Rose-coloured.
<i>Æ.—spectabilis</i> . Guatemala		"	2½ ft. "
<i>Aeschynanthus Hildebrandii</i> . Burma	<i>Gesneraceae</i> .	C.	½ ft. Scarlet, tipped with black.
<i>Amydrinm humile</i> . Borneo	<i>Aroideae</i> .	Div.	½ ft White.
<i>Anthurium Archduke Joseph</i> . Hort	"	Offsets or S.	2 ft. Bright-rose.
<i>A.—carneum</i> . Hort	"	"	Light rose-colour.
<i>A.—chelseiense</i> . Hort	"	"	1½ ft. Crimson.
<i>A.—desmetianum</i> . Hort	"	"	2 ft. Carmine-scarlet.
<i>A.—ferrierense</i> . Hort	"	"	2 ft Bright-red.
<i>A.—scherzerianum</i> . Guatemala	"	"	1 ft. Scarlet.
Numerous varieties and hybrids.			
<i>Aphelandra nitens</i> . Colombia	<i>Acanthaceae</i> .	C.	1½ ft. Leaves shining dark-green; fl's scarlet.
<i>Centropogon Lucyanum</i> . Hort	<i>Campanulaceae</i> .	C.	1½ ft. Crimson, tubular.
<i>Clerodendron macrosiphon</i> . Zanzibar	<i>Verbenaceae</i> .	C.	2—3 ft. Snow-white.
<i>Cochlostema jacobianum</i> . Eucador	<i>Commelinaceae</i> .	Div.	1½ ft. Blue and pink.

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Height, Colour of Flowers, &c.
Costus igneus. Brazil	Scitamineae.	Div.	2 ft. Bright orange; L. purple beneath.
Cyanotis barbata. Nepal	Commelinaceae.	Div. or C.	$\frac{1}{2}$ ft. Blue.
C—kewensis. Travancore	"	"	$\frac{1}{2}$ ft. Pink.
Dalechampia Roezliana. Mexico	Euphorbiaceae.	C.	2—3 ft. Pink and yellow.
Dichorisandra thyrsiflora. Brazil.	Commelinaceae	C.	3 ft. Bright-blue.
Euadenia eminens. W. Trop. Africa	Capparidace.	C.	$1\frac{1}{2}$ ft. Large, yellow.
Griffinia hyacinthina. Brazil	Amaryllidaceae.	Div.	1 ft. Beautiful blue.
Impatiens flaccida var. Ceylon	Geraniaceae.	C. or S.	1 ft. White.
I.—mirabilis. Malaya	"	C.	2—3 ft. Yellow.
I.—repens. "Gal-demata," Ceylon.	"	"	Stems creeping. Fl's bright yellow.
I.—sultani. Zanzibar	"	C. or S.	1 ft. Scarlet.
Karatas Innocentii. Brazil	Bromeliaceae.	Offsets	1 ft. Bright orange-red.
K.—spectabilis. Brazil	"	"	1 ft. Red and violet-blue.
Isoloma. See Bulbous and Tuberos Plants			
Musa coccinea. Flowering Banana. China	Scitamineae.	Su.	3—5 ft. Spathes bright red.
Nematanthus longipes. Brazil	Gesneraceae.	C.	2 ft. Scarlet.
Pitcairnea alta. W. Indies	Bromeliaceae.	Div. or su.	3 ft. Red.
P.—coerulea. Chili	"	"	3 ft. Blue.
P.—corallina. Colombia	"	"	2 ft. Crimson.
P.—mucosa. Brazil	"	"	1 ft. Red.
Saintpaulia ionantha. "African Violet." Central Africa	Gesneraceae.	Leaf-C. or div.	$\frac{1}{2}$ ft. Beautiful violet-blue.
Scutellaria Mociniana. Mexico	Labiatae.	S. or div.	$1\frac{1}{2}$ ft. Scarlet.
S.—violacea. Ceylon, &c.	"	"	1 ft. Violet-purple.
Siphocampylus elegans. New Grenada	Campanulaceae.	C.	2 ft. Bright-red.
S.—tovariensis. Venezuela	"	C.	2 ft. Scarlet.
Spathiphyllum candidum. Colombia	Aroidae.	Div.	1 ft. White, scented.
S.—cannæfolium. Trop America	"	"	1 ft. White.
S.—Patnii. Colombia	"	"	1 ft. "
Spironema fragrans. Mexico	Commelinaceae.	S. & div.	1 ft. White.
Strelitzia augusta. "Bird-of-Paradise Flower" S. Africa	Scitamineae.	Su. or div.	6—10 ft. White.
S.—regina. S. Africa	"	"	3—5 ft. Orange and purple.
Tacca cristata. Trop Asia	Taccaceae.	Div.	2 ft. Brownish-purple.
Tillandsia Lindenii. Peru	Bromeliaceae.	Div. & su.	$1\frac{1}{2}$ ft. Violet, bracts rosy.
T.—nitida. Jamaica	"	Div. & su.	2 ft. Blue.
T.—pulchra. Trop America	"	"	1 ft. Pink.
T.—(Vriesia) recurvifolia	"	"	1 ft. Blue, bracts rosy-purple.
T.—Roezlii. Peru	"	"	$1\frac{1}{2}$ ft. Rosy.

ORNAMENTAL CLIMBERS ADAPTED FOR
GROWING IN POTS.

SUITABLE FOR LOW ELEVATIONS.

[C.=cuttings ; S.=seed ; Tu.=tubers ; Div.=division].

Name and Native Country. [Hort.=Garden origin].	Natural Order.	How Propagated.	Remarks.
<i>Antigonon leptopus</i> . Mexico	<i>Polygonaceae</i> .	S. or C.	Beautiful bright-pink fl's.
A.— <i>leptopus albiflora</i> .	"	S.	White flowers.
<i>Aristolochia elegans</i> . Brazil	<i>Aristolochiaceae</i>		Fl's saucer-shaped, curiously marked.
<i>Asparagus plumosus</i> .	<i>Liliaceae</i> .	S. or tu.	Handsome delicate foliage.
" <i>Asparagus Fern</i> ." S.			
			Africa
A.— <i>Sprengeri</i> .	"	C.	Young " leaves " velvety-purple.
<i>Cissus discolor</i> . Bengal	<i>Ampelideae</i> .		
<i>Dichorisandra thyrsiflora</i> .	<i>Commelinaceae</i> .	C. or Div.	Beautiful deep-blue fl's.
			Brazil
<i>Dioscorea argyrea</i> .	<i>Dioscoraceae</i> .	Tu.	Large variegated leaves.
			Colombia
D.— <i>multicolor</i> .	"	"	" "
			Trop. America
<i>Gloriosa superba</i> .	<i>Liliaceae</i> .	"	Fl's large, beautiful orange red.
			Trop. Asia & Africa
<i>Hoya carnosa</i> .	<i>Asclepiadaceae</i> .	C.	Fl's in clusters, wax-like.
			Wax Flower. Trop. Asia
<i>Manettia bicolor</i> . Brazil	<i>Rubiaceae</i> .	"	Small twiner. Fl's scarlet and yellow.
<i>Marcgravia paradoxa</i> . Hort.	"	"	Large, handsome flat leaves, closely adhering to walls.
<i>Paullinia thalictrifolia</i> .	<i>Sapindaceae</i> .	"	Small twiner ; leaves very like <i>Adiantum</i> .
			S. America
<i>Philodendron carleri</i> . Hort.	<i>Aroideae</i> .	"	L. delicate satiny-green, with dark bands.
<i>Pothos argenteus</i> . Borneo	"	"	Silvery leaves.
P.— <i>reticulata</i>	"	"	L. heart-shaped, spotted pale green.
<i>Smilax argyrea</i> . Bolivia	<i>Liliaceae</i> .	Div.	L. large, blotched with white.
<i>Stephanotis floribunda</i>	<i>Asclepiadaceae</i> .	C.	Fl's tubular, waxy-white, scented.

CHAPTER XVIII.

SELECTIONS OF ORNAMENTAL PLANTS, TREES, &c., SUITABLE FOR UP-COUNTRY.

ORNAMENTAL FLOWERING TREES :—

[N. O.—Natural Order ; S.—Sinhalese ; T.—Tamil].

Acacia dealbata. (N. O. Leguminosæ). “Silver Wattle.”—A small Australian tree with finely cut leaves, distinguished from other species of the same genus by the silvery-white under-side of the leaves. Very ornamental when in flower, viz., during February and March, and July to August, with its large heads of yellow fragrant blossom. An objection to the tree, however, is that it invariably sends up numerous suckers, which are difficult to eradicate. Commonly grown at hill stations in India and Ceylon. Propagated by seed or suckers.

A.—cultiformis. (Knife-formed, in reference to the form of the phyllodes). “Knife-leaved Acacia.”—A small tree or large shrub, with pale-yellow flowers, produced in the dry weather, twice a year. The tree is also ornamental on account of its foliage.

A.—decurrens. (Running down, in allusion to the union of the leaves with the stem). Common or Black Wattle. A large Australian tree, well-established at Hakgala and elsewhere up-country ; yields a valuable tanning bark and useful timber. It is a quick-grower, reaching a height of 40 to 50 feet in a few years, and its fragrant yellow flowers, produced in the dry months, render it an ornamental tree. The seeds are small, 1,790 weighing only an ounce.

A.—longifolia. (Long-leaved). “Sydney Golden Wattle.”—A small spreading tree, very ornamental when in blossom, viz., during February to March, and July to August, the flowers being pale-yellow.

A.—pyncnantha. (Dense-flowered). “Golden Wattle,” or “Broad-leaved Wattle.”—A medium-sized tree, with undivided leaves (*phyllodes*), native of Southern Australia. Very ornamental



STENOCARPUS SINUATUS. (Flowers scarlet).

during the dry season, when it bears masses of yellow blossom. Mr. Nock informs me that it flowers at Hakgala when two or three years old. For tanning purposes, its bark ranks as one of the most valuable of Wattle-barks.

Callistemon lanceolata. (N. O. Myrtaceæ). Bottle-brush Tree.—A small tree with stiff, narrow leaves, native of Australia. It blossoms all the year round, but chiefly after the rains, when its scarlet flowers, crowded on spikes of the old wood in the form of a brush, are very attractive. Propagated by seed, which are very minute, and should be sown in pots.

Callophyllum Walkeri. (N. O. Guttiferæ). "Kina," S.—This is the familiar mountain "Kina" of Ceylon, a large handsome tree with stiff coriaceous leaves, which bears from January to April a profusion of pinkish-white, sweet-scented flowers. It is of slow growth, and is propagated by seed.

Elaeocarpus glandulifera. (N. O. Tiliaceæ).—A medium-sized tree, very handsome when in blossom, being then literally covered with racemes of whitish flowers.

Eucalyptus ficifolia. (N. O. Myrtaceæ). Scarlet-flowering Gum Tree.—A small tree, native of South-West Australia. Von Mueller mentions it as "worthy of cultivation for the sake of its magnificent trusses of crimson flowers, irrespective of its claims as a shade or avenue tree."

Hymenosporum flavum. (N. O. Pittosporaceæ).—A small tree of Eastern Australia, introduced about 1882 at Hakgala Gardens, where it is now well established. It bears during the dry weather a profusion of small pale-yellow flowers. Propagated by seed.

Meliosma Arnottiana. (N. O. Sabiaceæ).—A moderate-sized tree, bearing a profusion of yellowish-white flowers in April, being deciduous in January. Dr. Trimen said of it: "A great ornament to the montane forests when covered with its sheets of cream-coloured blossoms."

Pittosporum undulatum. (N. O. Pittosporaceæ). "Victorian Laurel."—A small Australian tree, introduced and established at Hakgala Gardens, and bearing in March fragrant cream-coloured flowers.

Rhododendron arboreum. (N. O. Ericaceæ). "Maha-ratmal," S.—A small tree 15 to 30 feet high, common in a wild state in the montane zone of Ceylon above 5,000 feet. Very conspicuous when bearing its large dark-crimson or pink flowers, from April to July.

Stenocarpus sinuatus. (N. O. Proteaceæ). "Fire Tree," or "Tulip Tree" of Queensland.—An erect tree, 40 to 50 feet high, very showy when bearing its large scarlet flowers. It has been established in Peradeniya Gardens since 1883, also at Hakgala Gardens. Flowers during the dry weather, but has not yet set fruit in Ceylon. Suited to elevations of 1,500 to 4,000 feet.

Sterculia acerifolia. (N. O. Sterculiaceæ). "Flame Tree."—A moderate-sized tree with large shining leaves, native of Southern Australia, introduced into Ceylon in 1882. In cool shade, it grows and flowers at so low as 1,500 feet, but is more suited to higher elevations, and thrives up to 5,000 feet. It produces in May and June, when bare of leaves, large masses of brilliant red blossom. Propagated by cuttings, or by seed when procurable.

ORNAMENTAL FOLIAGE TREES.

Acacia decurrens. (N. O. Leguminosæ). Tan Wattle.—A handsome tree, 40 to 60 feet high, native chiefly of Eastern Australia; thrives between 4,000 and 6,000 feet on poor land, but grows best in rich soil. The tree has of late become popular at the higher elevations in Ceylon for planting amongst Tea, for green-manuring or windbreaks; it affords excellent fuel. (See *Up-country Flowering Trees*).

A.—Melanoxylon. Blackwood Tree.—A large handsome tree, with two forms of leaves, furnishing excellent timber. Mr. J. K. Nock says: "Splits well for shingles. Greedy feeder, roots spreading considerable distance, consequently injurious to any plants growing near it."

Acrocarpus fraxinifolius. (N. O. Leguminosæ). A medium-sized tree with fine feathery foliage, introduced from India into Hakgala Gardens about 1890.

Agathis (Dammara) robusta. See *Foliage Trees for Low and Medium elevations*.

Ailanthus glandulosus. (Simarubaceæ).—A very handsome tree, 50 to 60 ft. high, with long pinnate leaves.

Araucaria Bidwillii. (Coniferæ). "Monkey Puzzle."—A large stately tree with flat scale-like, stiff, pointed leaves; grows to a great height in its native country. Thrives at Hakgala. See *Foliage Trees for Low elevations*.

A.—Cookii. Cookii.—See *Foliage Trees for Low elevations*.

A.—Cunninghamii. Moreton-Bay Pine.—A tall, erect tree of Eastern Australia, &c., with short rather slender branches. Very graceful.

Araucaria excelsa. Norfolk Island Pine.—A beautiful symmetrical tree, with regular tiers of horizontal branches, attaining to a great height; grown in Europe as an ornamental pot-plant. Thrives at Hakgala.—See *Foliage Trees for Low elevations*.

Bucklandia populnifolia. (N. O. Hamamelideæ).—A handsome tree, with large leathery, glossy leaves, native of the Himalayas. Thrives at Hakgala Gardens.

Castanospermum australe. (N. O. Leguminosæ). Moreton Bay Chestnut.—A moderate-sized tree with handsome pinnate leaves, native of Queensland.

Casuarina torulosa. (N. O. Casuarineæ). She-Oak.—A handsome leafless tree, with cord-like branchlets representing leaves. Of several species, this is one of the most suited to the higher elevations.

Cedrela Toona. (N. O. Meliaceæ). Red Cedar, Indian Mahogany.—A very handsome tree on account of its long feathery graceful leaves, which when young are of a crimson tint. It grows to a height of 40 to 50 feet, and yields fine timber, which is of commercial importance.

Chamaecyparis Lawsoniana. (N. O. Coniferæ). A very handsome pyramid-shaped small tree, with crowded pendulous fern-like branches; thrives at 4,000 to 6,000 feet.

Cryptomeria Japonica. (N. O. Coniferæ).—A tall handsome rapid-growing tree, of pyramidal outline, native of Japan.

Cupressus funebris. (N. O. Coniferæ). "Funeral," or "Weeping Cypress."—An elegant tree with graceful drooping branchlets; a favourite for planting in cemeteries.

C.—Knightiana.—A very elegant tall tree, with drooping feathery branchlets, distinguished by a glaucous hue. It is a native of Mexico, and has become thoroughly established at the higher elevations in Ceylon.

C.—Lawsoniana.—See *Chamaecyparis*.

C.—macrocarpa.—"Monterey Cypress."—A large, handsome, quick-growing tree, similar to *C. Knightiana*, but distinguished from it by its more vertical and pointed branches, also darker hue.

C.—pyramidalis—A tall tree with somewhat erect whippy branches, considered to be a variety of the following species.

C.—sempervirens.—Common Cypress.—A pyramid-shaped tree, with horizontal branches and feathery drooping foliage, native of South Europe, where it grows to a great height. It is especially ornamental in a young state. Thrives up-country.

Elaeocarpus glandulifera.—A medium-sized tree with striking foliage. See *Flowering Trees for Up-country*.

Eucalyptus citriodora. (N. O. Myrtaceæ).—Lemon-scented Gum-tree.—A handsome slender tree with a smooth white bark, native of Queensland. Its leaves have an agreeable lemon-scented odour.

E.-globulus Blue Gum-tree.—A large tree, commonly grown up-country for fuel and wind-belts. Very handsome on account of the glaucous-blue of the young leaves. Thrives best between 4,000 and 6,000 feet. Propagated by seed.

Ficus macrophylla. (N. O. Urticaceæ). Moreton Bay Fig. A Queensland tree, with large leathery leaves; thrives in sheltered situations up to 6000 ft.

Gordonia anomalum. (N. O. Ternstroemiaceæ). A medium-sized handsome foliage tree, indigenous to the hill forests of Ceylon. Dr. Trimen stated: "very rare; I fear that extensive clearings have exterminated this fine species in most places."

Frenela (Callitris) rhomboidea. (N. O. Coniferæ).—An elegant Cypress-like tree, native of Australia, but introduced and acclimatised at Hakgala Gardens. Very ornamental for lawns, &c.

Grevillea robusta. (N. O. Proteaceæ). Silky Oak.—A medium-sized tree, introduced from Australia in 1856, and extensively planted up-country amongst Tea for shade, also for fuel and wind-breaks. The pretty, fern-like leaves are silvery white beneath and render the tree very ornamental. The tree does not thrive well under 1,000 feet. Propagated by seed.

Juniperus Bermudiana. (N. O. Coniferæ). Bermuda Cedar.—A medium-sized tree, with leaves of two forms. It thrives at elevations of 4,000 to 6,000 ft., and attains a height of 30 to 40 ft. at Hakgala Gardens.

Melaleuca leucadendron. (N. O. Myrtaceæ). "Tea Tree" of Australia.—A large tree, with graceful foliage and curious fibrous-scaley bark, which may be pulled off in large sheets.

Pinus insignis. (N. O. Coniferæ). Monterey Pine.—A Californian pine-tree, thrives best at elevations of 4,000 to 6,000 ft. It was first introduced at Peradeniya in 1868.

P.-longifolia.—An Indian pine-tree, remarkable for its long, slender, pendulous leaves, which are 12 to 14 inches in length. Established at Hakgala Gardens.

P.-Montezumoe.—A large handsome pine-tree of Japan, with long spreading branches, introduced and established at Hakgala Gardens about 1880.

Rhodoleia Championi. (N. O. Hamamelideæ).—A medium-sized spreading tree, with glaucous-grey foliage and bright-red flowers. It is a native of Hong Kong, and has become quite established in Hakgala Gardens.

Syncarpia laurifolia. (N. O. Myrtaceæ). Turpentine-tree of Queensland.—A tall handsome quick-growing tree, of an erect symmetrical habit. Yields excellent timber. Established at Hakgala Gardens, where it bears seed.

Tristania conferta. (N. O. Myrtaceæ). Queensland Box.—A very handsome tree, with smooth shiny pointed leaves, suited to the higher elevations. It attains a great height, is suitable for avenues, and yields excellent timber.

FLOWERING SHRUBS AND HERBACEOUS PERENNIALS

SUITED FOR UP-COUNTRY.

[C.=cuttings; S.=seed; Div.=division; Su.=suckers; L.=layers; T.=Tamil].

Name.	Natural Order.	Colour of Flowers.	How Propagated.	Height in feet, &c.
<i>Abelia chinensis</i>	<i>Caprifoliaceæ</i>	Pink	C.	5—6
A.— <i>grandiflora</i>	"	White	"	"
A.— <i>rupestris</i>	"	Pinkish-White	"	"
<i>Abutilon</i> "Boule de Niegé"	<i>Malvaceæ</i>	White	"	4—5
A.—"Golden Fleece."	"	Yellow	"	5—6
Numerous varieties				
<i>Allamanda Schottii</i>	<i>Apocynaceæ</i>	"	C. or S.	3—4
<i>Aloe Hanburyana</i>	<i>Liliaceæ</i>	Coral-red	S. or Su.	1—1½
Numerous species.				
<i>Althæa rosea.</i> Hollyhock	<i>Malvaceæ</i>	Rose-pink, &c.	Div. & C.	3—4
<i>Azalia</i> , different varieties	<i>Ericaceæ</i>	Red, Pink, White.	L.	2—5
<i>Begonia fuchsoides</i>	<i>Begoniaceæ</i>	Scarlet	C.	2—3
<i>Beloperone oblongata</i>	<i>Acanthaceæ</i>	Bright-Pink	"	4—5
<i>Berberis cristata</i>	<i>Berberidæ</i>	Yellow	"	3—4
B.— <i>Fortunei</i>	"	"	"	4—5
B.— <i>leschenaultii</i>	"	"	C. or S.	6—8
<i>Brugmansia</i> , see <i>Datura</i> .	—	—	—	—
<i>Brunfelsia uniflora</i> (= <i>Franciscæa bicolor</i>)	<i>Solanaceæ</i>	Blue & white	C.	4—5
<i>Calliandra Guildingii</i>	<i>Mimosoæ</i>	Pink	C. or S.	6—8
<i>Callistemon brachyandrus</i>	<i>Myrtaceæ</i>	Yellow	"	5—6
C.— <i>lanceolatus</i>	"	Crimson	"	"
<i>Camellia</i> , numerous varieties	<i>Ternstroemiaceæ</i>	White, pink, &c.	Layers	8—15
<i>Campanula longifolia</i>	<i>Campanulaceæ</i>	Blue	C. or S.	2—3
C.—medium.	"	Blue & white	"	"
"Canterbury Bells."	"	"	"	"
<i>Cestrum aurantiaca</i>	<i>Solanaceæ</i>	Yellow	"	5—6
C.— <i>elegans</i>	"	Crimson	"	"
<i>Choisya ternatea.</i> "Mexican Orange."	<i>Rutaceæ</i>	White	C.	4—5

Name.	Natural Order.	Colour of Flowers.	How Propagated.	Height in feet, &c.
<i>Chrysanthemum pinnatifidum</i> .	<i>Compositae</i>	White	C. or S.	2½—3
C.— <i>sinensis</i>	"	White, pink, crimson, yellow.	"	"
Numerous varieties				
<i>Cotoneaster Simmondsii</i>	<i>Rosaceae</i>	Red berries	"	1—2½
<i>Cuphea jorullensis</i>	<i>Lythraceae</i>	Yellow	C. or div.	2
C.— <i>platycentra</i> .	"	Red	C. Div. or S.	
"Cigar Flower."				
<i>Cpyhomandra fragrans</i>	<i>Solanaceae</i>	Bluish-white	C. or S.	10—12
<i>Datura coccinea</i> . Thorn	"	Scarlet	C.	4—6
Apple				
D.— <i>chlorantha fl. piens.</i>	"	Yellow	"	6—8
D.— <i>Knightsii</i>	"	White	"	8—12
<i>Digitalis canariensis</i>	<i>Scrophulariaceae</i>	Yellow	S. or div.	2—3
D.— <i>purpurea</i> . Foxglove	"	Purple	"	"
<i>Duranta Ellisii</i>	<i>Verbenaceae</i>	White	C. or S.	8—12
D.— <i>Plumieri</i>	"	Pale-blue	"	8—10
<i>Eupatorium riparia</i>	<i>Compositae</i>	Red	C.	5—6
E.— <i>Weinmanianum</i>		Whitish	"	6—8.
<i>Euphorbia splendens</i>	<i>Euphorbiaceae</i>	Scarlet	"	3—4
<i>Franciscea bicolor</i> , see	—	—	—	—
<i>Brunfelsia</i>				
<i>Fuchsia arborescens</i> .	<i>Onagraceae</i>	Lilac	C. or S.	8—12
"Tree Fuchsia."				
F.— <i>corymbosa</i>	"	Scarlet	"	6—8
<i>Habrothamnus</i> , see <i>Cestrum</i>	—	—	—	—
<i>Heliotropium</i> . Heliotrope,	<i>Boraginaceae</i>	Blue shades	C.	3—4
"Cherry Pie."				
Different varieties.				
<i>Hibiscus rosa-sinensis</i> .	<i>Malvaceae</i>	Scarlet	"	8—12
Numerous varieties.	"	Shades of red, white, yellow, &c.	"	6—12
H.— <i>syriacus</i>	"	Bluish-purple	"	4—6
<i>Hydrangea hortensis</i>	<i>Saxifragaceae</i>	Blue, white or pink	"	1½—3
Several varieties.				
<i>Hypericum canariensis</i>	<i>Hypericineae</i>	Yellow	S. or C.	5—6
H.— <i>mysorensis</i>	"	"	"	8—10
<i>Impatiens elongata</i>	<i>Geraniaceae</i>	Bright rose-pink.	C.	2
I.— <i>Hookeriana</i>	"	White, veined with red.	"	3—4
I.— <i>Walkeri</i>	"	Scarlet	Div.	2—3
<i>Jasminum pubescens</i>	<i>Oleaceae</i>	White	C.	6—8
J.— <i>revolutum</i>	"	Yellow	"	"
J.— <i>Sambac</i>	"	White	"	5—6
<i>Laurustinus</i> , see <i>Viburnum</i>	—	—	—	—
<i>Libonia floribunda</i>	<i>Acanthaceae</i>	Orange-yellow	"	2—4
<i>Lobelia cardinalis</i> .	<i>Campanulacea</i>	Scarlet	"	3—4
"Cardinal Flower."				
<i>Magnolia fuscata</i> .	<i>Magnoliaceae</i>	Cream	C. or S.	8—10. Fl's strongly scented.
"Madanakam Poo," T.				
M.— <i>grandiflora</i>	"	White	Layers	10—15
<i>Montanoa bipinnatifida</i> .	<i>Compositae</i>	"	C.	8—12
"Tree Daisy."				
<i>Moræa iridioides</i>	<i>Irideae</i>	Blue & white	Div. or S.	2

Name.	Natural Order.	Colour of Flowers.	How Propagated.	Height in feet, &c.
<i>Musa coccinea</i> . "Flowering Banana."	<i>Scitamineae</i>	Scarlet	Su. or S.	5—6
<i>Nandina domestica</i>	<i>Berberideae</i>	Pinkish	C.	3—4
<i>Nierembergia gracilis</i> . "Cup Flower."		White & yellow	C. or S.	2—3
<i>Notelaea liquestrina</i>	<i>Oleaceae</i>	Pinkish	C. or Su.	1—1½
<i>Phlomis floccosa</i>	<i>Labiatae</i>	Yellow	C.	2
<i>Pleroma macranthum</i>	<i>Melastomaceae</i>	Violet-blue	C. or S.	6—10
<i>Plumbago capensis</i>	<i>Plumbagineae</i>	Light blue	C. or div.	3—4
<i>Polygonum chinense</i>	<i>Polygonaceae</i>	Creamy white	C.	5—7
<i>Rhododendron</i> , numerous species and varieties.	<i>Ericaceae</i>	Pink, crimson, white, &c.	S.	3—6
R.— <i>arboreum</i> .	"	Crimson	"	15—40
Ceylon <i>Rhododendron</i> .				
<i>Spiraea media</i>	<i>Rosaceae</i>	White	C. or div.	4—5
S.— <i>peruviana</i>	"	"	"	5—6
<i>Stevia Eupatoria</i>	<i>Compositae</i>	White	C.	5—7
<i>Streptocarpus</i> , numerous spp. and var's	<i>Gesneraceae</i>	Lilac, mauve, white, &c.	S.	½
<i>Streptosolen Jamesoni</i>	<i>Solanaceae</i>	Orange yellow	C. or S.	4—5
<i>Strobilanthes gossypinus</i> (See <i>Foliage Plants</i> .)	<i>Acanthaceae</i>	Lilac or blue	C.	"
<i>Tecoma capensis</i>	<i>Bignoniaceae</i>	Scarlet	"	4—6
T.— <i>Smithiana</i>	"	Orange-red	"	6—8
T.— <i>Stans</i>	"	Yellow	S. or C.	10—20
"Tree Daisy," see <i>Montanoa</i>	—	—	—	—
<i>Viburnum tinus</i> .	<i>Caprifoliaceae</i>	White	C.	5—7. Fl's scented.
" <i>Laurustinus</i> "				
<i>Wiganda Vigieri</i>	<i>Hydrophyllaceae</i>	Dark-blue	C. or Su.	8—10

ORNAMENTAL

FOLIAGE SHRUBS AND HERBACEOUS PERENNIALS

SUITED FOR UP-COUNTRY.

[C.=cuttings; S.=seed; Div.=division; Su.=suckers].

Name.	Natural Order.	How Propagated.	Height in feet, &c.
<i>Abutilon Thompsonii</i> .	<i>Malvaceae</i>	C.	3—4 Variegated leaves.
<i>Acalypha marginata</i> .	<i>Euphorbiaceae</i>	"	4—5
<i>Acanthus ilicifolius</i>	<i>Acanthaceae</i>	Div. or S.	3. Holly-like leaves.
A.— <i>mollis</i>	"	"	3—4.
<i>Agapanthus variegatus</i>	<i>Liliaceae</i>	Div.	1—1½.
<i>Agave americana variegata</i>	<i>Amaryllideae</i>	Su. or bulbs.	6—10.
Numerous species and var's			
<i>Aloysia</i> (<i>Lippia</i>) <i>scitiodora</i> .	<i>Verbenaceae</i>	C.	2—3.
"Sweet-scented Verbena."			
American Aloe, see <i>Agave</i>	—	—	—

Name.	Natural Order.	How Propagated.	Height in feet, &c.
<i>Anthericum liliastrum.</i> "St. Bruno's Lily"	<i>Liliaceae</i>	Div.	1. Variegated foliage.
<i>Bambusa aurea.</i>	<i>Graminae</i>	"	10—15.
B.— <i>Fortunei variegata.</i>	"	"	1.
B.— <i>nana.</i>	"	"	8.
See <i>Bamboos and Ornamental Grasses</i>			
Bay Laurel, see <i>Laurus.</i>	<i>Liliaceae</i>	S.	6—8.
<i>Beaucarnea longifolia.</i> Mexico			
<i>Begonia, fibrous-rooted.</i>	<i>Begoniaceae</i>	C. or div.	3—4.
Numerous spp. & var's			
<i>Berberis Fortunei variegata.</i>	<i>Berberidæ</i>	C.	4—5.
<i>Bocconia frutescens.</i> "John Crow Bush"	<i>Papavaraceae</i>	C. or S.	8—12.
<i>Buxus semperflorens.</i> Boxwood	<i>Enphorbiaceae</i>	C.	½—6.
<i>Cerasus Lauro-cerasus.</i> Laurel Cherry	<i>Rosaceae</i>		
<i>Cineraria maritima.</i> "Cotton Lavender," see <i>Santolna</i>	<i>Compositae</i>	S. or C.	1. Silvery foliage.
<i>Dicentra (Dielytra) thalictrifolia.</i> Lyre Flower	<i>Fumariaceae</i>	C.	1—1½.
<i>Doryanthes palmerii.</i> Spear Lily	<i>Amaryllidæ</i>	Su.	6—8.
<i>Echeveria metalica</i> "Oyster plant"	<i>Crassulaceae</i>	Div.	3 in
E.— <i>secunda</i>	"	"	3 "
<i>Furcraea gigantea.</i> Mauritius Hemp. See <i>Succulent Plants</i>	<i>Amaryllidæ</i>	Bulbils or Su.	6—8. } Small succulent rosette-like plants. Edgings.
<i>Iresine Herbstii.</i>	<i>Amarantaceae</i>	C.	2—3.
I.— <i>Lindenii</i>	"	"	1½—2.
<i>Laurus nobilis.</i> Bay Laurel	<i>Lauraceae</i>	"	6—8.
<i>Libertia,</i> see <i>Bulbous Plants, &c.</i>	—	—	—
<i>Melianthus Major.</i> "Honey Shrub"	<i>Sapindaceae</i>	C. or div.	3—4.
<i>Musa coccinea.</i> "Flowering, or Chinese Banana"	<i>Scitamineae</i>	Su. or S.	5—6.
M.— <i>Ensete.</i> Abyssinian Banana	"	S.	8—9.
<i>Myrtus communis.</i> Myrtle	<i>Myrtaceae</i>	C.	8—10.
<i>Nolina,</i> see <i>Bancarna</i>			
<i>Periwinkle,</i> see <i>Vinca.</i>			
<i>Phormium tenax.</i> Newzealand Flax	<i>Liliaceae</i>	Div.	5—6.
<i>Podocarpus macrophylla.</i>	<i>Coniferæ</i>	S. or C.	6—8.
<i>Prunus lusitanica.</i> Portugal Laurel	<i>Rosaceae</i>	C.	6—12.
<i>Santolina chamaecyparissus.</i> Cotton Lavender	<i>Compositae</i>	C. or div.	1.
<i>Strobilanthes gossypinus.</i>	<i>Acanthaceae</i>	C.	4—5.
<i>Vinca minor.</i> Variegated Periwinkle	<i>Apocynaceae</i>	"	1.

ORNAMENTAL CLIMBERS AND CREEPERS

SUITABLE FOR UP-COUNTRY.

[C.=cuttings; S.=seed; L.=layers; T.=Tamil].

Name and Native Country. [Hort.=Garden origin].	Natural Order.	Colour of Fl's. &c.	How Propagated.	Position suited for.
<i>Abronia umbellata</i> (Annual) California	<i>Nyctaginaceae</i>	Lilac or pink	C.	Hanging-pots.
<i>Allamanda Hendersoni</i> . Brit. Guiana	<i>Apocynaceae</i>	Yellow, large.	"	Trees, fence, &c.
<i>Ampelopsis Veitchii</i> . "Virginian Creeper," Japan	<i>Ampelidaceae</i>	Leaves bronze.	"	Walls.
<i>Begonia fuchsoides</i> . New Grenada	<i>Begoniaceae</i>	Scarlet	"	Pillars, verandah, &c.
<i>Bignonia capreolata</i> . N. America	<i>Bignoniaceae</i>	Pink and yellow	"	} Arbours & arches.
<i>B.—venusta</i> . "Tanga-poo," T. Columbia	"	Orange-yellow	"	
<i>Bomarea carderi</i> . Columbia	<i>Amaryllidaceae</i>	Bright-pink and white	"	Pillars, &c.
<i>Bougainvillea spectabilis</i> . S. America	<i>Nyctaginaceae</i>	Purple	"	Trees, banks, &c.
<i>Cassia viminea</i> . W. Indies	<i>Leguminosae</i>	Yellow	"	Trees, pillars, &c.
<i>Clematis</i> , several varieties	<i>Ranunculaceae</i>	White, violet, blue, &c.	S.	Walls, arbours, &c.
<i>Cobæa scandens</i> . Mexico	<i>Polemoniaceae</i>	Greenish purple	S. & C.	Tall trees, fences, &c.
<i>Convolvulus</i> , different var's	<i>Convolvulaceae</i>	Various	S.	Fences, arbours, &c.
<i>Crotalaria semperflorens</i> . Ceylon, &c.	<i>Leguminosae</i>	Yellow	S. or C.	Rockeries, &c.
<i>Dumasia villosa</i> . Nepaul	"	"	"	Pillars and arbours.
<i>Ficus pumila</i> (=F.—repens) Ceylon, &c.	<i>Urticaceae</i>	Small ornamental foliage	C.	Creeper on walls.
<i>Fuchsia radicans</i> . Brazil	<i>Onagraceae</i>	Scarlet	"	Pillars, banks, &c.
<i>Hardenbergia monophylla</i> . Australia	<i>Leguminosae</i>	Blue	C. or S.	Hanging-pots, &c.
<i>Hedera Helix</i> . Ivy. Britain	<i>Umbelliferae</i>	Handsome foliage	C.	Creeper on walls.
<i>Hoya carnosa</i> . Wax Flower	<i>Asclepiadaceae</i>	Pale-pink	"	Sheltered pillars. trellis-work, &c.
<i>Ipomœa Learii</i> . Several showy species and var's	<i>Convolvulaceae</i>	Blue to pink	S.	Arbours, fences, &c.
<i>Lathyrus latiflorus</i> . Ever- lasting Pea. Britain	<i>Leguminosae</i>	Pink, &c.	S. or C.	Fences, walls, &c.
<i>Lonicera caprifolia</i> . European Honeysuckle	<i>Caprifoliaceae</i>	Yellowish	C.	} Tree-trunks, arbours, &c.
<i>L.—japonica</i> . Japanese Honeysuckle	"	Red and white.	"	
<i>Lophosperma scandens</i>	<i>Scrophulariaceae</i>	Pink	S.	} Trellis-work, &c.
<i>Mandevilla suaveolens</i> . Buenos Ayres	<i>Apocynaceae</i>	White, scented	C. or S.	
<i>Maurandya Barclayana</i> . Mexico	<i>Scrophulariaceae</i>	Violet-purple	"	
<i>M.—erubescens</i> . Mexico	"	Rose-pink	"	
<i>Nasturtium</i> , see <i>Tropaeolum</i>				
<i>Passiflora edulis</i> . Passion- flower. W. Indies	<i>Passifloraceae</i>	White	S.	Fences, trees, &c.

Name and Native Country [Hort. = Garden origin].	Natural Order.	Colour of Fl's. &c.	How Propagated.	Position suited for
<i>Rhynchosperma cyanosperma</i> .	<i>Leguminosae</i>	Bright-red, or white	S.	Rockeries, &c.
Roses, see article on <i>Roses</i>	<i>Rosaceae</i>	Various	C. or L.	Fences, arbours, &c.
<i>Rubus</i> (Bramble), several species	S.	Striking foliage	C. or S.	Trees, fences, &c.
<i>Ruscus</i> (<i>Semele</i>) <i>androgynus</i> . Canary Is.	<i>Liliaceae</i>	Handsome foliage (not true leaves)	C.	Tall trees.
<i>Schmidtia bicolor</i>	<i>Acanthaceae</i>	Pink and yellow	..	Arbours, arches, &c.
<i>Senecio scandens</i> . S. Africa	<i>Compositae</i>	White	..	Fences, walls or pillars.
<i>Smilax argyræa</i> . Bolivia	<i>Liliaceae</i>	} Variegated foliage	..	} Trees, &c.
S.—ornata	"		..	
<i>Solandra grandiflora</i> . Jamaica	<i>Solanaceae</i>	White	..	Large trees.
<i>Solanum jasminoides</i> . S. America	"	"	..	Fences, arbours, arches, &c.
<i>Tacsonia mollissima</i> . Quito	<i>Passifloraceae</i>	Pink	..	} Pillars, arbours, &c.
T.—quitensis. Peru	"	"	S. & C.	
T.—van Volkemii. New Grenada	"	Scarlet	..	
<i>Tecoma jasminoides</i> . Queensland	<i>Bigoniaceae</i>	Waxy-pink and white	C.	} Hanging-pots, rockeries, &c.
<i>Thunbergia fragrans</i> . Ceylon, &c.	<i>Acanthaceae</i>	Pure-white	S. & C.	
<i>Tropæolum canariensis</i>	<i>Geraniaceae</i>	Bright-yellow	S.	} Trellis-work, pillars, &c.
T.—majus. Nasturtium. Peru	"	Orange-yellow	..	
Also double varieties.				
T.—Lobbianum. Columbia		Scarlet		} Rockeries and hanging-pots.
<i>Vinca minor</i> . Periwinkle Europe	<i>Apocynaceae</i>	Blue	C.	
V.—variegata. " "	"	Variegated foliage	..	
<i>Wistaria sinensis</i> . Japan	<i>Leguminosae</i>	Blue or purple	..	Verandah walls and pillars.

ROSES.

One of the most pleasant features of horticulture in the tropics is that Roses—the “Queen of flowers”—can, with careful attention and selection of suitable varieties, be grown with a wonderful degree of success, not only in the Hills, but at all elevations down to sea-level. In the tropics roses can usually be had in blossom all the year round, and in up-country gardens the quality of the blooms is frequently such as would compare well with those produced in temperate countries. Unfortunately, however, roses grown in equatorial regions, especially at low elevations, usually lack much of the delightful fragrance which is so characteristic of these flowers in cooler climes.

The following hints may be considered as preliminaries to success in growing roses: Choose a site with full exposure to the sun, shade from trees or houses being detrimental; protection from wind is necessary in the Hills. A medium-loamy soil is best, while sandy soils or stiff clay are the least suitable. Perfect drainage is essential. A liberal quantity of manure (preferably cow-manure) should be worked into the soil, and the plants may be planted about 4 ft. apart in rows, on raised beds or borders if the land be flat. A mulching of stable manure, renewed at intervals, should cover the whole surface and sides of the beds; this will protect the latter from the sun and retain moisture in the soil. Young plants should be chosen in preference to old ones. Any flower buds that may appear early should be removed, as the plants should not be allowed to bear blooms until three to four months after planting. In dry weather the plants must be liberally watered, and an application of liquid manure once or twice a week is most beneficial.

Pruning.—As a general rule Tea, Noisette, and Bourbons, which are the only kinds suited to the low-country, do not need much pruning beyond removal of worn out or dead wood. Branches that have made vigorous growth and have finished flowering should be cut back, otherwise the plants will assume a ragged and straggling appearance. The Hybrid Perpetual varieties are, however, generally benefited by a hard pruning, and this is best carried out in the Hills towards the end of October; thus the new growth which follows should afford a display of bloom during the season months in the Hills, February to May.

Propagation.—This is invariably effected in the tropics by cuttings or layering, as plants on their own roots are the most adapted to the climate. Cuttings may be put in at any season, and strike best in a soil consisting mainly of fine sand, with an admixture of charcoal. It is customary to take the cuttings with a heel when possible, and to insert them in the ground sloping-wise. They should be shaded and kept moist until new growth is visible. Layering is adopted in the case of varieties which do not propagate easily by cuttings, *e. g.* "Marechal Niel," and is successfully effected at Peradeniya all the year round. The layered shoot is pegged down into a bamboo-joint filled with fine sandy soil, being thus easily removed when the shoot has developed roots and become an independent plant.

Roses in pots or tubs.—In the low-country and hot dry region, Roses generally do better in pots or wooden tubs than in an open

border, owing to the unsuitable conditions of soil or climate. The former method enables the requirements of the plants being better attended to, the tubs being filled with only the best soil and provided with efficient drainage, while the plants can be afforded the most suitable spot in regard to light and shelter.

Importing Roses.—When new plants or varieties are required, they should when practicable be obtained from a reliable firm at home, such as Messrs Cant & Sons of The Old Rose Nurseries, Colchester, England. The plants being packed dry when in a dormant state, they take up but little space and can be transmitted in small packages by post. Though a good firm can be relied upon for sending the best varieties, it is well to remember that only roses on their own roots are adapted to the tropics, also that standard roses are not suitable. Small rooted cuttings travel well when their roots are in a ball of adhesive earth and surrounded by moss and waterproof paper; the stems, however, must have plenty of air, or will rot in transit. When they arrive, if the weather be dry, the plants should be grown in bamboo-pots in the shade for a few weeks before being planted out.

VARIETIES.

The success of rose cultivation in the tropics very largely depends on the kinds or varieties chosen. This is more especially true of the plains or low-country, where, as a rule, only Teas, Noisettes and Bourbons will thrive. Hybrid Perpetuals may be considered as generally unsuited to elevations below 2,500 ft.

DESCRIPTIVE LIST.

(FOR ELEVATIONS BELOW 2,500 FT. : THOSE MARKED † ARE ALSO SUITED FOR UP-COUNTRY).

TEA-SCENTED ROSES :—

- | | |
|---|--|
| †Adam.—Rose and salmon, large. | †Homer.—Blush-rose and salmon. |
| †Catherine Mermet.—Light-flesh, exquisite in form. | †Hon. Edith Gifford.—Flesh colour, white centre. |
| †Devoniensis.—Creamy-white. | Jean Ducher.—Salmon-yellow. |
| †Enchantress.—Creamy white, free bloomer. | La Boule d'or.—Golden-yellow |
| †Etoile de Lyon.—Sulphur-yellow. (Dry districts, up to 4,000 ft.) | Madame Camille.—Salmon-pink |
| | †Maman Cochet.—Carmine and yellow |

† Maman Cochet.—White variety.
 † Marie van Houtte.—Creamy yellow, edged carmine

Niphetos.—White, centre pale-yellow
 President.—Salmon-rose, large.
 † Safrano.—Coppery yellow

HYBRID TEAS :—

† Admiral Dewey.—Light blush
 † Bessie Brown.—Creamy-white
 † Captain Christy.—Clear flesh, dark centre
 † Caroline Testout.—Salmon-pink
 Clara Watson.—Salmon and pink
 Clio.—White
 † Grace Darling.—Large, full, rich pink

Gruss an Teplitz.—Bright crimson
 † Killarney.—Pale pink
 La France.—Silvery peach. (Dry districts, up to 4,000 ft.)
 † Mrs. W. J. Grant.—Bright rosy pink
 Viscountess Folkestone.—White, tinted with pale salmon, very large

NOISETTES :—

† Aimee Vibert.—Pure white
 Boule de Niede.—Pure white
 Caroline Kuster.—Bright orange-yellow
 † Celine Forestier.—Rich sulphur-yellow
 Cloth-of-Gold.—Yellow, pale margin

† Lamarque Jaune.—Golden-yellow, large
 † Rêve d' Or.—Deep-yellow, sometimes coppery yellow.
 † William Allan Richardson.—Orange-yellow or creamy-white.

BOURBON :—

Apolline.—Light pink
 Empress Eugenie.—Rosy-blush, purple edges
 Madame Plantier.—Pure white
 † Mrs Paul.—Blush white

† Souvenir de la Malmaison.—Flesh-colour
 (= Hundred-petal Rose)
 Victor Emmanuel.—Purplish maroon shade

HYBRID PERPETUAL ROSES (FOR ELEVATIONS

ABOVE 2,500 FT.) :—

Abel Grand.—Rosy-blush
 Baroness Rothschild.—Clear-rose
 Baron Rothschild.—Brilliant crimson
 Beauty of Waltham.—Rosy-crimson
 Ben Cant.—Bright crimson

Black Prince.—Dark-crimson, shaded with black
 Captain Hayward.—Carmine-red
 Duke of Edinburgh.—Bright scarlet-crimson
 Dupuy Jamain.—Bright cerise
 Frau Karl Druschki.—Pure white, very large

Her Majesty.—Satiny rose,
large
Hugh Dickson.—Brilliant crim-
son
Jules Margottin.—Bright-car-
mine
Lord Raglan.—Scarlet-crimson
M a d a m e Eugene Verdier.—
Deep pink
M a d a m e Victor Verdier.—
Bright cherry-red
Maharajah.—Deep crimson,
single flowers

Margaret Dickson.—White,
rose centre
Maria Baumann.—Bright car-
mine
Mrs. John Laing.—Soft-pink
Paule Neron.—Deep rose
Peach Blossom.—Delicate
peach-blossom
Prince Camille de Rohan.—
Deep velvety crimson-ma-
roon
Victor Hugo.—Bright crimson

CLIMBING ROSES SUITABLE FOR TRAINING ON
ARCHES, FENCES, PERGOLAS, &c.

THOSE MARKED † ARE SUITED FOR THE LOW-COUNTRY.

‡Aimee Vibert.—White
Caroline Testout (Climbing).—
Salmon-pink
†Celine Forestier.—Rich sul-
phur-yellow
†Devoniensis (Climbing).—
Creamy white
Dorothy Perkins.—Bright pink,
semi-double, large trusses
†Gloire de Dijon.—Orange-
yellow, shaded salmon.

Lamarque Jaune.—Golden
yellow
†M a r e c h a l Niel.—Beautiful
deep yellow
†Niphetos (Climbing).—Pure
white
Reve d'or.—Deep yellow
†William Allen Richardson.—
Orange-yellow

SHOWY ANNUALS AND BIENNIALS

CHIEFLY SUITED FOR UP-COUNTRY.

[T.=Tamil].

Name.	Natural Order.	Height in ft. (or inches).	Colour of Flowers, &c.
Acroclinium roseum. Everlasting Flowers	<i>Compositae</i>	1½	Rose, pink, and white var's.
Ageratum mexicanum	"	1—1½	Blue.
Alonsoa Warscewiczii Several var's.	<i>Scrophulariaceae</i>	1½—2	Orange-red, &c.
Alternanthera amœna. "Joy Weed." Several species	<i>Amarantaceae</i>	6—10 in.	Leaves bronze-green.
Alyssum minimum. Sweet Alyssum	<i>Cruciferae</i>	6 in.	White, scented.
Amaranthus caudatus. "Love-lies-bleeding." Several other varieties	<i>Amarantaceae</i>	1½—2	Bright-red, pendulous tails; or brilliant-red foliage.

Name.	Natural Order.	Height in ft. (or inches).	Colour of Flowers, &c.
<i>Ammobium alatum</i> .	<i>Compositae</i>	1½—2	White.
“Winged everlasting”			
<i>Anagallis grandiflora</i>	<i>Primulaceae</i>	8—10 in.	Blue, light-blue and white.
Pimpernell			
<i>Antirrhinum majus</i> .	<i>Scrophulariaceae</i>	1	Shades of crimson.
Large and dwarf var's			
<i>Arctotis grandis</i>	<i>Compositae</i>	1½—2	Bluish-white.
<i>Argemone grandiflora</i> .	<i>Papaveraceae</i>	2	White.
A.—Hunnemannii	“	2	Yellow.
<i>Asperula azurea</i> .	<i>Rubiaceae</i>	1	Light-blue, scented.
Aster, China.	<i>Compositae</i>	6—15 in.	White, pink, lilac, &c.
Numerous varieties, as “German,” “Victoria,” “Mignon,” “Crown,” “Quilled,” &c.			
<i>Athanasia annua</i> .	“	1	Yellow.
Everlasting			
Balsam (<i>Impatiens</i>), numer- ous varieties	<i>Gesneraceae</i>	6—12 in.	White, pink, rose-red, &c.
<i>Bartonia aurea</i>	<i>Gentianaceae</i>	1	Golden-yellow, large fl's
<i>Brachycome iberidifolia</i> .	<i>Compositae</i>	1	Blue and white var's.
Swan-river Daisy			
<i>Browallia grandiflora</i>	<i>Solanaceae</i>		Dark-blue, large fl's.
<i>Cacalia (Emilia) coccinea</i>	<i>Compositae</i>	1½—2	Scarlet; erect stems.
<i>Calandrinia grandiflora</i> .	<i>Portulacaceae</i>	½	Pink, rose, yellow, &c.
Rock Purslane			
<i>Calceolaria hybrida</i> .	<i>Scrophulariaceae</i>	8—10 in.	Bright-yellow.
Slipper Wort			
<i>Calendula officinalis</i> .	<i>Compositae</i>	1—1½	Orange, yellow-striped, pale lemon, &c.
Pot marigold			
Several varieties			
C.—pluvialis.	“	1—1½	White and purple.
Cape marigold			
<i>Calliopsis</i> , see <i>Coreopsis</i>			
<i>Callichroa (Layia) platyglossa</i> .	“	1	Yellow.
<i>Callirhoe digitata</i> .	<i>Malvaceae</i>	1	Bright magenta.
Poppy Mallow			
<i>Callistephus chinensis</i> .			
See <i>Aster</i>			
Candytuft, several varieties	<i>Cruciferae</i>	1—1½	White, crimson, &c.
<i>Centaurea cyanus</i> .	<i>Compositae</i>	1½	Rich-blue, lilac, pink, &c.
Corn-flower			
C.—moschata. Sweet Sultan	“	2	Purple.
<i>Centranthus macrosiphon</i>	<i>Valerianaceae</i>	1½	Rosy-purple.
<i>Chelone (Pentstemon) barbata</i>	<i>Scrophulariaceae</i>	2½	Scarlet.
<i>Chrysanthemum coronarium</i>	<i>Compositae</i>	1½	White, yellow-eyed, &c.
C.—carinatum	“	1½	Tricolor varieties.
C.—leucanthemum	“	1½—2	Large, white, yellow eye.
“Ox-eye Daisy”			
C.—segatum.	“	1½	Yellow, several varieties.
Yellow corn-flower			
<i>Clarkia elegans</i>	<i>Onagraceae</i>	1½	} White, pink, red, &c.
C.—pulchella	“	1½	
<i>Clintonia (Downingia) elegans</i> .	<i>Campanulaceae</i>	1—1½	White, purple, &c.
C.—pulchella	“		Blue.

Name.	Natural Order.	Height in ft. (or inches).	Colour of Flowers, &c.
<i>Collinsia bicolor</i>	<i>Scrophulariaceae</i>	1½	Purple and white.
<i>Convolvulus</i> , see <i>Ornamental Climbers for Up-country</i>	—	—	—
<i>Coreopsis (Calliopsis) bicolor</i>	<i>Compositae</i>	1—2	Yellow and brown or crimson.
C.— <i>Drummondii</i>	"	1—2	Bright-yellow.
<i>Cosmos bipinnatus</i>	"	2—3	Pink, white, &c.
C.— <i>sulphureus</i>	"	2—3	Yellow.
<i>Cuphea miniata</i>	<i>Lythraceae</i>	1—1½	Scarlet, tipped with yellow.
<i>Datura Stramonium</i>	<i>Solanaceae</i>	2	White.
<i>Delphinium cardiopetalum</i> . Larkspur	<i>Ranunculaceae</i>	1—2	Different shades.
Numerous varieties			
<i>Dianthus chinensis</i> . Chinese or Indian Pink. Several single and double varieties	<i>Caryophyllaceae</i>	1	White, crimson, &c.
<i>Erysimum Perowskianum</i>	<i>Cruciferae</i>	1	Orange and yellow.
<i>Eschscholtzia californica</i> . Californian Poppy	<i>Papaveraceae</i>	1—1½	Orange-yellow.
<i>Gaillardia picta</i> . Blanket-flower	<i>Compositae</i>	1	Yellow and crimson.
<i>Gamolepis tagetes</i>	"	9 in.	Bright-yellow, single fl's
<i>Gaura grandiflora</i>	<i>Onagraceae</i>	2	White.
<i>Gilia tricolor</i>	<i>Polemoniaceae</i>	8 in.	Large, lavender or white, purple-eyed.
G.— <i>multicaulis</i>	"	1	Blue.
<i>Godetia Whitneyi</i> . Numerous varieties	<i>Onagraceae</i>	1	Rich-crimson, &c.; flowers large.
<i>Gypsophila elegans</i>	<i>Caryophyllaceae</i>	1½	Feathery, lilac.
<i>Helianthus annuus</i> . Sunflower. Numerous tall and dwarf varieties	<i>Compositae</i>	1½ - 3	Yellow, dark-eye. Showy.
<i>Helichrysum</i> . Everlastings	"	1½ - 2½	Yellow, white, orange, &c.
<i>Ipomoea, rubro-coerulea</i> . Morning Glory	<i>Convolvulaceae</i>	8 - 16	Various shades; large, handsome fl's
<i>Ipomopsis (Gilia) elegans</i>	<i>Polemoniaceae</i>	6—8	Tubular crimson fl's; feathery leaves.
<i>Jacobaea elegans</i> , see <i>Senecio</i>			
<i>Kaulfussia (Charicis) ameloides</i> . Larkspur, see <i>Delphinium</i> .	<i>Compositae</i>	1—1½	Blue, crimson, and violet; daisy-like fl's
<i>Lathyrus</i> , see <i>Sweet Pea</i>			
<i>Layia</i> , see <i>Callitroea</i>			
<i>Leptosiphon (Gilia) roseus</i>	<i>Polemoniaceae</i>	8—10 in.	Rose-pink.
<i>Leptogyne calliopsidea</i>	<i>Compositae</i>	1½	Lemon-yellow, like <i>Marguerites</i> .
<i>Linaria cymbalaria</i> . Several var's	<i>Scrophulariaceae</i>	6—12 in.	Lilac, yellow, orange, crimson, &c.
<i>Linum grandiflorum rubrum</i> . Several var's	<i>Linac</i>	1½	Scarlet, blue, &c.
<i>Lobelia Erinus</i> . Numerous var's	<i>Campanulaceae</i>	4 in.	Shades of blue, crimson, purple and white.
<i>Lupinus polyphyllus</i> . Lupin. Several var's	<i>Leguminosae</i>	½—2	Orange, yellow, blue, &c.

Name.	Natural Order.	Height in ft. (or inches).	Colour of Flowers, &c.
Malope grandiflora Marigold, African.	<i>Malvaceae</i> <i>Compositae</i>	1½ -2 1½—2	Crimson, white-striped, &c. Lemon-yellow, orange, &c.
<i>Tagetes erecta</i> M.—, French. <i>Tagetes patula</i> "Samie-poo," T.	..	½—1	Orange-yellow, and crimson varieties.
Malcolmia maritima, see <i>Virginian Stock</i>			
Matthiola annua, see <i>Stocks</i> .			
Mesembryanthemum tricolor. Fig Marigold	<i>Ficoideae</i>		
Mignonette (<i>Reseda odorata</i>) Numerous varieties	<i>Resedaceae</i>	1—1½	Greenish-white or yellow, very fragrant.
Mimulus maculosus. Monkey Flower	<i>Scrophulariaceae</i>	8—10 in.	Pale-yellow, blotched, &c.
Mirabilis Jalapa. Marvel-of-Peru	<i>Nyctagineae</i>	1—1½	Rose-pink, white, &c.
Myosotis. Forget-me-not.	<i>Boraginaceae</i>	8—10 in.	Blue; several varieties.
Nasturtium (see <i>Ornamental Climbers</i>).			
Nemesia strumosa	<i>Scrophulariaceae</i>	12—15 in.	White, crimson, yellow, &c.
Nemophila insignis	<i>Hydrophyllaceae</i>	½	Blue, white, and purple- margined.
Nicotiana affinis. Tobacco Plant.	<i>Solanaceae</i> ..	1 2—3	White, purple, pink, &c.
Numerous species & var's	..	1	Blue.
Nierembergia frutescens	<i>Ranunculaceae</i>	12—15 in.	Pale-blue; feathery foliage.
Nigella damascena. Fennel Flower			
Nolana grandiflora	<i>Nolanaceae</i>	8—10 in.	White and blue; trailing.
Nycteria selaginoides	<i>Scrophulariaceae</i>	6—8 in.	Pink.
Ænothera biennis. Evening Primrose	<i>Onagraceae</i>	1—1½	Large, bright-yellow fl's.
Pansy, numerous varieties	<i>Violaceae</i>	1—3	Numerous shades.
Papaver, see <i>Poppy</i>	—	—	—
Pentstemon, numerous spp. and var's	<i>Scrophulariaceae</i>	1—1½	Crimson, rosy-purple, &c.
Petunia, single and double var's	<i>Solanaceae</i>	1—1½	White, purple, and striped; large showy flowers.
Phacelia campanularia	<i>Hydrophyllaceae</i>	1—1½	Bright-blue; several var's.
Platystemon californicus. Californian Poppy	<i>Papaveraceae</i>	1	Bright lemon-yellow.
Philydrum lanuginosum	<i>Philydraceae</i>	3	Yellow.
Phlox Drummondii. Numerous showy var's	<i>Polemoniaceae</i>	1	White, red, purple, crim- son, margined and fringed var's
Poppy, Shirley. (<i>Papaver Rhœas</i>)	<i>Papaveraceae</i>	1—2	Scarlet, purple, white, &c.
Poppy, Opium. (<i>P. somniferum</i>)	..	1½	Different shades; single and double var's.
Poppy, Californian, see <i>Platystemon</i>	—	—	—
Portulaca grandiflora. Sun Plant	<i>Portulacaceae</i>	½	Brilliant different hues.

Name.	Natural Order.	Height in ft (or inches).	Colour of Flowers, &c.
<i>Pyrethrum aureum</i> . Golden Feather	<i>Compositae</i>	6—8 in.	Handsome yellow foliage.
<i>Reseda</i> , see <i>Mignonette</i> .	—	—	—
<i>Rhodanthe Manglesii</i> . Everlasting	<i>Compositae</i>	1—1½	Rosy-purple, &c.
<i>Salpiglossis coccinea</i> . Numerous varieties	<i>Solanaceae</i>	1½ 2	Scarlet, blue, purple, &c.
<i>Saponaria calabarica</i> . Soap-wort	<i>Caryophyllaceae</i>	1	Bright-pink.
<i>Scabiosa</i> . Several varieties	<i>Dipsacae</i>	1½—3	Blue, yellow, &c.
<i>Schizanthus pinnatus</i> . "Fringe flowers"	<i>Scrophulariaceae</i>	1½—2	Purple, crimson, &c.
<i>Sedum</i> . Stonecrop. Numerous varieties	<i>Crassulaceae</i>	½	Yellow, white, purple, &c.
<i>Senecio elegans</i> . Purple Jacobæa	<i>Compositae</i>	1½	Crimson, purple, white, &c.
<i>Silene pendula</i> . Catch Fly	<i>Caryophyllaceae</i>	1½	Carmine; single and double var's.
<i>Sphenogyne speciosa</i> . Several varieties	<i>Compositae</i>	1	Yellow, crimson, white, &c.
<i>Statice sinuata</i> . Sea Laven- der. Several varieties	<i>Plumbaginæae</i>	1—1½	Golden-yellow, rose- purple, &c.
Stocks, "Ten weeks," "East Lothian," and "Virginian."	<i>Cruciferae</i>	1—2	White, purple, &c.
Sunflower, see <i>Helianthus</i> .	—	—	—
Sweet Pea. (<i>Lathyrus odoratus</i>)	<i>Leguminosae</i>	4—5	Numerous beautiful shades.
Sweet William. / (<i>Dianthus barbatus</i>)	..	8—10 in.	Variegated scarlet, crimson, &c.
Tobacco Plant, see <i>Nicotiana</i>	—	—	—
<i>Torenia Fourneri</i>	<i>Scrophulariaceae</i>	6 in.	Pale-blue; also a white variety.
T.—Bailloni	..	6 in.	Yellow, trailing.
<i>Trachelium coeruleum</i>	<i>Campanulaceae</i>	1—1½	Blue.
<i>Trachymene coerulea</i>	<i>Umbelliferae</i>	1½	Blue.
<i>Tropæolum majus</i> . Nasturtium	<i>Geraniaceae</i>	8—10 in.	Shades of crimson, &c.
<i>Verbena</i> . Numerous varieties	<i>Verbenaceae</i>	1	White, scarlet, purple, &c.
<i>Viola</i> , see <i>Pansy</i>	—	—	—
Viola (<i>Viola odorata</i> .) Several single and double varieties. See page 363	<i>Violaceae</i>	½	Blue, purple, white, &c.
<i>Whitlavia</i> (<i>Phacelia</i>) <i>grandiflora</i> .	<i>Hydrophyllaceae</i>	5	Violet-purple.
<i>Xeranthemum annuum</i> . Everlasting	<i>Compositae</i>	1—1½	Rose, white, violet, &c.
<i>Zinnia</i> , Numerous varieties	..	1½	Scarlet, pink, yellow, &c.
Z.—Haageana	..	1	Orange-yellow, single.

ORNAMENTAL BULBOUS OR TUBEROUS PLANTS

CHIEFLY SUITED FOR UP-COUNTRY.

Propagated by bulbs, tubers or division, and in some cases also by seed.

Name.	Natural Order.	Colour of Flowers.	Height in ft. (or inches).
<i>Agapanthus umbellatus</i> .	<i>Liliaceae</i>	Blue	2—2½
" African Lily."			
A.—umbellatus. Var. alba.	"	White	"
<i>Albica aurea</i> . S. Africa	"	Greenish-yellow	2
<i>Allium fragrans</i>	"	White	1
Numerous other species			
<i>Alstromeria multiflorus</i>	<i>Amaryllidaceae</i>	Orange-yellow	2—3
A.—psittacina	"	Crimson	1½—2
<i>Amaryllis Belladona</i> .	"	Bright-pink	"
Belladona Lily			
<i>Anthericum liliastrum</i> .	"	White	1½
St. Bruno's Lily			
<i>Antholyza bicolor</i>	"	Scarlet & green	2
<i>Arthropodium cirrhatum</i>	<i>Liliaceae</i>	White	2
<i>Begonia</i> , tuberous-rooted	<i>Begoniaceae</i>	Scarlet, yellow, &c.	1—1½
Numerous varieties			
<i>Belamacanda chinensis</i> .	<i>Iridaceae</i>	Orange-red, spotted	
Leopard Lily		brown	1½
<i>Clivia</i> , see <i>Imantophyllum</i>	—	—	2—3
<i>Crinum asiaticum</i>	<i>Amaryllidaceae</i>	White	"
C.—giganteum	"	"	"
C.—Mooreii	"	Rose	1
<i>Cyrtanthus carneus</i>	"	Bright-red	1
C.—intermedius	"	Pink	1
C.—Mackenii. "African Bride"	"	White	2—3
<i>Dahlias</i> , "Cactus,"	<i>Compositae</i>	Various	2—2½
"Pompon," &c.			
Double and single var's			
<i>Gladiolus</i> , several varieties.	<i>Iridaceae</i>	"	3
<i>Gloxinia</i> , see <i>Pot Plants</i> .			
<i>Hemerocallis aurantiaca</i> .	<i>Liliaceae</i>	Bright-yellow	2½
" Golden Lily "			
H—fulva. " Day Lily "	"	Orange-yellow	1— 1½
<i>Hippeastrum</i> . Knight's Star-Lily	<i>Amaryllidaceae</i>	Red, white- streaked, &c.	1½
Numerous varieties.			
<i>Imantophyllum miniata</i>	"	Scarlet, yellow	1—1½
<i>Iris</i> , different varieties	<i>Iridaceae</i>	Purple, blue,	1—1½
<i>Ismene calanthina</i> .	<i>Amaryllidaceae</i>	lilac, &c.	1—2
" Peruvian-Daffodil "			
<i>Isoloma bogotense</i>	<i>Gesneraceae</i>	Yellow & red	1½
I.—molle	"	Scarlet & yellow	1½
<i>Ixia flexuosa</i>	<i>Iridaceae</i>	Pink	2
I.—pendula	"	Yellow	2
<i>Lachenalia aurea</i>	<i>Liliaceae</i>	Orange-yellow	8—10 in.
<i>Leucojum aestivum</i> .	<i>Amaryllidaceae</i>		
" Snow Flake "			
<i>Libertia formosa</i>	<i>Iridaceae</i>	White	1½

Name.	Natural Order.	Colour of Flowers.	Height in ft. (or inches).
<i>Libertia paniculata</i>	<i>Iridaceae</i>	White	1½
<i>Lilium longiflorum</i>	<i>Liliaceae</i>	"	3—4
<i>Lycoris aurea</i>	<i>Amaryllidaceae</i>	Yellow	1
<i>L.—sanguinea</i>	"	Carmine	1½
<i>Nerine japonica</i> (= <i>Lycoris radiata</i>)	"	Red	1
<i>N.—sarniensis</i> . "Guernsey Lily"	"		
<i>Ornithogalum nutans</i> . "Star of Bethlehem"	<i>Liliaceae</i>	White, &c.	1
<i>Pardanthus</i> , see <i>Belamacanda</i>	--	—	1—1½
<i>Phædranassa chloracea</i>	<i>Amaryllidaceae</i>	Crimson	1
<i>Sparaxis grandiflora</i>	<i>Iridaceae</i>	Purple, white, &c.	2
<i>S.—tricolor</i>	"	Orange & yellow	2 Large fl's.
<i>Sprekelia formosissima</i> . "Jacobæa Lily"	<i>Amaryllidaceae</i>	'Deep-crimson	1
<i>Tigrida pavonia</i> . Tiger Lily	<i>Iridaceae</i>	Orange-red	1½—2½
<i>Tritonia aurea</i> . Torch Lily	"	Orange	3—4
<i>Vallota purpurea</i> . "Scarborough Lily"	<i>Amaryllidaceae</i>	Red, crimson, white	1—1½
<i>Watsonia augusta</i>	<i>Iridaceae</i>	Scarlet	2—3
<i>W.—densiflora</i>	"	Bright-crimson	2½—3½
<i>Zephyranthes carinata</i> . Zephyr Flower	<i>Amaryllidaceae</i>	Bright-rose	1
<i>Z.—tubispatha</i>	"	White	10 in.

SELECTED PLANTS SUITABLE FOR GROWING IN POTS UP-COUNTRY.

In addition to many of the foregoing selections of annuals, biennials, bulbous and tuberous plants, &c., the following are especially adapted for pot-culture at medium to high elevations. With, however, the protection of a green-house or a glazed verandah, palms and many other choice plants of lower elevations (which without such artificial protection would not thrive much above 3,000 ft.) can be grown successfully. The limit in Ceylon, under ordinary conditions, for purely tropical palms may be said to be about 3,000 ft., Palms which are indigenous to sub-tropical regions or high elevations will, however, flourish best under reversed conditions, being unsuited for low elevations. For a list of these see under *Palms*.

Achimenes.—Small tuberous-rooted herbaceous plants. Flowers numerous and showy.

Aspidistra lurida variegata.—Hardy stemless plant, with large handsome green and white-striped leaves.

Azalea indica.—Small shrubs, bearing a profusion of large showy flowers.

Begonia, fibrous-rooted.—Numerous varieties, showy flowers and foliage.

B.—tuberous-rooted.—Very large, brilliant yellow or scarlet flowers.

B. rex.—About 10 to 12 inches high. Foliage very ornamental. Numerous varieties.

Calathea.—A herbaceous stemless genus, with large showy leaves. Propagated by division.

Chrysanthemum, Japanese.—One of the most beautiful genera of flowering plants. Numerous varieties.

Cineraria.—A genus of beautiful flowering plants, cultivated as annuals.

Coleus.—Annuals with beautifully marked soft leaves, easily propagated by cuttings.

Cyclamen.—Small tuberous plants, bearing very pretty delicate flowers, suited only for growing under cover at the higher elevations.

Dracaena (Cordyline).—Handsome palm-like plants, with bronze, crimson or green leaves. Numerous varieties. Propagated by suckers or portions of stem.

Epiphyllum.—Succulent plants, bearing very showy, bright pink or crimson flowers.

Ferns.—See article on *Ferns*.

Francoa ramosa.—An ornamental creeping plant, suitable for hanging pots. Propagated by division or cuttings.

Freesia.—A Cape genus of small tuberous plants, producing a profusion of creamy-white, scented flowers. Several species and varieties.

Fuchsia.—A very ornamental genus of small flowering shrubs; numerous varieties. Propagated by cuttings.

Genista.—Small free-flowering shrubs, with yellow blossoms.

Geranium.—A universal favourite. Numerous varieties, flowers very showy and scented.

G.—, Zonal or Tri-color.—Leaves beautifully marked, horse-shoe shaped.

G.—, Ivy-leaved.—Showy and free-flowering.

Gesnera.—A genus of numerous species of small choice herbaceous plants, generally tuberous-rooted.

G.—Douglasii & G.—magnifica are especially attractive.

Gloxinia.—An extensive genus of tuberous-rooted small plants, exceedingly showy when in bloom.

Impatiens.—A showy genus of herbaceous flowering plants. Among the best are *I. Holstii*, *I. Sullani*, and *I. fasciculata*.

Pelargonium.—A class allied to Geraniums, with scented, curly or cut leaves and showy flowers. *Pelargonium* is the botanical name for Geraniums.

Petunia.—A very showy genus of flowering annuals, blooming freely and continuously. Single, double, and fringed varieties.

Primula chinensis.—Small annual flowering plants, numerous varieties.

P.—obconica.—Small perennial plants, flowering in the winter season.

Streptocarpus.—A perennial herb with prostrate leaves, bearing scapes of large bluish or lilac flowers. Several species and hybrids.

Violets. (*Viola odorata*).—Several single and double-flowered varieties can be grown successfully in sheltered borders or in pots. Among the best are: *Neapolitan* (double, pale lavender, very sweet); *Czar* (large, single, blue); *Compte Brazza* (large double, white).



CHAPTER XIX.

PLANTS SPECIALLY SUITED FOR THE DRY REGION, SEA COAST, AND SANDY SITUATIONS.

ORNAMENTAL AND USEFUL TREES FOR THE DRY REGION :—

[S.—SINHALESE; T.—TAMIL].

- Acacia leucophlea.** "Maha-andara," S., "Velvel," T.—A large tree with spreading branches, and bright pale-yellow fl's. Heart-wood hard and durable.
- Adenanthera pavonina.** Bead Tree; "Madatiya." S.—See under *Shade Trees*.
- Azadirachta indica.** "Kohomba," S.—A tall straight tree with long spreading branches. Flowers white, sweet-scented.
- Bauhinia tomentosa.** "Petan," or "Kaha-petan," S., "Tiruvatti," T.—A small tree or large shrub, with slender branches and yellow flowers. Heart-wood hard, very tough, dark-red.
- Berrya ammonilla.** "Hal-milla," S., "Chavandalai," T.—A large erect handsome tree; valuable timber. See *Important Timbers of the Tropics*.
- Cassia Fistula.** "Indian Laburnum;" "Ehela," S. }
C.—marginata. "Ratu-wa," S., "Vakai," T. } See *Beautiful Flowering*
C.—multijuga. (South American tree). } *Trees.*
- Cæsalpinia coriaria.** Divi-divi.—A spreading, medium-sized tree, with fine feathery leaves, producing greenish-white sweet-scented flowers. See *Tannin Products*.
- Holoptelea integrifolia.** "Indian Elm;" "Goda-kirilla," S., "Velayil," T.—A tree 50 to 60 ft. high, with handsome drooping branches; good timber.
- Millingtonia hortensis.** Cork Tree.—See *Beautiful Flowering Trees*.
- Mischodon zeylanicus.** "Tammana," S., "Tampanai," T.—A tree 30 to 40 ft. high, with long lanceolate leaves; young foliage bright pink. Timber excellent.
- Murraya exotica, var buxifolia.** "Etteriya," S.—A small graceful tree, flowers pure white and sweet scented.
- Alseodaphne (Persea) semecarpifolia.** "Wewarani," S., "Ranai" or "Yavaranai," T.—A large, much-branched tree, common to the dry region. One of Ceylon's best timbers.
- Pithecolobium (Inga) Saman.** Rain tree; "Peni-karal," S.—See under *Shade Trees*. Thrives in a fairly dry district, if in good deep soil.
- Polyalthia longifolia.** "Mara-illupai," T.—A large handsome erect tree, much planted as an avenue tree in North Ceylon and South India.
- Spathodea campanulata.**—See *Beautiful Flowering Trees*.
- Tamarindus indicus.** Tamarind; "Siyambala," S.—A large handsome tree, adapted for roadsides. Excellent timber.
- Thespesia populnea.** Tulip Tree; "Suriya," S.—See under *Shade Trees*.

- Vitex altissima*. "Milla," or "Sapu-milla" S., "Kadamanakku," T.—A very large tree, with a dense head and somewhat drooping branches.
- V.—*Leucoxydon*. "Elebedda," S., "Kaddu-nochchi," T.—A large tree with spreading head, common in dry region, especially near tanks. Wood hard, dark-grey; valuable timber.

SHADE TREES.—See Chapter on *Shade Trees*.

FLOWERING SHRUBS :—

- | | |
|--|---|
| <p><i>Allamanda Schottii</i>. Fl's. yellow</p> <p><i>Barleria cristata</i>. Pink and white</p> <p><i>Cæsalpinia pulcherrima</i>. "Peacock Flower." Bright-yellow or scarlet</p> <p><i>Gardenia florida</i>. Fl's white, scented</p> <p><i>Ixora coccinea</i>. "Ratambala," S. Fl's. scarlet</p> <p><i>Ixora rosea</i>. Fl's. pink.</p> | <p><i>Jasminum pubescens</i>. Fl's. white, scented</p> <p><i>Lagerstroemia indica</i>. Bright-purple fl's.</p> <p><i>Pavetta indica</i>. Fl's. white</p> <p><i>Randia dumetorum</i>. "Kukuruman," S. Fl's white</p> <p><i>Reinwardtia tetragyna</i>. Yellow fl's.</p> <p><i>Thunbergia erecta</i>. Blue or white fl's.</p> <p><i>Turnera ulmifolia</i>. Fl's yellow</p> |
|--|---|

ORNAMENTAL CLIMBERS :—

- | | |
|--|--|
| <p><i>Allamanda Hendersoni</i>. Fl's. large, yellow</p> <p><i>Antigonon leptopus</i>. Fl's. lovely pink</p> <p><i>Bignonia unguis</i>. Fl's. yellow</p> <p><i>Bougainvillea spectabilis</i>. Bright purplish-crimson</p> <p><i>Ipomœa Briggsii</i>. Fl's. bright-crimson</p> | <p><i>Ipomœa tuberosa</i>. Fl's. yellow</p> <p><i>Porana volubilis</i>. Bridal Bouquet.— Fl's. creamy-white</p> <p><i>Quisqualis indica</i>. Rangoon creeper.— Fl's. orange-red</p> <p><i>Thunbergia laurifolia</i>. Fl's. large, blue</p> |
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FOR THE SEA-COAST.

ORNAMENTAL TREES :—

[S.=seed; C.=cuttings; Su.=suckers; S.=Sinhalese; T.=Tamil].

Name.	Natural Order.	How Propagated.	Height and descriptive notes.
<i>Artocarpus incisa</i> . Bread-fruit	<i>Urticaceae</i>	Su.	40—50 ft. A beautiful foliage tree.
<i>Barringtonia speciosa</i> . "Mudilla," S.	<i>Rubiaceae</i>	S.	About 50 ft.; handsome large leaves.
<i>Carallia integerrima</i> . "Dawata," S.	<i>Rhizophoraceae</i>	"	50—60 ft.
<i>Casuarina equisetifolia</i> . Beef-tree; "Kassa," S.; "Souku," T.	<i>Casuarinac</i>	"	50—80 ft. Ornamental.
<i>Cerbera borbonica</i> . "Mudu-kaduru," S.	<i>Apocynaceae</i>	"	About 25 ft. Fl's. white.
<i>Cocos nucifera</i> . Coconut Palm.	<i>Palmae</i>	"	60—80 ft.
<i>Eucalyptus alba</i> . White Gum-tree	<i>Myrtaceae</i>	"	50—60 ft. Smooth, white bark.
E.— <i>citriodora</i> . Lemon-scented Gum-tree	"	"	40—50 ft. Slender, handsome tree.
<i>Glicircidia maculata</i> . "Madre"	<i>Leguminosae</i>	S. or C.	About 30 ft. See <i>Beautiful Flowering Trees</i> .
<i>Morinda citrifolia</i> . "Ahu," S.	<i>Rubiaceae</i> *	S.	25—30 ft. Large leaves.

Name.	Natural Order.	How Propagated.	Height and descriptive notes.
<i>Ochrosia borbonica</i> . "Mudu-kaduru," S.	<i>Apocynaceae</i>	S.	30 ft. Large handsome leaves.
<i>Peltophorum ferrugineum</i> . "Iva-vakai," T.	<i>Leguminosae</i>	..	See <i>Beautiful Flowering Trees</i> .
<i>Pisonia morindifolia</i> . Lettuce Tree ; "Letchicotta," T.	<i>Nyctagineae</i>	C.	See <i>Ornamental Foliage Trees</i> .
<i>Pithecolobium dulce</i> . "Madras-Thorn"	<i>Leguminosae</i>	S.	40—50 ft. high ; also coppiced and used as hedges.
P.—Saman. Rain Tree ; "Peni-karal," S.	..	..	See <i>Shade Trees for Road-sides</i> .
<i>Plumeria acutifolia</i> . Temple-tree	<i>Apocynaceae</i>	C.	} See <i>Beautiful Flowering Trees</i> .
P.—rubra. Red Temple-tree	..	C. or S.	
<i>Polyalthia longifolia</i> . "Mara-illupai," T.	<i>Anonaceae</i>	S.	} See <i>Ornamental Foliage Trees</i> .
<i>Pterocarpus indicus</i> . Padouk	<i>Leguminosae</i>	..	
<i>Spathodea campanulata</i>	<i>Bignoniaceae</i>	..	See <i>Beautiful Flowering Trees</i> .
<i>Thespesia populnea</i> . "Suriya," S. ; Tulip tree	<i>Malvaceae</i>	..	See <i>Shade Trees for Road-sides</i> .

ORNAMENTAL SHRUBS :—

[S.=seed ; C.=cuttings ; Su.=sucker ; S.=Sinhalese ; T.=Tamil].

Name.	Natural Order.	How Propagated	Height and descriptive notes.
<i>Acalypha</i> , different var's.	<i>Euphorbiaceae</i>	C.	8—10 ft. Large, brilliant, coloured leaves.
<i>Agave americana</i> . American Aloe	<i>Amaryllideae</i>	Su. or S.	6—8 ft. Leaves variegated, very striking.
<i>Aralia filicifolia</i>	<i>Araliaceae</i>	C.	6—8 ft. Young leaves yellow, handsome.
<i>Arundo Donax variegata</i>	<i>Gramineae</i>	Div.	6—8 ft. Handsome variegated grass.
<i>Caesalpinia pulcherrima</i> . Peacock flower.	<i>Leguminosae</i>	S.	5—6 ft. Fl's bright-yellow.
<i>Carissa Carandas</i> . "Maha-karamba," S. ; "Perunkila," T.	<i>Apocynaceae</i>	..	A spiny shrub, with white fl's. See <i>Tropical Fruits</i> .
<i>Clerodendron inerme</i> . "Wal-gurenda," S. ; "Pinari," T.	<i>Verbenaceae</i>	S. or C.	3—5 ft., fl's white tinged with pink.
C.—nutans	..	C.	4—5 ft. Fl's white, pendulous.
C.— <i>Siphonanthus</i>	..	S. or C.	5—6 ft. Showy.
<i>Croton (Codicum)</i> , different var's	<i>Euphorbiaceae</i>	C.	5—8 ft. Very showy foliage.
<i>Datura suaveolens</i> . Trumpet Flower	<i>Solanaceae</i>	..	6—8 ft. Fl's large, white.

Name.	Natural Order	How Propagated.	Height and descriptive notes.
Hibiscus (<i>Shoe-flower</i>), numerous var's.	<i>Malvaceae</i>	C.	6—8 ft. Fl's of various shades, pink to scarlet, yellow and white.
<i>Ixora</i> , different species and varieties	<i>Rubiaceae</i>	..	4—6 ft. Fl's various colours, pink, yellow and scarlet.
<i>Lagerstroemia indica</i> . Crape myrtle	<i>Lylhraceae</i>	..	6—8 ft. Fl's purple-lilac, in large racemes.
<i>Nerium oleander</i> . Oleander	<i>Apocynaceae</i>	..	8—12ft., or more. Fl's large, bright crimson or pink.
<i>Panax fruticosum</i>	<i>Araliaceae</i>	..	5—6 ft. Leaves much cut, ornamental.
<i>Pandanus odoratissimus</i> . Screw Pine; "Mudukeyiya," S.; "Talai," T.	<i>Pandanaceae</i>	Su. or S.	15—20 ft. high. Fruit globose or oblong, scarlet.
<i>Pavetta indica</i> . "Pawatta," S.; "Pavaddai," T.	<i>Rubiaceae</i>	C. or S.	4—6 ft., bears a profusion of white fl's.
<i>Scœvola Kœnigii</i> . "Takkada," S.	<i>Goodenoviaceae</i>	..	A large bush, 6—10 ft., fl's white.
<i>Sophora tomentosa</i> . "Mudu-murunga," S.	<i>Leguminosae</i>	..	4—6 ft., covered with grey velvety pubescence.
<i>Vinca rosea</i> . Madagascar Periwinkle	<i>Apocynaceae</i>	..	2 ft. Fl's rose-pink or white.
<i>Wrightia zeylanica</i> . "Wal-idda," S.	..	..	3—5 ft. Slender, erect branches. Fl's pure-white.
<i>Yucca gloriosa</i> . Spanish Bayonet	<i>Liliaceae</i>	S. or Su.	5—8 ft. Leaves stiff, sharp-pointed.

ORNAMENTAL CLIMBERS :—

[S.=seed; C.=cuttings; Su.=suckers; S.=Sinhalese; T.=Tamil]

Chester

Name.	Natural Order.	How Propagated.	Height and descriptive notes.
<i>Allamanda Hendersonii</i>	<i>Apocynaceae</i>	C.	A quick-growing climber, with large, yellow bell-shaped fl's.
<i>Antigonon guatamalensis</i>	<i>Polygonaceae</i>	C. or S.	A moderate-sized climber with lovely pink fl's.
<i>Argyreia speciosa</i> . "Maha-dumudu," S.	<i>Convolvulaceae</i>	..	Leaves large handsome, greyish-white beneath. Fl's large, purple.
<i>Bignonia unguis</i>	<i>Bignoniaceae</i>	S. or Su.	A slender creeper, yellow fl's.
<i>Clerodendron Thomsonæ</i>	<i>Verbenaceae</i>	C. or S.	Fl's white and scarlet.
<i>Cryptostegia grandiflora</i>	<i>Asclepiadaceae</i>	C.	Fl's bright-pink.
<i>Ipomœa Briggsii</i>	<i>Convolvulaceae</i>	S.	Bright-crimson, very showy.
l.— <i>carneum</i>	..	..	Fl's pale-pink.
l.— <i>vitifolia</i>	..	S. or C.	Fl's bright-yellow.
<i>Quisqualis indica</i> . Rangoon Creeper	<i>Combretaceae</i>	C.	Fl's orange-red, sweet-scented.
<i>Porana volubilis</i> . "Bridal Bouquet."	<i>Convolvulaceae</i>	..	A large climber; fl's, creamy-white, in large panicles.

SAND-BINDING PLANTS.

Certain plants have a natural capacity for growing in loose sandy soils, or even pure sand, as on barren sea shores or river banks. The value of such plants does not consist only in their sand-binding properties, by which they prevent the erosion of land or the shifting of sand-banks, &c., but also in establishing a foundation in which it may be possible to introduce more useful plants. For sand-banks by the sea-shore, the following plants are among the most adaptable :—

Spinifex squarrosus. “Water Pink ;” “Maharawana-rewula,” S.—A grey or glaucous grass which grows in broad tufts on the sandy sea-shores. It is especially cultivated on the Madras coast for its sand-binding properties.

Ipomoea biloba.—“Mudu-bin Tamburu,” S.—A creeping plant of the Convolvulus family, with bright purplish-rose flowers and thick succulent leaves ; common on the sea-shore sand along the south and west coast of Ceylon.

Scaevola Koenigii.—A large glaucous bush, with yellowish-white flowers and pithy stems ; common on the south-west coast.

Pandanus odoratissima. Screw Pine ; “Mudu-keiya,” S.—A spreading bush with numerous aerial roots, which descend and fix the plant in the sand.

Barringtonia recemosa. “Medilla,” S.—A small tree with long drooping branches, common near the sea shore.

Tephrosia purpurea. “Pila,” S.—A perennial, 1 to 2 feet high. Flowers purplish-pink.

Cassia auriculata. “Ranawara,” S.—An annual, 1 to 2 feet high, with spreading branches and bright-yellow flowers. The dried leaves form the “Matara Tea.”

FOR INLAND SANDY BANKS.

Certain useful sand-binding plants also afford valuable fodder or grazing for cattle. Thus in the low-country the “Mauritius-grass” (*Panicum molle*), “Guinea grass” (*P. maximum*), and “Ettora” (*P. repens*) are excellent subjects for combining the purposes of sand-binding and fodder on the banks of rivers or streams ; while in drier situations the Doob-grass or “Arugam-pillu,” *T. (Cynodon Dactylon)*, Love grass or “Tutteri,” *S. (Chrysopogon*

aciculatus), "Hinundu-piyali" S. (*Desmodium triflorum*), *Cassia mimosifolia*, and the Sensitive-plant (*Mimosa pudica*), all have useful binding properties on loose sandy soils. At elevations of 4,000 to 6,000 feet, *Paspalum dilatatum* ("Golden-crown" grass) is an excellent plant for binding railway banks, &c., while it is also one of the best of fodder plants for up-country.



CHAPTER XX.

SHADE TREES.

FOR DIFFERENT PURPOSES AND ELEVATIONS.

The importance of shade trees in the tropics is impossible to over-estimate. They are essential to the agriculturist for his crops, and a boon to man and beast on account of the shelter they afford from the sun, as well as for their effect in tempering the atmosphere. Most crops in the tropics require shade at some stage of their growth, some more or less permanently, especially at low elevations, where also there are few bungalows or human abodes which are not benefited by a certain amount of protection from the powerful rays of the tropical sun. Shade trees enhance the beauty of our surroundings, and render the atmosphere cooler and healthier by checking radiation from the soil. In towns as well as in malarial localities, the hygienic effects of suitable and well-grown trees are well known.

Qualities of good shade trees.—The suitability of trees for purposes of shade depends much on local conditions and individual requirements. Many trees may also serve other useful purposes in addition to providing shade or shelter; thus, certain kinds which yield edible fruit or other useful product may with advantage be used for shade in certain localities. In parts of India, Mango and other fruit-trees are planted as shade trees for road-sides, while in Uganda rubber trees are used for this purpose, the Government in either case deriving a revenue from leasing the crops. The most essential qualities of a good shade-tree are: (1) it should be evergreen, or at least have the habit of putting on fresh foliage immediately after shedding the old leaves; (2) it should have a normally spreading form, with an upright clean trunk for at least 15 ft. from the ground; (3) it should be a fairly fast grower; and (4) the foliage should be of a light feathery nature, with small leaves which have the habit of closing at night or in dull weather. Too rapid a growth must be deprecated as being productive of brittle wood and short-lived trees. In regard to



INGA SAMAN, OR RAIN TREE.

An excellent road-side shade tree when properly planted and attended to.



INGA SAMAN, OR RAIN TREE. SHOWING EFFECTS OF ILL TREATMENT.

habit of growth, shade trees may be said to belong to either of two types, viz: (1) *centripetal* (towards the centre), in which the branches are developed in an upward or horizontal direction; and (2) *centrifugal* (from the centre) with the branching system curving downwards or drooping. Trees of the former type are the most suitable for road-sides or streets, whilst those of the latter are very effective when planted in parks, pastures or open spaces. The quality of any shade tree may be said to depend largely upon the attention given it when young, as well as on the manner of planting. Careless or improper planting, injury by cattle, &c.,



THE SHADY RIVER-DRIVE IN PERADENIYA GARDENS.

when young, or ruthless treatment of the trees by disinterested owners of adjoining land, will permanently disfigure shade-trees of the best qualities.

Trees for Parks, Pasture Land, &c.—Scenic effects should here be studied in combination with the practical purposes of shade-trees. Trees of bold appearance, with striking foliage and drooping branches will produce an imposing effect, and at the same time improve the conditions of pasture. Their shade will encourage the growth of soft, tender herbage, and improve grazing conditions generally.

Shade Trees for field Crops.—That suitable shade-trees, thinly planted and properly attended to, have beneficial effects, physically or chemically upon most crops in the tropics is a well-established fact. They help to preserve moisture, ærate the soil by means of their deep-feeding roots, which bring plant food from the understrata of the soil, to be returned again in the form of mulch by the fallen leaves. Leguminous trees are thus preferable for various reasons: (1) they are usually fast-growers, (2) their thin feathery foliage does not form too dense a shade, (3) their leaves have often the habit of closing up at night, and (4) many of the family have the property of collecting free nitrogen by means of nodules on their rootlets.

Trees for Road-sides, Streets, &c.—Trees of the type with upright or horizontally spreading branches should be chosen for this purpose. Large leaves and heavy dangerous fruits are obviously characters which disqualify for planting in public thoroughfares. The ideal tree for this object should have, in addition to being evergreen and of an upright spreading habit, light thin foliage, with the leaves closing up at night or in dull cloudy weather. Probably the Inga Saman or Rain Tree approaches most closely these requirements. It is a handsome tree when well-grown, being adapted to a fairly wide range of climate, and its nutritious sugary pods form an excellent cattle-food.

The planting and preservation of suitable shade trees for road-sides being of public importance, the writer would suggest the adoption of certain measures, such as the following, for the planting and maintenance of the trees:

- (a) Proper holes (from 2 to 3 feet deep, by as much in diameter, and three-quarter filled with good soil) to be prepared before planting.
- (b) Where possible, holes to be well behind the side-drains, and not in the margin of the road; the distance from the road should be 10 to 15 feet.
- (c) The plants to be well established in bamboo-pots or plant-baskets before being planted out.
- (d) Planting out should as far as possible be done at the commencement, not delayed till the end, of the rainy seasons.
- (e) The distance for planting apart in the first place may be 25 to 30 feet (according to species of tree), every alternate tree being cut out later, if necessary, as it fills its allotted space and encroaches on its neighbour.

- (f) Proper protection must be provided against cattle, &c., either collectively or individually by means of tree-guards or fence, until the trees are sufficiently established to take care of themselves.
- (g) The injudicious cutting of branches, or interference with the growth and proper form of trees in public thoroughfares, should be considered an act punishable by law.
- (h) The building of houses, huts or shanties too close to the trees should not be permitted.

SHADE TREES SUITED FOR THE MOIST LOW-COUNTRY.

(Elevations below 2,000 ft., with Average Annual Rainfall of 70 Inches or more).

FOR ROADSIDES :—

[S.=SINHALESE; T.=TAMIL].

- Canarium commune*. Java Almond; "Rata-kekuna," S.—A large Malayan tree. See under *Tropical Fruits*.
- Filicium decipiens*. "Pehimbiya," S., "Katu-puwarasa," T.—An elegant evergreen tree, 50 to 70 ft. high. See *Ornamental Foliage Trees*.
- Laoensia Vandelliana*.—An erect, medium-sized tree with small leaves, native of Brazil; introduced at Peradeniya in 1865.
- Myroxylon Balsamum*. Balsam-of-Tolu; "Rata-karanda," S.—A large handsome tree with small leaves, native of S. America. See under *Important Timbers*, &c.
- Parkia Roxburghii*.—An immense tree with fine feathery leaves, native of Malaya. See *Ornamental Foliage Trees*.
- Peltophorum ferrugineum*.—A handsome foliage and flowering tree, with fine feathery leaves, native of Ceylon. See *Beautiful Flowering Trees*.
- Pithecolobium Saman*. "Saman"; Rain-tree; Guango; "Peni-karal," S.—A very large quick-growing tree, with small leaves, excellent for roadsides; introduced from S. America in 1851.
- Pometia eximia*. "Gal-mora," S.—A large handsome tree with a round head. See *Ornamental Foliage Trees*.
- Pterocarpus indicus*. Padouk; "Rata-gammalu," S.—A large handsome tree with drooping branches. See *Ornamental Foliage Trees*.
- Terminalia belerica*. Myrobalan-tree; "Bulu," S., "Rani-maran," T.—A very large handsome tree. See *Ornamental Foliage Trees*.

FOR PARKS OR OPEN SPACES :—

(See the above, also *Ornamental Foliage Trees*).

FOR FIELD CROPS, AS TEA, CACAO, &C.

- Adenanthera pavonina* (*Leguminosac*). Bead-tree; "Madatiya," S.—A moderate-sized straight tree, with small pinnate leaves.
- Albizzia moluccana* (*Leguminosac*). Sau Tree; } Large, very quick-growing
"Rata-mara," S. } trees, with thin feathery
Albizzia stipulata (*Leguminosac*). "Kabal- } foliage; in flower Dec.
mara," S. } to Jan.

- Erythrina lithosperma* (*Leguminosac*). "Dadap."—A moderate-sized tree of rapid growth, suitable for shade; also affords a quantity of foliage for mulching or green-manuring.
- Erythrina umbrosa* (*Leguminosac*). "Immortel" or "Mortel."—A moderate-sized tree with large leaves, much used as a shade tree for Cacao &c., in the West Indies.
- Erythrina velutina* (*Leguminosac*). "Bocare."—A popular shade tree for Cacao in the West Indies.
- Gliricidia maculata* (*Leguminosac*). "Madré," or "Madura."—A small quick-growing tree of Nicaragua, suitable as a shade tree for Cacao, &c. See *Beautiful Flowering Trees*.
- Grevillea robusta* (*Proteaceae*). Silky Oak.—An upright medium-sized tree, with light foliage, much planted for shade amongst Tea, also for wind-belts, fuel reserve, &c., in Ceylon. Thrives best from 1,500 to 4,000 feet.
- Inga laurina* (*Leguminosac*). "Pois-doux."—A small tree, used in the West Indies as a shade tree for Cacao.
- Myroxylon Balsamum* (*Leguminosac*). Balsam-of-Tolu. Suitable as a permanent shade tree for field crops. See *Ornamental Foliage Trees*.

FOR TIMBER, WIND-BELTS, AND FUEL :—

(See also *Important Timbers, &c., of the Tropics*).

- Artocarpus integrifolius*. Jak; "Kos," S.—A moderate-sized or large tree, affording excellent timber, suitable for wind-belts.
- Cassia siamea*. "Wa," S. A large quick-growing tree, yielding hard dark timber.
- Casuarina equisetifolia*. She Oak; Beef-wood; "Kassa-gaha," S.—Suitable for wind-belts; very hard, durable timber.
- Eugenia Jambos*. Jambu.—A small bushy tree, suitable for wind-belts.
- Filicium decipiens*. "Pehimbiya," S.—A slow-growing tree, suitable for wind-belts; excellent timber.
- Melia dubia*. "Lunu-midella," S.—A handsome quick-growing tree. Wood light, much used for ceilings.
- Mesua ferrea*. Ceylon Iron-wood; "Na-gaha," S.—Slow-growing, thick-foliaged tree; would make effective and permanent wind-belts.
- Michelia Champaca*. Champac; "Sapu."—A large quick-growing tree, affording good timber and fuel.
- Mischodon zeylanicus*. "Tammanu," S.; "Tampanai," T.—A small much-branched tree, suitable for wind-belts; excellent timber.
- Myroxylon Balsamum*. Balsam-of-Tolu.—A moderate-sized or large tree; good timber, suitable for wind-belts.
- Pterocarpus marsupium*. "Gammalu," S.—A wide spreading handsome tree; fine hard timber.

SHADE TREES SUITED FOR THE INTERMEDIATE OR SEMI-DRY REGION.

[With Rainfall of 50 to 70 inches].

FOR ROADSIDES :—

- Azadirachta indica*. "Kohomba," "Margosa," S.; "Vempu," T.—A moderate-sized tree, with straight trunk and spreading branches; suited for dry region.
- Caesalpinia coriaria*. Divi-divi.—See *Tannin Products*.

- Diospyros Embryopteris.** "Timbiri," S.; "Panichchai," T.—A moderate-sized tree with spreading branches.
- Eucalyptus alba.** White Gum-tree.—A tall slender tree with smooth grey bark, native of N. Australia; thrives and bears seed at Anuradhapura.
- E.—citriodora.** Lemon-scented Gum-tree.—A handsome slender tree, with smooth bark.
- Mischodon zeylanicus.** "Tammanu," S.; "Tampanai," T.—A much-branched tree, 30 to 40 ft. high, suited to dry region.
- Myristica laurifolia.** "Wild Nutmeg," "Malaboda," S.; "Palmanikam," T.—A large tree with wide spreading branches and large leaves; thrives in rather dry as well as moist region.
- Peltophorum ferrugineum.** "Iva-vakai," T.—A moderate-sized or large, much-branched, handsome tree, indigenous to dry region of Ceylon. See *Beautiful Flowering Trees*.
- Pithecolobium Saman.** "Saman"; Rain-tree, "Peni-karal," S.—See *Shade Trees for moist low-country*.
- Polyalthia longifolia.** "Mara-illupai," T.—A large erect tree with slender branches and long wavy leaves; often planted as an avenue tree in India and Northern Ceylon. Specially suited to dry region.
- Pterocarpus marsupium.** "Gammalu," S. (See above). Suited to moderately dry region.
- Swietenia macrophylla.** Large-leaved Mahogany.—A large handsome tree, suited to dry districts.
- Tamarindus indica.** Tamarind; "Siyambala," S.; "Puli," T.—A large handsome tree, adapted to a dry as well as moist region.
- Thespesia populnea.** Tulip Tree; "Suriya," S.; "Kavarachu," T.—A small much-branched spreading tree, with ovate pointed leaves. Indigenous to the dry region of Ceylon near the sea, often planted as an avenue or shade tree. See *Important Timbers of the Tropics*.

FOR PARKS, PASTURE LAND, AVENUES, &c. :—

Same as above.

SHADE TREES SUITED FOR MEDIUM ELEVATIONS.

(2,000 to 5,000 ft.; Rainfall 70 to 140 inches).

FOR ROADSIDES, PASTURE LAND, AND OPEN SPACES :—

- Acacia melanoxylon.** Black-wattle.—A large tree, furnishing excellent timber.
- Acacia pycnantha.** Golden-wattle. 30 to 40 feet high; good timber, valuable tannin bark.
- Albizzia moluccana.** Sau Tree; "Rata-mara," S. A large quick-growing tree; thrives from 1,000 to 3,500 ft. Thin feathery foliage.
- A.—stipulata.** "Kabal-mara," S. (See above).
- Castanospermum australe.** Moreton Bay Chestnut. A medium-sized tree, thrives from 1,000 to 3000 ft.
- Cedrela serrata.** Red Toon. } Quick-growing handsome trees; good timber
C.—Toona. Toon-tree; Indian Mahogany. } and shade. Thrive up to 6,000 ft.
- Cullenia excelsa.** "Wild Durian."—A symmetrical, spreading evergreen tree; thrives up to 3000 ft.
- Grevillea robusta.** Silky Oak. (See above). A useful and ornamental tree, with fine feathery foliage, excellent for shade, wind-belts, fuel; also affords serviceable timber.
- Pterocarpus marsupium.** "Gammalu," S.—Thrives up to 3,000 ft. (See above).

FOR TIMBER, WIND-BELTS, AND FUEL :—

(See also *Important Timbers of the Tropics*).

- Acacia pycnantha., See above | Cedrela serrata. See above
 Albizzia moluccana. " | Cedrela Toona. "
 Eucalyptus Leucoxyton. Iron-bark Tree.—A large Australian tree, affording very hard durable, and strong timber, used by cartwrights and ship-builders.
 E.—marginata. Jarrah.—An Australian tree, yielding valuable, durable timber, resistant to termites and other insects; largely used for sleepers, street-paving, jetty-building, &c.
 E.—robusta.—An upright tall tree, with rough brown bark, much planted for timber and fuel reserves at elevations of 3,000 to 5,000 ft. in Ceylon.
 Grevillea robusta. Silky Oak. (See above).
 Michelia Champaca. "Sapu" S.—A large quick-growing tree; good timber and fuel, thrives up to 2,000 ft.

FOR FIELD CROPS, TEA, &C :—

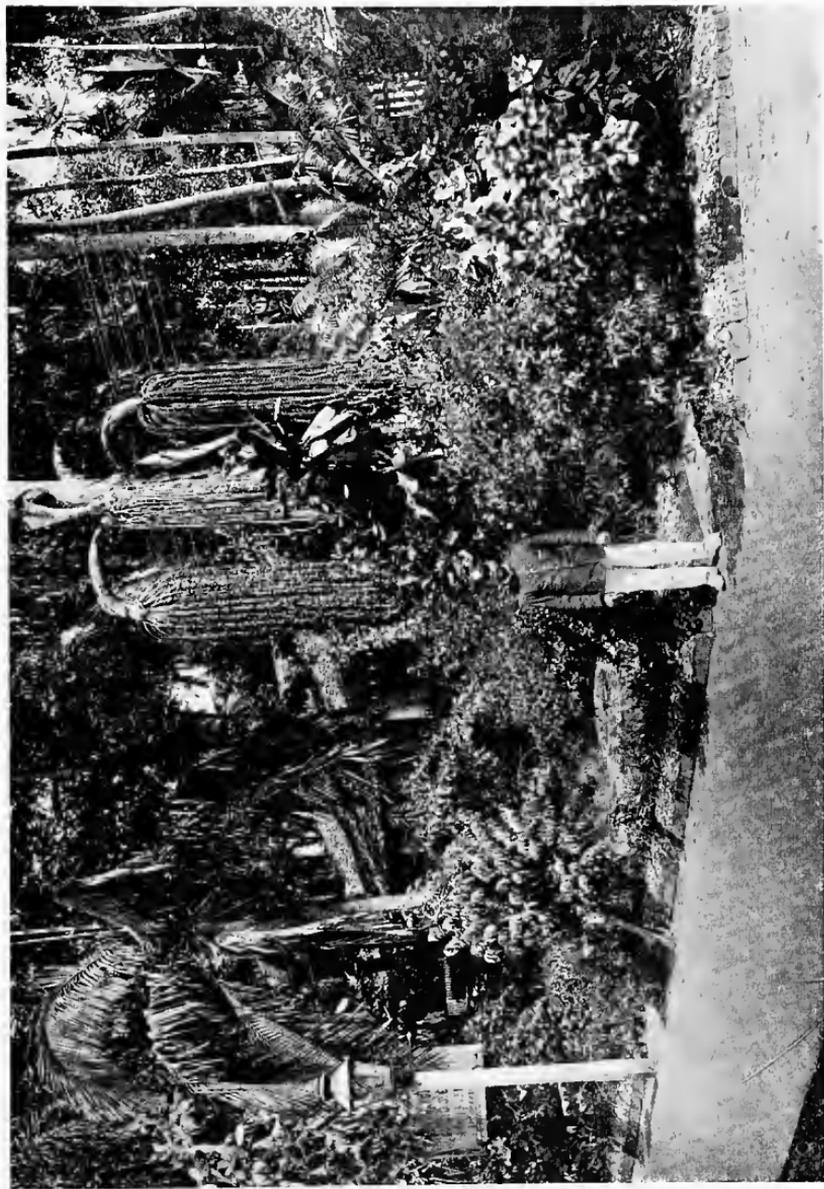
(See also *Shade Trees suited for crops in low-country*).

- Acacia dealbata. Silver-wattle.—See *Ornamental Foliage Trees*.
 A.—ducurrens. Tan-Wattle.—See above.
 Acrocarpus fraxinifolius. A handsome quick-growing Leguminous tree.
 Albizzia moluccana. (See above)
 A.—stipulata. (") } Thrive up to about 4,000 ft.
 Erythrina lithosperma. (") }
 Cedrela serrata. Red Toon. (See above) } Thrive from 2,000 to 6,000 ft.
 Grevillea robusta. Silky Oak. (") }

TREES SUITED FOR WIND-BELTS, TIMBER, AND FUEL.

FOR ELEVATIONS ABOVE 4,000 FT.

- Acacia decurrens. Tan-Wattle.—(See above).
 A.—Melanoxyton. Black-wattlè.—A large tree, furnishing excellent timber (See *Ornamental Foliage Trees*). Also several other species of Acacia.
 Calophyllum Walkerii. "Kina," S.—A large tree, with a thick straight trunk and a rounded head. Common at the higher elevations in moist region. Good wind-belt tree. Peculiar to Ceylon.
 Cedrela serrata. Red Toon.—See above; also *Ornamental Foliage Trees*.
 Cupressus Knightiana. Conifer. } Large, quick-growing, handsome trees, useful
 C.—macrocarpa. " } for timber, fuel and wind-belts. See *Ornamental Foliage Trees*.
 Eucalyptus Leucoxyton. Iron-bark Tree.—See above.
 E.—marginata. Jarrah.—A large tree of Western Australia, affording one of the most durable timbers known. (See above). Also several other species of Eucalyptus.
 Frenela rhomboidea.—A moderate-sized handsome, coniferous tree; good for timber, fuel, &c.
 Grevillea robusta. Silky Oak.—See above.
 Michelia nilagirica. "Wal-sapu," S.—A moderate-sized shrubby tree, with a rounded head, common in moist forests above 4,000 ft. One of the best of indigenous mountain timbers of Ceylon.



STATION PLATFORM GARDEN, HENERATGODA, CEYLON.



MIRIGAMA SCHOOL GARDEN, CEYLON.

CHAPTER XXI.

RAILWAY, SCHOOL, AND RESTHOUSE GARDENS.

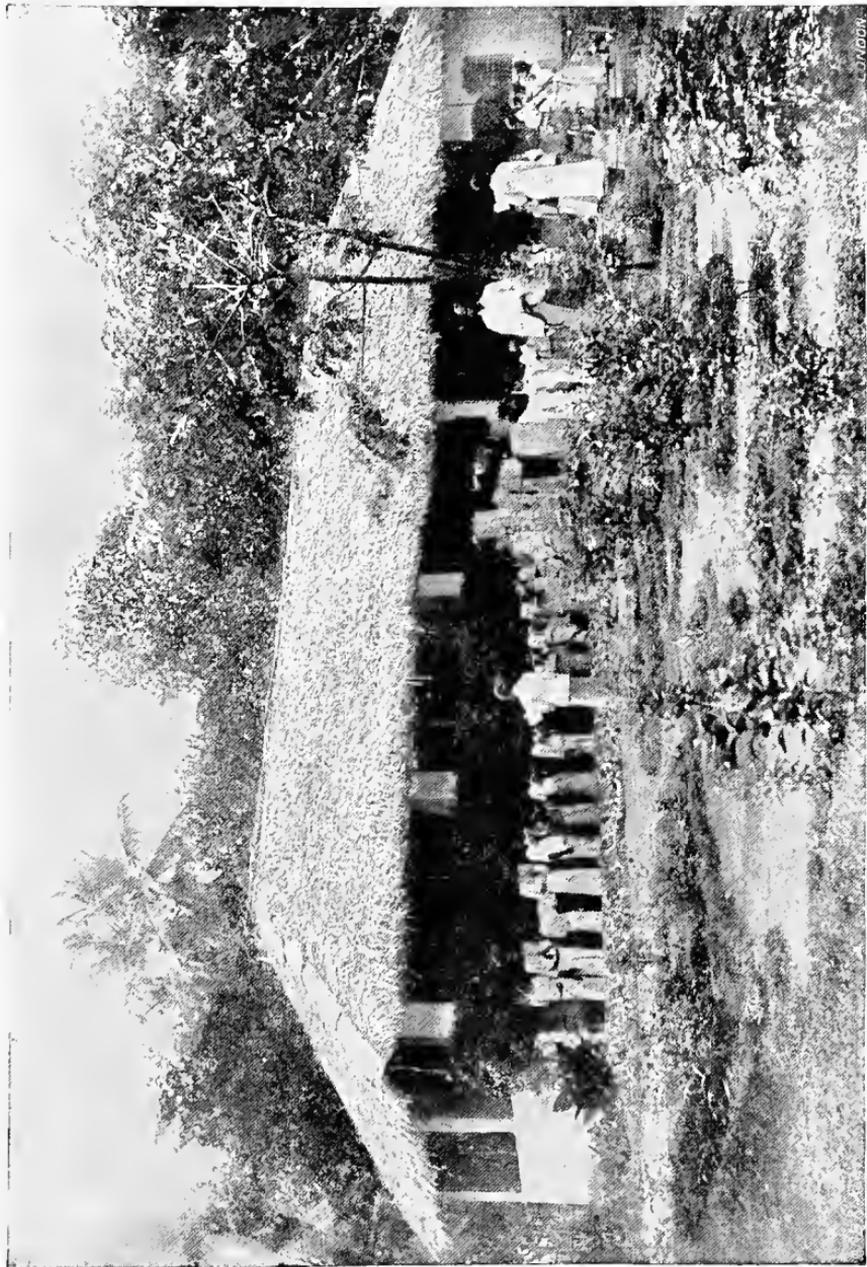
The vicinity of Railway-stations, as well as the compounds or premises of Schools or Resthouses, afford in many cases excellent opportunities of establishing attractive and useful little gardens, often in isolated or sparsely cultivated districts, and thus capable of serving as object-lessons to the peasantry. The immediate utility and educational influence of such gardens may sometimes be considerable, while through their agency useful and ornamental plants may be introduced and established in remote districts. Further, such gardens may be the means of demonstrating the kinds of plants most adapted to the particular climate and soil of their locality; while their effect in rendering a vicinity salubrious and agreeable can be readily conceived. Thus the most cheerless and bleak situations may be rendered attractive and interesting, by establishing and maintaining neat little gardens suitable to the surroundings. In America, Station gardens are made a valuable source of revenue to the railway proprietors; while in England also their importance is recognised, and different Companies encourage their development and upkeep by giving away considerable sums of money annually in prizes for the best managed gardens.

Laying out and Planting.—The outline of the garden being decided upon, the boundary should be planted with suitable trees for the purpose of providing shade or shelter. These may be planted closer than they are intended to remain when grown up, allowance being made for thinning out as the trees approach maturity. Deciduous trees should not as a rule be planted for shade, especially near buildings, as they are likely to drop their leaves when shade is most required. (See chapter on *Shade Trees*). It is essential at the outset to guard against vermin and wandering cattle, so that protection by means of a wall, a paling of old sleepers, or a good barbed-wire fence is usually indispensable. A

live fence or hedge of some formidable prickly plant will, however, often afford an efficient barrier when well-established. (See under *Hedges*).

In planning the garden, it may help to make one's idea clear by first sketching on paper the general contour of the ground, afterwards marking off the space with string and pegs. The plan to be carried out should, of course, depend on the area, whilst the labour available for carrying on the work and maintaining the garden in a proper condition, is a question which must also be considered. A small garden well-kept is obviously preferable to a larger one which always presents an indifferent appearance. Station-masters in Ceylon too frequently make the mistake of thinking that a great number of miniature beds and borders constitute an attractive garden. In many cases the latter are so fantastically made that they are neither ornamental nor practical, being unsuitable for the growth of ornamental plants, and too small and intricate to allow of their being properly worked. Simple beds of moderate dimensions, either oblong, round or oval in shape, and borders of suitable width and natural curves, are much more preferable to numerous geometrical figures.

The beds or borders should be so arranged as to leave plenty of working space between them. The foundation should whenever possible be in lawn, which if well-kept will not only increase the ornamental effect of the plants, but will itself always present a very attractive and pleasing appearance. Borders should as a rule be confined to the outskirts of the garden; they should be planted with tall shrubs so as to form an effective background, the front rows being occupied by smaller plants. The beds may be dotted about the lawn and by the sides of paths, but care should be taken to leave the centre of the garden as open as possible. In cases where only a narrow strip of ground along the platform is available, no design should be attempted. A bold border of mixed ornamental shrubs for a background, finishing with smaller plants in front, is in this case the most practical and effective arrangement. The ideal station garden should present a striking background of tall shrubs and shady flowering-trees, with beds of gradually smaller plants in front set, with plenty of room, in a smooth level lawn; this will allow of the best view being obtained from the platform or the railway carriages. It should not be forgotten that ornamental climbers can be used with charming effect over bamboo or iron arches, twining round tree-trunks or trained in festoons between pillars. They may also serve useful



SCHOOL GARDEN, NEAR VEYANGODA, CEYLON.

purposes in screening off an unsightly outhouse, or shading an exposed verandah. Climbers however, like trees, may be injurious to buildings, and should not be permitted to grow unchecked over the roofs of these.

Paths.—These should be wide enough for two persons to walk comfortably abreast, and may be either straight or gracefully curved. It must be remembered that they are meant for convenience rather than ornament; therefore avoid having more than are necessary. Cleanly-kept paths, of uniform width and with neatly trimmed edges, add considerably to the general effect of a garden.

Upkeep.—However well a garden may be laid out and planted, its usefulness and attractiveness will depend upon how the plants are grown, and their surroundings looked after. The requirements of the plants in the way of watering, shading and supporting when necessary, pruning or shaping, need regular attention. It is considered that the condition of a garden invariably reflects the extent of personal interest of its owner or the person in charge. Weeding, forking and mulching the soil, keeping the lawn mown and uniformly level, are operations which should never be neglected.

Fruit-trees and Vegetables.—See special chapters on these.

SELECTED FLOWERING AND FOLIAGE PLANTS, ANNUALS, CLIMBERS, &c.

SUITABLE FOR GARDENS FROM SEA-LEVEL TO 6,000 FT.
ELEVATION.

	FLOWERING AND FOLIAGE PLANTS, 5 TO 8 FT. HIGH.	LOW PLANTS SUITABLE FOR BEDS, FRONT ROWS, OR EDGING.
	Lagerstrœmia indica. Fl's. lilac.	Vinca rosea. Pink and white fl's.
	Tabernamontana coronaria. Fl's. pure-white.	Coleus, different var's. Ornamental foliage.
	Croton, different var's. Ornamental foliage.	Caladiums, different var's. Ornamental foliage.
	Palms, different var's. Handsome graceful foliage.	Alternanthera, several var's. Useful for edging.
	Acalypha, different var's. Ornamental foliage.	Coreopsis. Yellow fl's.
	Pisonia alba. Lettuce-tree. Greenish-yellow foliage.	Ageratum. Blue fl's.
	Arundo Donax. Variegated grass. Ornamental foliage.	Angelonia. Blue fl's.
	Hibiscus, different var's. Showy fl's.	Cosmos. Pink and white fl's.
	Amomum magnificum. Ornamental leaves; showy fl's.	Ananas variegata. Ornamental foliage.
		Turnera elegans. Creamy-white fl's.
		Gynandropsis. Large pink fl's.
		Torenia Fournieri. Small plant, violet-blue and white fl's.

↑
Sea Level.
↓

FLOWERING AND FOLIAGE PLANTS,
5 TO 8 FT. HIGH.

- Sea Level. ↑
 Poinsettia pulcherrima. Showy scarlet fl's.
 Heliconia aureo-striata. Ornamental leaves.
 Panax fruticosum. Ornamental leaves
 Aralia filicifolia. Ornamental leaves.
 Cordyline (Dracaena). Ornamental leaves.
 Mussaenda erythrophylla. Showy scarlet fl's.
 Gardenia florida. White, scented fl's.
 Kopsia fruticosa. Pink and white fl's.
 Plumiera rubra. Temple-Tree. Crimson fl's.

CLIMBERS:—

- 1,500 ft. ↑
 Solanum Wendlandii. Large blue fl's.
 Allamanda Hendersonii. Large yellow fl's.
 Bignonia magnifica. Beautiful magenta fl's.
 B.—unguis. Bright-yellow fl's.
 Cissus discolor. Pretty satiny leaves.
 Antigonon leptopus. Lovely pink fl's.
 Clerodendron Thomsonae. Beautiful white and scarlet fl's.
 Petræa volubilis. Beautiful blue fl's.
 Congea tomentosa. Showy pink fl's., large sprays.

FLOWERING AND FOLIAGE
SHRUBS:—

- 3,500 ft. ↑
 Pavetta indica. Fl's. white.
 Russelia juncea. Fl's. scarlet.
 Sanchezia nobilis. Ornamental variegated leaves.
 Strobilanthes coloratus. Fl's. dark-purple.
 Montanoa bipinnatifida. Daisy-tree. Fl's. white.
 Graptophyllum hortense. Variegated foliage.
 Tecoma stans. Yellow fl's.
 Beloperone oblongata. Pink fl's.

CLIMBERS:—

- Ipomœa Briggsii. Dark crimson fl's.
 Bignonia venusta. "Tanga-poo." Fl's. orange-yellow.
 Solanum seafortianum. Blue fl's.

LOW PLANTS SUITABLE FOR BEDS,
FRONT ROWS, OR EDGING.

- Gomphrena globosa. Purple fl's.
 Phrynium variegatum. Ornamental variegated foliage.
 Salvia farinacea. Blue fl's.
 Pentas carnea. Pink fl's.
 Ruellia colorata. Purple leaves, perennial.
 Salvia. Scarlet fl's.
 Petunia. Showy purple or white fl's.
 Cuphea jorullensis. Fl's orange-yellow.
 Marigolds, Fl's showy, yellow, orange, &c.

SHOWY FLOWERING ANNUALS:—

- Asters.
 Balsams.
 Browallia.
 Verbena.
 Larkspur.
 Nicotiana var's.
 Linum.
 Poppies.
 Linaria.
 Schizanthus.
 Phlox Drummondii.
 Zinnia.
 Chrysanthemums (Annual).
 Portulaca.
 Celosia, or Cock's Comb.
 Salpiglossus.
 Exacum macranthum.
 Mignonette.

(See selections for medium or high elevations).

FLOWERING AND FOLIAGE
SHRUBS:—

4,500 ft.	↑	<i>Duranta Plumieri</i> . Pale blue fl's.
		<i>Plumbago capensis</i> . Pretty blue fl's.
		<i>Berberis cristata</i> . Yellow fl's.
		<i>Pleroma macranthum</i> . Large violet fl's.
		<i>Bocconia frutescens</i> . Ornamental foliage shrub.
		<i>Iresine Herbstii</i> . Ornamental variegated foliage.
		<i>Musa coccinea</i> . Flowering-banana. Scarlet fl's.
		<i>Streptosolen Jamesoni</i> . Showy orange-red fl's.
		<i>Brunfelsia uniflora</i> . Bluish-white fl's.
		<i>Hedychium coronarium</i> . Fl's. white, scented.
6,000 ft.	↓	<i>Datura fastuosa</i> . Fl's. large, white.
		<i>Habrothamnus elegans</i> . Bears bright crimson berries.
		<i>Libonia floribunda</i> . Orange-red fl's.
		<i>Fuchsia arborescens</i> . Showy lilac fl's.
		<i>Spirœa peruviana</i> . Creamy-white fl's.

ORNAMENTAL

6,000 ft.	↓	<i>Cobœa scandens</i> . Large plant ; fl's. purplish white.
		<i>Mandevilla suaveolens</i> . Chili Jasmine. Fl's. large, pure white.
		<i>Scmidtia bicolor</i> . Fl's. yellow and brown.

BULBOUS AND TUBEROUS PLANTS:—

<i>Agapanthus umbellatus</i> . Lovely blue fl's.
<i>Ixia pendula</i> . Orange-yellow.
<i>Hippeastrum</i> . Different var's. Large showy fl's.
<i>Dahlias</i> . Purple, yellow, scarlet, &c.
<i>Tritonia aurea</i> . Orange-yellow.
<i>Cyrtanthus</i> . "African Bride." White or pink, scented.
<i>Cannas</i> . Yellow, scarlet, &c.
<i>Heliotrope</i> . Blue flowers.
<i>Roses</i> . Different varieties.
<i>Hyrdangea</i> . Fl's blue or white.
<i>Vinca (Periwinkle)</i> . Blue or white.
<i>Cineraria</i> . Blue, white, scarlet, &c.
<i>Violets</i> . Blue, violet, purple, white.
<i>Daisies</i> . White, scarlet, &c.
<i>Geraniums</i> . Scarlet, pink, white, &c.
<i>Santolina</i> . "Cotton Lavender." White cottony foliage. Scented.
<i>Pansies</i> . Different colours.
<i>Sweet Pea</i> . Various shades.

CLIMBERS:—

<i>Solanum jasminoides</i> . Fl's. white, showy.
<i>Tacsonia</i> , different var's. Fl's. showy.
<i>Tropœolum (Nasturtium)</i> . Fl's. yellow, &c.
<i>Wistaria sinensis</i> . Fl's. beautiful pale-purple.

AGRI-HORTICULTURAL SHOWS.

HINTS ON FORWARDING AND ARRANGING EXHIBITS.

Procure in good time a catalogue or schedule of the forthcoming Show ; go carefully through the various classes, when possibly some of the prizes offered will suggest themselves as within your scope.

1.—If time permits, sow or plant crops of vegetables, flowers, &c., to allow them to grow and mature in time for the Show ; the period required in each case will depend on the nature of the crop, as well as on local conditions of climate or soil.

2.—If in due course you are satisfied that the result of your efforts will make at least a creditable exhibit, write to the Secretary of the Show, intimating the articles which you wish to exhibit.

3.—In selecting exhibits, adhere to the rules laid down in the catalogue, especially in regard to number or quantity required : disregard of these particulars is intended to, and often does, disqualify an exhibitor.

4.—Show-rules usually state that exhibits which have not been grown by the exhibitor or his employer for at least two months before the exhibition will be disqualified. This does not necessarily apply to flowers for table decorations.

5.—In transporting delicate fruits, such as oranges, mangoes, mangosteens, sapodilla, tomatoes, &c., they should be packed in shavings, sawdust, or some soft material to prevent them from being bruised. Smaller fruits, such as Uguessa, Kon, Strawberries, &c., may be packed in layers with their own leaves; whilst large kinds, such as plantains, pineapples, durians, jak, &c., should be packed with dry straw or shavings, in crates or well-ventilated boxes.

6.—Plants should be sent in crates, and the stems, leaves or flowers securely tied and held in position. Support the stems of flowering annuals in pots. Avoid obtrusive pots, stakes, or ties.

7.—Wash root-crops carefully before sending to a Show, and cut off all unnecessary roots.

8.—Remember that quality counts for more than quantity; that vegetables, fruits, and other edible products should be in a reasonably fit state for consumption when exhibited, it being impossible to properly judge under-ripe or over-mature articles.

9.—The impression your exhibit makes on the judges is largely dependent on the manner it is arranged. Do not stage small articles in large and unsightly receptacles, such as cadjan baskets, with their contents usually hidden at the bottom. See that pots, tubs or other receptacles containing plants are washed.

10.—Fruits, vegetables, herbs, &c., should be shown in shallow basket-trays or plates of uniform sizes. Fruits, especially small kinds, are rendered more effective by having a few of their own leaves arranged neatly around them.

11.—Cut-flowers should have their stalks placed in water immediately after cutting; these will keep longer if when being trimmed their stalks are cut under the water instead of in the air.

12.—The value of an exhibit will be much enhanced if a label is fixed to it, giving the name under which it is commonly known, also, if possible, the scientific name; this will secure points in the judging and add interest to the Show; it is one of the most important considerations at floral exhibitions in England, and applies particularly to such exhibits as Roses.

13.—Flowers which naturally grow in clusters, as Verbena, Phlox, Schizanthus, &c., are best shown in bunches; while blooms of a large size as Dahlia, Hibiscus, &c., are seen to best advantage when exhibited singly.

14.—Though bottles or tins, if of uniform sizes and securely held in position, may answer the purpose of displaying cut-flowers at an exhibition, the proper thing to use so as to show the flowers to the best advantage as well as to facilitate arrangement, is an *exhibition box*. This may be made of any light wood, on the principle of a writing desk, and painted green. The size may vary according to requirements, but for all practical purposes the following are suitable dimensions: 3 ft. 9 in. long, 1½ ft. in breadth, 7 inches high at the back, and 5 inches in front. The cover is 6 inches in depth at the back, and 8 in front, being 1½ inches longer and wider than the box, and having a narrow beading within the four sides, half an inch from the bottom of the lid, which overlaps the box, leaving ample room for the blooms.

15.—Fruits which have an objectionable odour, such as Durian and Jak, especially when cut open for judging, should not be placed among the more attractive exhibits, but confined to an isolated corner or shed.

JUDGING AT SHOWS.

GENERAL RULES FOR SOCIETIES AND JUDGES.

I.—To be an efficient judge one should possess a practical knowledge of all the classes he or she has to judge, not only as they appear at the Show or on the market, but also through their cultivation.

II.—It is usually preferable to appoint three judges to form a quorum, as this will enable a casting vote being given in cases of close contest.

III.—The system of judging by points *i.e.* awarding a certain number of marks out of a possible maximum to different points or qualities of the exhibit, should be adopted where there is close competition.

IV.—The judging should always be done as punctually as possible and, needless to say, before the public are admitted to the Show. Frequently the judges have too much to do in the allotted time, which must result in their work being unduly hurried, or its being delayed until it has to be carried on in the presence of the public.

V.—The judges should be provided with ruled sheets of paper, on the left-hand side of which are written or printed the exhibits and prizes, with sufficient space allowed opposite these for the names of winners and any necessary remarks.

VI.—The executive committee should make a point of arranging the exhibits as nearly as possible in the order in which they are given in the Show catalogue.

VII.—Societies should avoid offering prizes for classes which are not in season at the date of the Show, as this will limit the prizes which would be available for other classes, or bring forward inferior specimens, if any.

VIII.—The prize cards and rosettes should be of a uniform size and colour, according to their respective value, for all classes in the Show. Thus the first-prize cards should be *red*, the second-prize *blue*, and the third or “highly commended” *lavender* or *yellow*.



CHAPTER XXII.

STANDARD PRODUCTS OF CEYLON.

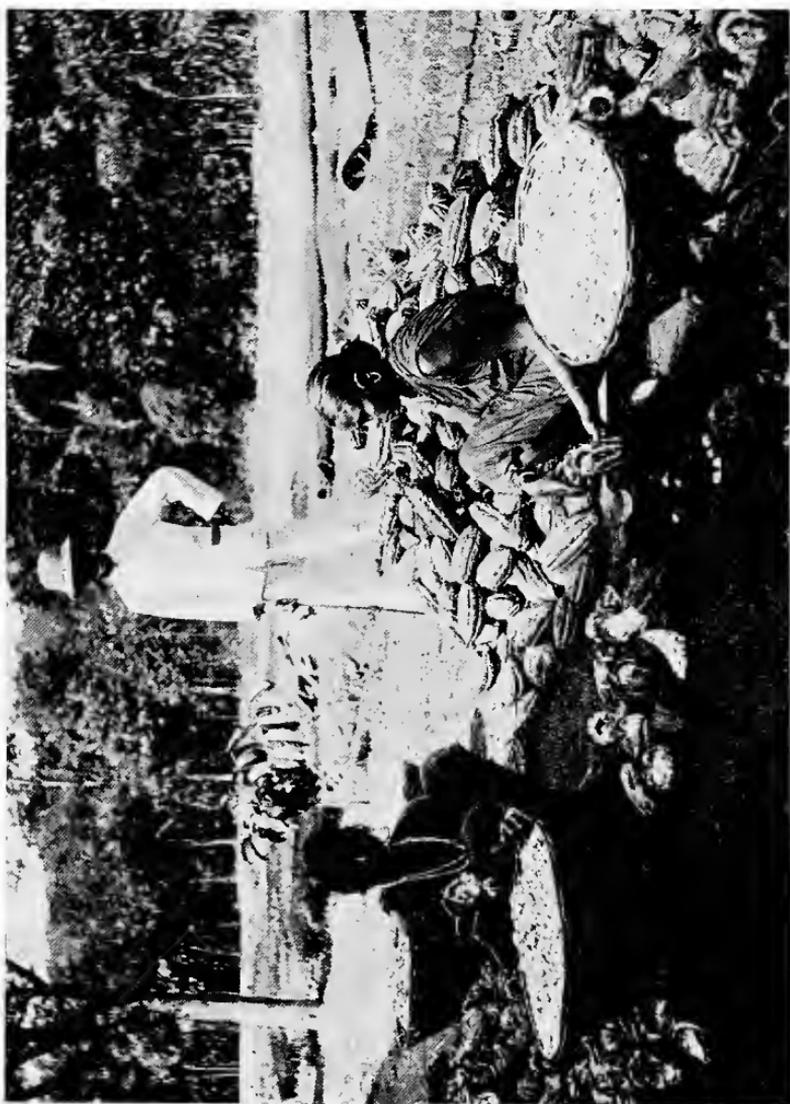
[S.—SINHALESE; T.—TAMIL].

Cacao or Cocoa; Chocolath-gas, S.; Coco-maram, T. (*Theobroma Cacao*. Sterculiaceae).—A small tree, 20 to 30 ft. high, with large oblong leaves, native of Tropical America, and cultivated extensively in its native home as well as in the West Indies, Ceylon, and West Tropical Africa. The tree bears a great number of small pinkish or yellowish flowers in bunches on the stem and branches, followed by the fruit,—large warty or furrowed (sometimes pointed) pods, 6 to 9 inches long, red or yellow when ripe. Each pod contains from twenty-five to forty large seeds, closely packed in a column in the hollow centre and surrounded by a mucilaginous substance. Cocoa or chocolate is prepared by roasting the seeds, which are afterwards ground between hot cylinders to a paste (for chocolate), or mixed with sugar, starch, &c., for cocoa. “Cocoa butter” or “oil of theobroma” is obtained from the seeds by expression, and is of special value in medicine.

The Cacao tree has a long tap-root, and requires deep and well-drained soil. It thrives best in a warm moist climate at elevations of 500 to 1,500 ft., but also yields good crops in a moderately dry climate with an annual rainfall of about 60 inches. It is susceptible to exposure to the sun or strong winds, and must be afforded protection by means of suitable shade trees (such as species of *Erythrina*), planted 60 to 70 feet apart. Propagation is by seed (occasionally by bud-grafting), which must be sown fresh, preferably in plant-baskets. The seeds germinate in about three weeks, and the seedlings, which grow rapidly, are ready for planting out in three to four months from the time of sowing. The distances for planting, under average conditions, should be 12 by 12 ft., though on good flat land they may be as much as 15 by 15 ft., while on poor steep soil 10 by 10 ft. will be sufficient. In the West Indies catch-crops, such as Bananas, Tapioca, &c., are usually grown between the rows for the first year or two, both for the purpose of yielding a return and affording temporary shade to the young Cacao plants.



AMELONADO CACAO TREE.



SHELLING CACAO PODS.

The first crop is obtained in the fourth or fifth year from planting, but the trees will not be in full bearing until ten or twelve years old. Two crops a year are obtained, the principal one (in Ceylon) from October to December, and the other from April to June. In a plantation, however, a few fruits will usually be found throughout the year. Clean weeding is essential; very little pruning is necessary beyond removing superfluous suckers and dead or barren branches. Excessive pruning or thinning out is injurious, and exposes the fruits to the attacks of the insect *Helopeltis*. The pods must be cut off, not pulled or torn. They are collected into heaps, then cut or broken open (*shelling*), the seeds (also known as "beans" or "nibs") being afterwards carried to the curing house, where they are heaped to undergo fermentation for about five or six days, the heaps being turned every other day. In Ceylon, but not always in other countries, the seeds are then well washed to get rid of the mucilage surrounding them, then dried in the sun on barbecues, either under a movable roof or in the open. The drying process occupies from three to six days, according to the weather. Colouring the beans with clay, brick-dust, &c., is sometimes adopted in the West Indies and Venezuela in order to give them a fictitious appearance, as well as to assist in the polish of the seeds; annatto is also sometimes used for this purpose. Polishing the seeds is essential for the sake of appearance, and this is secured either by rubbing them with the hands, or by "dancing" among them with bare feet, as is done in the West Indies.

The yield should be from 2 to 6 cwt. of cured beans or more per acre, though 8 cwt. per acre is sometimes obtained. An average crop of fifty pods per tree is considered good, but certain trees may bear as many as 500 pods. Fifteen average pods may be expected to give 1 lb. made cocoa. The Cacao tree was introduced into Ceylon about 1819, but its systematic cultivation was not undertaken till about 1878, when the first export of 10 cwt. (from 300 acres) was recorded. The present acreage in Ceylon is estimated at about 24,000 acres, with an export of 81,122 cwt. in 1909, when prices ranged from 40s. to 55s. per cwt.

There are numerous more or less distinct varieties, which may be divided into two or at most three groups, viz.—"Forastero" (=foreign), "Criollo" (=native), and "Calabacillo" (=Calabash); the latter, though long regarded as a form of Forastero, is now considered a distinct type. The typical Forastero has a thick and deeply furrowed bottle-necked pod, red or yellow; the seeds, which are large and numerous, are somewhat rounded, and purplish

in section; the tree is a vigorous grower and usually the most prolific kind. Some of the best varieties of Forastero are "Cundeamar," "Amelonado," "Verdilico," and "Cayenne." The "Criollo" type (known in Ceylon as "Caracas" and "Old Ceylon Red"), which is apparently identical with the "Nicaragua," is distinguishable by its smaller, thin-shelled and red pods, with globular seeds which are usually white inside. The "Calabacillo" has usually a small and roundish pod with a smooth skin; beans flat, dark-purple inside. The "Criollo" variety generally commands the highest price, but the tree is of a delicate nature and liable to disease.

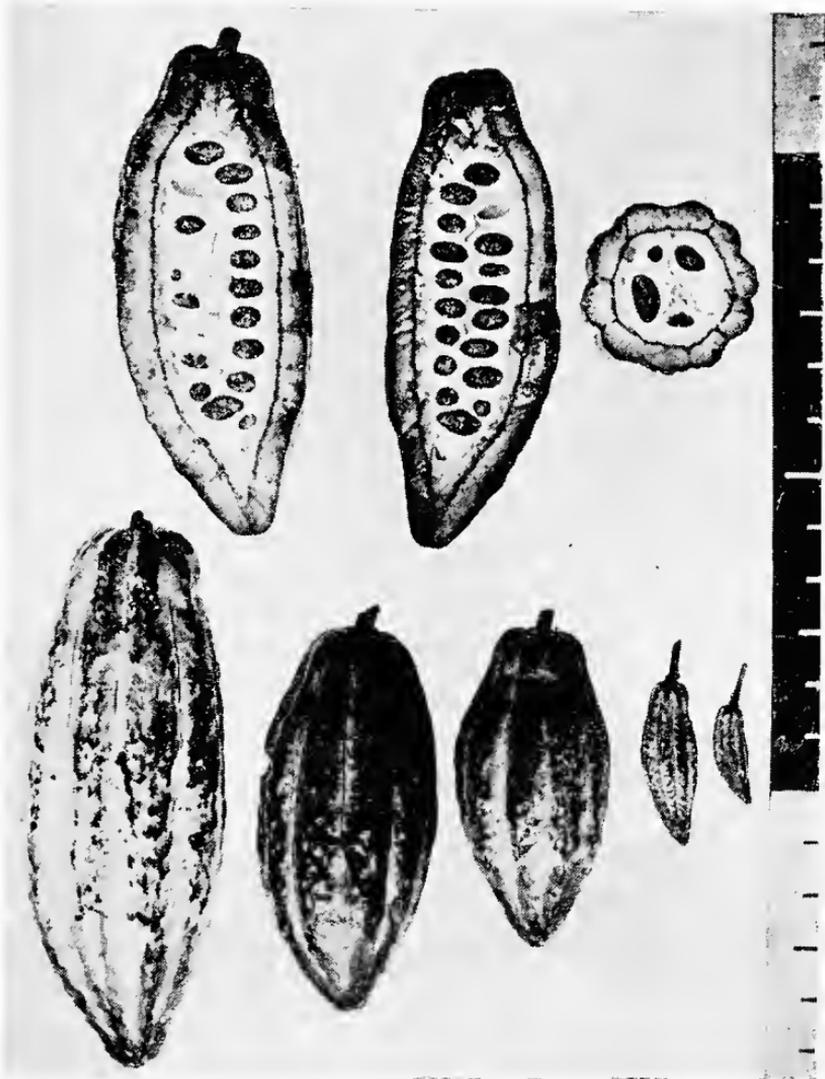
Theobroma pentagona. "Alligator Cacao."—A distinct species, introduced at Peradeniya from Trinidad in 1895. The small pods have five prominent ridges; the seeds are very large, but few, and white in section. It is highly spoken of in Trinidad, but at Peradeniya the tree is a scanty bearer.

T.—angustifolia. "Monkey Cacao."—A remarkable species introduced at Peradeniya in 1895, and fruited for the first time here in 1909. It bears large, hairy, brown and furrowed pods; the seeds are of no commercial value.

Cardamoms. See *Spices*.

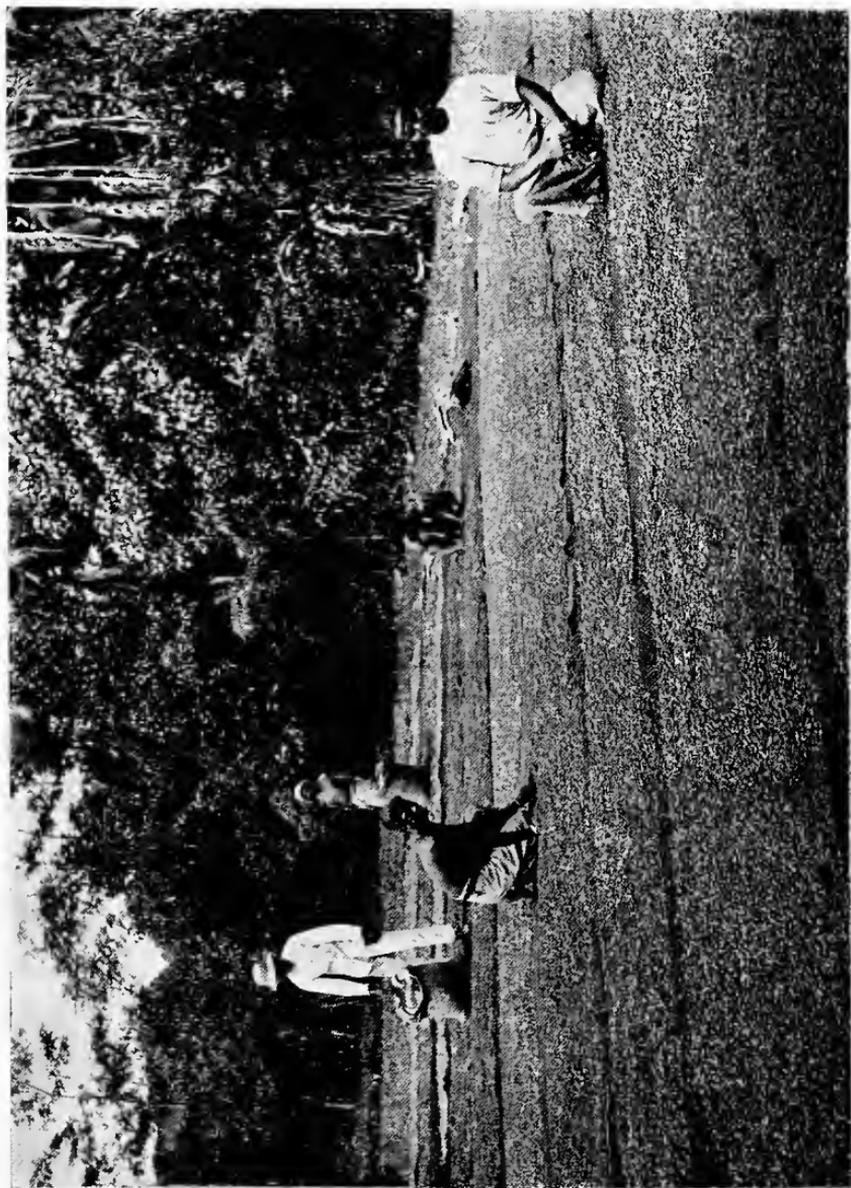
Cinnamon. See *Spices*.

Citronella-oil Grass; Pangiri-mana, S. (*Andropogon Nardus*, var.).—A large coarse grass, 3 to 4 ft. high, cultivated in Ceylon (and of late years in Java) for its essential oil, which is obtained from the leaves by distillation. The grass grows in any ordinary soil, and thrives best in a moist and hot atmosphere. It flourishes up to 2,000 ft. elevation, but its cultivation in Ceylon is confined to the south-west coast, where about 30,000 acres are under the product. The grass is readily propagated by division (seed being rarely produced), and may be planted about 2 by 3 ft. apart, in rows. Permanent shade is unnecessary, and cultivation is very simple, weeding being the chief requirement. It is recommended to replant the field every five years. The clumps are ready for cutting in about eight months from time of planting. Two cuttings a year may be obtained, and about 40 lbs. of marketable oil per acre is an estimated annual yield. The oil is of a strong aromatic odour; it is exported for use in scenting soaps, perfumery, &c., and is also an excellent preventive against mosquitoes and leech bites. Owing to overproduction and the fall in the price of the oil (the present price being about 1s. per lb.), this cultivation has considerably declined in recent years. The export of oil from Ceylon in 1909 was 1,551,140 lbs., realizing 60 to 72 cts. per lb.



DEVELOPMENT AND STRUCTURE OF CACAO FRUIT.

Nos. 1 to 5, Cacao fruits from one to seventeen weeks old ; Nos. 6 to 8, longitudinal and transverse sections of Cacao pods.



CURING CACAO IN THE SUN, EXPERIMENT STATION, PERADENIYA.

VARIETIES.—In Ceylon there are two varieties cultivated. "Maha-pangiri" and "Lenabatu-pangiri;" the former is considered to give the larger yield and better quality of oil.

Lemon-grass; Seyra, *S.* (*Andropogon citratus*).—A grass resembling the former kind, cultivated for the production of Lemon-grass oil. The latter commands a higher price than Citronella oil, but the demand for it is limited. The plant may be grown successfully up to 2,500 ft., and has given an annual yield of 20 lbs. refined oil per acre at the Peradeniya Experiment Station. Propagation is by division of mature clumps, and general cultivation is the same as for



COCONUT PALMS (*Cocos nucifera*),
ON THE EXPERIMENT STATION, PERADENIYA.

Citronella grass. The yield of oil varies with soil and climate; but usually, with two crops a year, the return per acre is considered to amount to about 5,000 bundles (each 6 in. in diameter), capable of yielding at least 100 quarts of oil. Refined lemon-grass oil sells in Europe for at least 6*d.* per oz. As a quart contains forty fluid ounces, the product of an acre should thus realise a value of £100. The oil is used in perfumery and in the manufacture of scented soaps.

Coconut Palm; "Pol," *S.*; "Tennai" or Thénga, *T.* (*Cocos nucifera*).—To the inhabitants of Ceylon and other tropical countries

where the coconut palm flourishes, this is one of the most important trees of the vegetable kingdom. Though extensively grown in most tropical regions, the original home of the palm is unknown. It thrives best in a moist hot climate, especially near the sea, but will also succeed to a considerable distance inland where the climate is sufficiently hot and moist. In Ceylon it is cultivated and gives good returns up to 1,600 ft. above sea-level. Coconut cultivation, together with the preparation of its different products for market, forms a large industry in Ceylon. Enormous quantities of copra (the dried inner portion of the nut, from which coconut oil is obtained), desiccated coconut (used in confectionery and cooking), fibre from the husks (coir-fibre), and whole nuts (to the extent of 20 million a year), are exported. The local uses of the nut, leaves, stem and flowers for cookery and domestic purposes are innumerable, and in many cases sufficient to supply the total requirements of the poorer natives. The palm likes moist alluvial or deep loamy soil, and flourishes particularly on the sandy sea-coast, as well as on the banks of rivers. It is propagated by the nuts, which are sown in the husk in a nursery bed, being usually laid on their side and almost covered with fine sandy soil. In eight to ten months the seedlings are ready for planting out. The holes in which they are to be planted should be 3 ft. deep by 3 ft. wide, and allowed to remain open for some time previous to planting. When the plants are put in, the holes should only be partially filled, leaving the crown of the plant about a foot below the surface of the ground; in course of time, through the process of cultivation and weathering, the hole becomes filled up, and the tree is thus ensured a firm hold of the ground. The holes should be 25 by 25 ft. apart, thus allowing about seventy trees to the acre. A crop may be obtained in the seventh or eighth year from planting, and the trees remain productive until about seventy to eighty years old. They yield all the year round, and an aggregate annual return of forty to fifty nuts per tree, or 3,500 nuts to the acre, is considered a good average yield. The trees attain a height of 70 to 80 feet, with an unbranched wavy (never straight) stem. They are easily climbed by the Natives, who throw their feet in a loop of cloth or fibre, and this being pressed against the stem affords a foot-hold.

VARIETIES.—A great number of varieties are in cultivation, these varying chiefly in the size, shape and number of nuts produced, also in thickness of the husk and of the interior, height of tree, &c. The different varieties are known by various local names.



A Coconut plantation in the Low-country, Ceylon, showing method of using husks for manuring, or rather for retaining moisture near the roots. The longitudinal dark slits on the two trees in foreground (right and left side) are old scars of the Coconut bleeding disease.



TERRACED RICE FIELDS IN CEYLON

The *King Coconut* is a distinct variety, said to have originated in Ceylon; it bears a yellow oval fruit, which is distinguished by its sweet juice, and is esteemed for culinary purposes. The *Dwarf Coconut* bears fruit when only 2 or 3 ft. high, and the nuts are small in proportion. *Needle Coconut* is a distinct variety with a large triangular fruit, the nut having a sharp point at one end; it is cultivated in the Nicobar Islands. *Maldivé Coconut* is characterised by a small, almost spherical fruit; while the *Edible-husked Coconut* is furnished with a husk which, when tender, is fleshy and of a sweetish acid taste.

Rice; Goyan, *S.* (*Oryza sativa*. Gramineae).—Rice is the staple food of the native population of Tropical Asia, where the plant is indigenous and has been extensively cultivated from time immemorial. Its cultivation has in recent times spread to other tropical and sub-tropical countries, as the warmer parts of South America, West Indies, &c. The Rice plant is an annual grass, growing, according to variety and soil, from 2 ft. to 4 ft. high, and its grain is considered to furnish the human race with a larger proportion of food than any other plant of the vegetable kingdom.

There are numerous varieties, which come under two main types, (1) *common* or *aquatic rice*, and (2) *hill rice*. The former kind requires marshy or irrigated land and a hot climate (up to about 3,000 ft. in valleys), while the latter must be grown on dry land, and thrives up to about 4,000 ft. For the aquatic rice, a sandy loam, overlying a clayey subsoil (to prevent the water draining away), is essential. Manuring is indispensable, and crushed bones are among the most suitable form of fertiliser. When water cannot be turned on to the land from streams or rivers, it has to be raised by mechanical means (often very primitive) from wells, &c., and in dry provinces, as in India, Ceylon, and Egypt, immense tanks or artificial lakes are constructed as reservoirs, the overflow from which supplies large tracts of irrigable land. In Ceylon, sloping or steep land is often rendered irrigable and suitable for rice cultivation by means of an elaborate system of terracing (see under *Irrigation*). In preparing land for sowing, water is first turned on to soften the soil, which is then either ploughed, roughly dug by mamoties, or merely puddled by teams of bulls or buffaloes. The seed is usually soaked for twenty-four hours before sowing. In Ceylon it is generally sown broadcast in the field, at the rate of about 2 bushels per acre. Transplanted rice, however, yields much greater returns, the seedlings in this case being transplanted to the fields when 7 to 8 inches high, and at distances of 6 to 8 inches apart. The muddy soil

being levelled with flat boards, the grain is sown, and when the latter has sprouted well the water is gradually turned on the field. The fields are kept flooded until the flowers appear, when the supply of water is reduced. When the grain is well formed, the water is turned off so as to hasten ripening and facilitate harvesting. Harvesting takes place in three to seven months (according to variety) from time of sowing. Two crops a year may be obtained in Ceylon, in the wet region, (1) the "Maha" crop (the principal one), sown in July or August and harvested in January or February; and (2) the "Yala" crop, sown in April and May and reaped in August and September. When the grain turns yellow, the crop is cut down with a sickle, tied in sheaves, and dried in the sun. Threshing in Eastern countries is often, if not usually, done by the trampling of bulls or buffaloes, these being tied in teams and made to walk in a circle, the rice being thrown under their feet. The grain is afterwards winnowed in the wind, then stored; hulling is done in wooden mortars, as required for consumption.

The yield of rice varies considerably according to variety and cultivation. The average return in Ceylon is about twenty-five to thirty-five bushels per acre, or about fifteen-fold. With good cultivation, however, twenty to twenty-five-fold is considered an ordinary yield. Two bushels of paddy when hulled is said to give only one bushel of clean rice. The whole production of rice in Ceylon, which is entirely in the hands of the Natives, is about $4\frac{1}{2}$ million bushels per annum, against an import of about double that quantity from India and Burma.

VARIETIES.—These are numerous, being distinguished chiefly by size, form and colour of grain, height of plant, also the period required to yield a crop, the latter a very important character. The following are some of the principal varieties grown in Ceylon:—

Name of Variety.	Time of sowing.	Time of harvesting.	Name of Variety.	Time of sowing.	Time of harvesting.
Ma-vi (seven months' paddy):—			Hinati (three months' paddy):—		
Kalukurumavi.	July	Feb.	Kalu-hinati.	Nov. & May	Feb. & Aug.
Muthusamba.	"	"	Sudu-hinati.	"	"
Sudumavi.	"	"			
Hatili (six months' paddy):—			El-vi or Hill paddy (seven months' paddy):—		
Gangala.	"	"	Rat-el	July	Feb.
Kaluhatali.	"	"	Suwand-el	"	"
Suduhatali.	"	"			

Name of Variety.	Time of sowing.	Time of harvesting.	Name of Variety.	Time of sowing.	Time of harvesting.
Hondarawala (five months' paddy):—			Pol-el (six months' paddy).	Aug.	Jan.
Girisa	Aug.	Jan.	Batukiri-el (five months' paddy).	..	Dec.
Kalukumara	"	"			
Kirinarun	"	"			
Bala-vi (four months' paddy):—	Nov. and	Feb. and	Kalu-el (four months' paddy).	July	Nov.
Kirikurumba	May	Aug.	Mada-el (three months' paddy).	.	..
Sittarakali	"	"			
Pana mora	"	"			

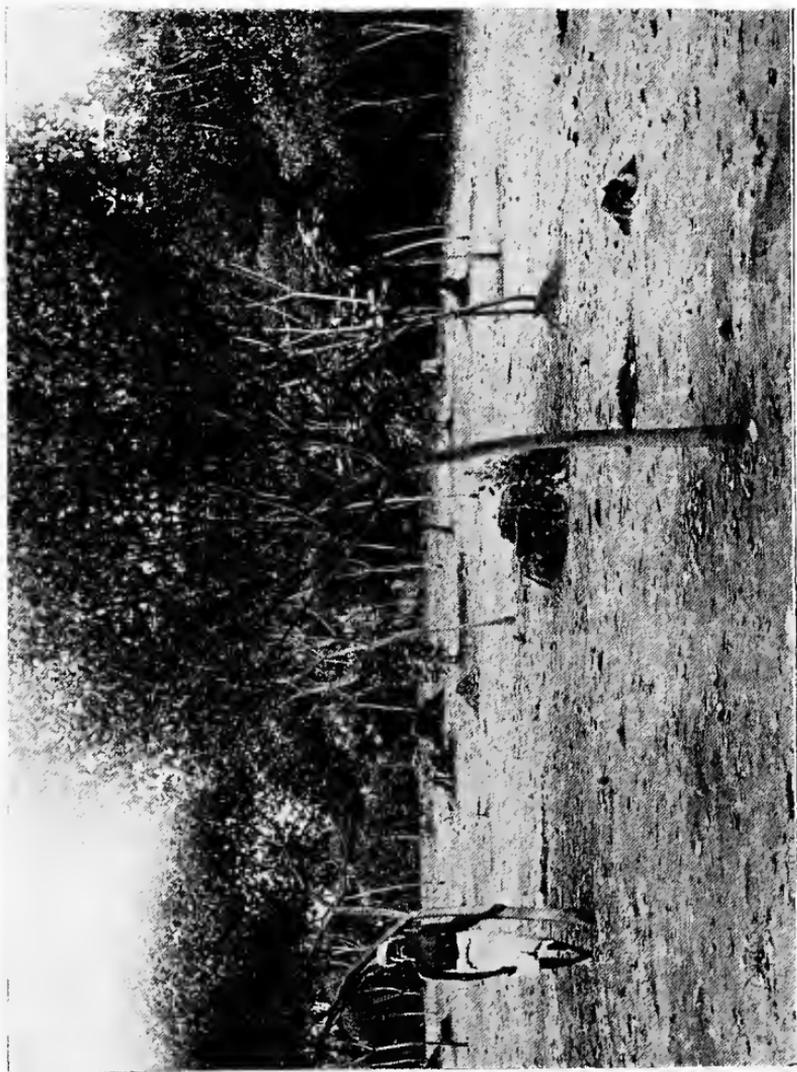
RUBBER.

Rubber is obtained from certain trees, climbers, or shrubs, being extracted in the form of white milk or latex by means of incisions made in the bark. This latex is supposed to be a waste product, *i. e.*, not connected with the life functions of the plant, and flows out for a brief time from fresh or renewed incisions, being then collected in specially prepared tins or other receptacles. It coagulates on exposure to the air, and the latex of some species coagulates much more readily than others. Coagulation is, however, usually accelerated by adding a few drops of acetic or other acid, the rubber particles forming a floating mass; this is then separated from the liquid (which is discarded), thoroughly washed by means of water and a rolling pin or a machine roller, and then made up into any of the commercial forms such as *biscuit*, *block*, *sheet*, *crepe*, &c. Biscuit or sheet rubber usually commands the highest price. About two months are required for the rubber to become quite dry and ready for packing for export. In tapping, specially constructed knives are used for the purpose. Different systems of tapping are employed, certain systems being more adapted than others to certain species as well as to trees of different ages. Perhaps the most generally approved are the "herring-bone" or "half-herring bone," and the half-spiral systems. Only one-third the circumference of the tree should be operated on at once. A thin shaving is taken off the upper surface of the cut every alternate day or so, until the intervening space of bark becomes too narrow or exhausted of latex, when the operation may be repeated on a fresh portion of the stem. The tapping may thus be extended over almost the whole year. It is essential to prevent the incision from penetrating the cambium (see under *Plant Life*), otherwise a knotted condition of the stem will be produced, and if the cambium be much injured the tree will probably die.

RUBBER-PRODUCING TREES, SHRUBS, CLIMBERS, &c.

Para Rubber. (*Hevea brasiliensis*. Euphorbiaceae).—A quick-growing, tall, erect tree, native of South America, introduced into Asia in 1876, through the Royal Botanic Gardens of Kew, being first established at, and later distributed by, the Botanic Gardens of Peradeniya and Singapore. About the year 1898, the cultivation of this and other rubber-producing trees received an impetus, and has since made rapid strides in Ceylon and Malaya, extending also to most tropical countries. Whereas in 1900 the export of rubber from Ceylon was 8,223 lb. of £859 in value, in 1909 it had increased to over 1,741,000 lb., valued at about £480,326, while the estimated export for 1910 is 3,000,000 lb. The Para rubber tree is the most important of all rubber-producing species. It thrives in any moderately good soil, from sea-level to about 2,000 feet elevation, provided the rainfall is evenly distributed and not under 70 inches a year, with a minimum temperature of 60° to 70° Fah. The trees should be planted out (preferably as stumps or basket-plants) at a distance of not less than 15 feet by 20 feet apart (or 145 trees per acre); a distance of even as much as 20 by 25 feet apart (88 trees to the acre) is to be recommended where the soil and climate are especially suitable, and the trees are likely to attain a large size. With good growth, the trees become tappable in from five to seven years, or when the stems have attained a girth of about 22 inches at 3 feet from the ground. The average annual yield of dried rubber may then be approximately $\frac{1}{2}$ lb. per tree, increasing to 2 or 3 lb. per tree at eight to ten years old, and to an average of 4 to 6 lb. per tree when these are twelve to fourteen years old. A return of 200 lb. of dried rubber per acre, from trees six years old, and 500 lb. at ten years old, are considered good average yields, but in many cases a much larger crop is obtained. Ten trees on Culloden Estate, in Ceylon, about twenty-two years old, have given an average yield of 18 lb. of dried rubber each in 1909, the range being from 13 to 25* lb. per tree. The cost of bringing Para-rubber in bearing, exclusive of cost of land, varies from about £20 to £30 per acre, according to nature of land and situation, while the cost of obtaining and "curing" the rubber ranges from about 10½d. to 1s. 4d. per lb. The market value of rubber at present fluctuates a great deal; thus the price of *Fine Para* (at present the standard grade) rose from about 3s. 6d. to 9s. 4d. during 1909, and reached 12s. 4½d. in April, 1910.

*A Para rubber tree thirty-three years old, in Heneratgoda Gardens, Ceylon, has yielded 98 lb. excellent rubber during 1909, tapping being confined to one-fourth the circumference of the stem. The tree is still being tapped and increasing in yield.



JEQUIE MANICOBÁ RUBBER (*Manihot dichotoma*), THREE YEARS OLD.
ON EXPERIMENT STATION, PERADENIYA.

The seeds are large and oily, about 110 weighing one lb. ; they are of short vitality, and germinate in ten to twelve days.

Ceara Rubber. (*Manihot Glaziovii*. Euphorbiaceae).—A small, rather spreading, quick-growing tree, 25 to 40 feet high, native of South America, introduced into Ceylon in 1877. By 1883 as many as 977 acres were reported to be under this tree in Ceylon, but the yield of rubber being found disappointing, the cultivation fell into neglect for a number of years. Now, however, with more perfect methods of tapping, the trees yield a satisfactory return, and the rubber is second in quality only to that of *Hevea brasiliensis*. The latex is remarkable for its readiness to coagulate without the addition of acid. The tree thrives at medium elevations, and withstands a drier climate than is suited to *Hevea* ; it may also be planted at closer distances, and is tappable at an earlier age than the latter tree. Seeds of a hard horny character, retaining their vitality a long period ; should be rasped at one or both ends before sowing (see under *Propagation*). According to Mr. H. Powell, in the *Agricultural Journal of British East Africa* for April 1908, seeds at least a year old (from the time they fall from the trees) should be selected for propagation, fresh seed being “ of slow and uncertain germination.”

Jequie Manicoba Rubber. (*Manihot dichotoma*).—A quick-growing species, similar to, but rather smaller than, Ceara Rubber, being also distinct by the regular forking of the branches. It is a native of South America, and has been introduced into Ceylon in 1907. The seeds are larger than, but not so hard as, those of Ceara-rubber ; they germinate in a fortnight to three weeks, filing or other artificial aid being unnecessary. The tree thrives best on a red loamy soil, is said to be tappable at three to four years from planting, and yields its maximum return of rubber from the age of eight years onwards. In Brazil the trees are planted about 6 or 7 feet apart, or 1,000 to the acre, and a yield of one ton of rubber per acre is said to be thus obtained.

Remano Manicoba Rubber. (*Manihot Piauhyensis*).—Another South American tree, resembling the two former species, described as reaching a height of only 8 to 16 feet, the branches being forked two or three times. It has been introduced into Ceylon in 1908. The tree is found in the State of Piauhy, and grows best in a light sandy soil. Both this and the Jequie-rubber are said to be superior to Ceara-rubber in the yield and quality of their produce. The seeds are larger than those of the preceding species, and, being less hard and horny, germinate readily.

Manihot heptaphylla.—Another species of Maniçoba-rubber, said to be a tree 20 to 25 feet in height, with dark-brown bark and purplish twigs. The seeds are larger and paler than those of Ceara-rubber.

Central American, or Ule Rubber. (*Castilloa elastica*. Urticaceae).—A quick-growing tall tree with large oval leaves, native of Central America, introduced into Ceylon in 1876. It is propagated by the white, papery seeds, which are of the size of peas and of short vitality; it thrives best at medium elevations, with a rainfall of not less than 70 inches. The trees may be planted at the same distances apart as Hevea, say about 150 to the acre. At six to seven years of age they are tappable, when the yield should be about 100 lb. per acre; at eight years old the yield may be 175 lb., and at nine years, on a moderate estimate, 240 lb. per acre, increasing to at least 2 lb. per tree when about twelve years old. In quality, this rubber is considered to be next to Ceara Rubber.

Lagos Rubber. (*Funtumia elastica*. Apocynaceae).—A large, upright tree, native of West Tropical Africa, Uganda, &c., introduced into Ceylon in 1897. Cultivation and methods of tapping same as for Hevea, &c. A yield of one lb. or more per tree has been obtained from uncultivated trees in Uganda, and the quality of the rubber is but little inferior to that of Para-rubber. The tree is unsuited for cultivation in Ceylon, owing to a caterpillar pest which regularly attacks and completely defoliates the branches. The seeds are small and grain-like, with a long silky appendage at the top end; they retain vitality well, and germinate readily in about fourteen days.

Rambong, or India Rubber. (*Ficus elastica*. Urticaceae).—A very large spreading tree, often with aerial roots developed downwards from the branches, or with enormous buttressed roots spread over the ground. The aerial or buttressed roots as well as the stems are tapped for rubber, but the trees take comparatively long to attain a tappable age, when however it yields large quantities of good rubber. The tree does not produce fertile seed in Ceylon, and has to be propagated by cuttings, which do not readily strike root.

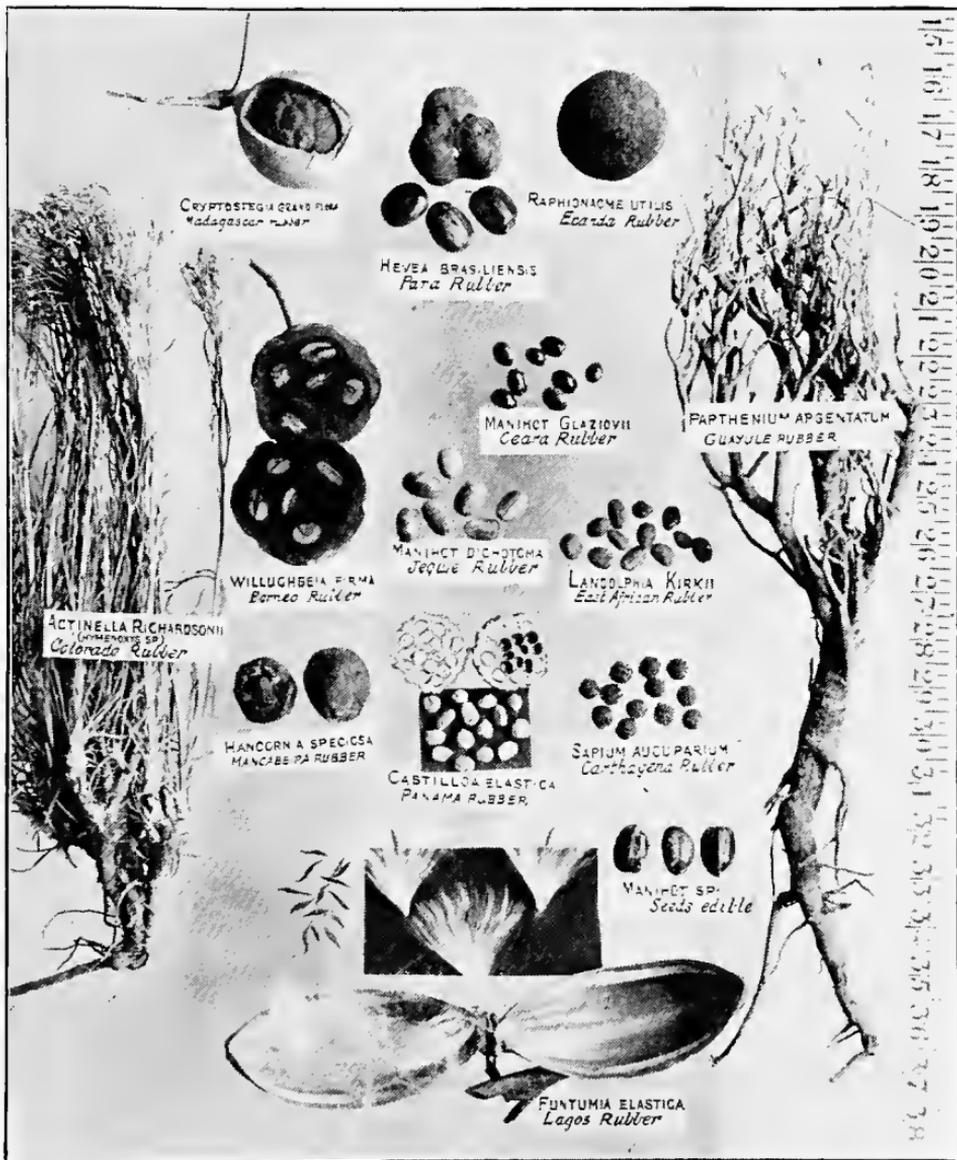
Ecanda Rubber, or Bitinga. (*Raphionacme utilis*).—A low stemless plant, bearing a large tuberous root not unlike a turnip in form, native of the treeless grass tracts or plateaus of Zambesi, British Central Africa, &c. It is found chiefly at elevations of 4,000 to 5,000 feet above sea-level, and is considered one of the most important of root-rubbers, the tubers containing a large percentage of rubber. Propagated by tubers. So far, probably no one has succeeded in germinating seed of this plant outside its native country.

OTHER RUBBER-YIELDING PLANTS.

[Several of these only afford rubber of an inferior quality].

- Actinella Richardsonii*. Colorado Rubber. (*N. O. Apocynaceae*).
Anodendron paniculata. (*Apocynaceae*). Large liane of Ceylon, India, &c.
Carpodinus lanceolata. Root-rubber. (*Apocynaceae*). Central African climber.
Clitandra Henriquesiana. Root-rubber. (*Apocynaceae*). An erect shrub of Central Africa.
Cryptostegia grandiflora. Madagascar Rubber. (*Asclepiadaceae*). An ornamental climber, native of Tropical Africa. Commonly grown in gardens.
Ecdysanthera glandulifera. (*Apocynaceae*). A climber of Cambodia.
Eucomia ulmoides. Chinese Rubber. A bushy tree of China, suited to a cool or temperate climate.
Ficus Vogleii. West African or Congo Rubber. (*Urticaceae*). A medium-sized tree, introduced at Peradeniya in 1881.
Forsteronia floribunda. (*Apocynaceae*). "Milk-Vine" of Jamaica.
F.—gracilis. A liane of British Guiana.
Hañcorina speciosa. Mangabeira Rubber. (*Apocynaceae*). Small shrubby tree; fruit edible, seed of short vitality.
Landolphia florida. Mozambique Rubber. (*Apocynaceae*). Tropical African liane.
L.—Kirkii. Zanzibar Rubber. " "
L.—owariensis. Congo or Sierra-Leone Rubber. " "
L.—Petersiana. East African Rubber. " "
Leuconotis elastica. (*Apocynaceae*). Borneo.
Mascarenhasia elastica. (*Apocynaceae*). A tree of Madagascar, introduced at Peradeniya in 1902.
Parameria glandulifera. Taking Milk-creeper. (*Apocynaceae*). A Malayan liane.
Parthenium argentatum. Guayule or Mexican Rubber. (*Compositae*). A small, slow-growing desert shrub.
Sapium aucuparium. (*Enphorbiaceae*). } Large trees yielding the "Carthagena
S.—verum. " } Rubber" of Colombia and "Tonckpong
 Rubber" of British Guiana.
Tabernamontana crassa. (*Apocynaceae*). Medium-sized tree, native of Central Africa.
Ureceola elastica. (*Apocynaceae*). A climber of Burma.
Willughbeia firma. Borneo Rubber. (*Apocynaceae*). A large liane.

Tea; *Thay-gas*, *S.*; *Téy-ilé*, *T.*—The tea of commerce consists of the cured young leaves and tender tips of two distinct species or varieties of *Camellia Thea* (Assam or Manipuri indigenous Tea), and *Camellia Thea*, var. *Chinensis* (China Tea). To these may be added certain hybrids, notably the "Assam Hybrid," said to be a "natural hybrid" between the Assam and China Teas. The China Tea is distinguished in Ceylon by its squat straggling habit; it is best suited for the higher elevations, and is not so productive as the other kinds named. The Assam Tea, left to itself, is an erect tree, 30 to 40 feet high. In cultivation it is "topped" early, and kept as a bush about 4 ft. high. Tea has been cultivated from time immemorial in China and Japan. Its cultivation in Ceylon on a commercial scale may be said to date from 1867, though the earliest



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SEED, FRUIT, OR TUBERS OF THE PRINCIPAL RUBBER-YIELDING PLANTS.



PLUCKING TEA IN CEYLON.

records of its introduction to the Botanic Gardens go as far back as 1839 for Assam Tea, and "before 1824" for China Tea. Tea is now the principal planting product of Ceylon, where its export rose from 23 lbs. in 1873 to over 186 million lbs. in 1909, and about 395,000 acres are under the product. Other important tea-producing countries are India, China, and Japan, also to a smaller extent Java and Natal. The tea plant (more especially the Assam Tea) is adaptable to a wide range of temperature and various conditions of soils, and thrives from sea-level to 6,000 ft. It will not, however, flourish in a dry climate, especially at low elevations. The soil must be well drained and should contain a certain amount of humus; when the latter is deficient it should be supplied by means of green-manuring. Manuring periodically by artificial or cattle manure is necessary in order to maintain the crop in a remunerative condition.

Propagation is entirely by seed, which may be sown in raised nursery beds, at distances of 4 inches apart each way, the beds being shaded by fern fronds or *Grevillea* leaves fixed in the ground slanting-wise. It is best, however, to raise plants in small plant-baskets or bamboo joints. About ten months from the time of sowing, the seedlings should be ready for planting out in the field. Holes being made in lines, the plants are set out at distances of about 4 ft. by 4 ft. apart, being shaded and if necessary watered until well established. About eighteen months after planting, the plants are "topped" (*i.e.* cut back to 12 or 15 inches from the ground) so as to induce a spreading bush. The first crop of leaf is obtained in the third year in the low-country, it being a year or so later at higher elevations. At low elevations plucking takes place about every ten days, and at higher elevations once a fortnight or three weeks, according to elevation. When the bushes stop flushing, they are pruned back severely, this being necessary at intervals of about fifteen to eighteen months in the low-country, or of three to four years up-country. When in full bearing at seven or eight years old, the crop of made tea may be, according to elevation and cultivation, from 500 lbs. to 11,000 lbs. or more per acre.* The tea plant lives to a great age. The oldest tea in cultivation in Ceylon is over fifty years of age, and shows no lack of vigour. *Plucking*, which is usually done by women or boys, consists in nipping off by hand the tender end leaves with the bud and shoot; two leaves and bud constitutes *fine* plucking and

* On Mariawatte Estate, Gampola, Ceylon, a field of over 100 acres has given an average per acre of 1,144 lbs. for seventeen years.

affords good tea, while three or four leaves and bud forms *coarse* plucking and yields tea of a lower quality. The leaf being brought to the factory, it is *withered* on hessian screens in drying sheds, then *rolled* by means of rolling machines, after which it is *fermented*, followed by *firing* in drying machines, being finally *sifted*. By the latter process the tea is simultaneously *graded* into such qualities as "souchong" "pekoe souchong," "orange pekoe," "broken orange pekoe," and "dust." It is then packed into lead-lined square cases or chests of uniform sizes for export. Black or ordinary tea has been exported from Ceylon in 1909 to the extent of nearly nineteen million lbs., valued at over eighty-one million rupees.

Green Tea.—This is obtained by omitting the fermentation process employed in making ordinary or "black tea." China-made teas usually belong to this type. There is a certain demand for green teas in some countries, notably the United States, and Ceylon manufactures and exports green tea to meet this demand to the extent of about six million pounds a year.

Brick Tea.—A cheap and coarse tea, made in Tibet and used in Central Asia boiled with salt, butter, &c.; also exported to Russia for use by the peasants. It is made with twigs and leaves of tea, pressed with some glutinous substance and dried in moulds.

Soluble Tea.—A process has recently been invented by Mr. Kelway Bamber by which the essence of tea is extracted, and rendered available in a concentrated soluble form.

Tobacco; Dhoom-kola, S.; Poyilé, T.—The dried leaves of *Nicotiana Tabacum* and *N. rustica* (or varieties of these), both of South American origin, may be said to furnish the tobacco of commerce. The principal tobacco-growing countries are the United States, Cuba, South America, Sumatra, Philippines, Borneo, India, Turkey, South Africa, &c. Tobacco growing is a local industry in the north of Ceylon, the produce being chiefly used for chewing with betel and for making inferior cheroots; the cured leaves are also exported to India to some extent. The best soil for tobacco is considered to be a light sandy loam, rich in potash, lime and humus. The plant flourishes on alluvial soils, but not on clayey or calcareous ground. A hot humid climate favours the growth and the development of the special properties of the plant, but a dry season must be relied upon for harvesting. Tobacco is a very exhausting crop, and manuring is essential. Cattle manure when obtainable is always the best. The crop is an annual one, the plants being raised from

seed † (which is small, and should be sown under cover), and planted out in the field in rows, 3 ft. by 1½ ft. apart. The young tender plants must be shaded with small branches or fern-fronds (and watered if the weather be dry) until well established, after which no shade is required. In five to six weeks from planting, the flower buds will appear at the top of the plants; these as well as any side-buds must be nipped off, the operation being known as *suckering* or *disbudding*. These buds must be repeatedly removed, so as to divert the vigour of the plant to the leaves. About six weeks later, or three months from the germination of the seed, the leaves are ripe for cutting, this being indicated by their turning a yellowish green, with the appearance of spots, and the edges and tips curling downwards. Cutting should not be done on a wet day. The plants may be cut whole close to the ground, or the leaves separately, the latter being considered the better method. After withering in the sun for a few hours, they are carried to the drying house, and hung to dry. The *withering* makes the leaves tough and prevents them being broken when handled. The leaves are sorted according to quality into "hands," each hand containing as a rule fourteen leaves. *Curing*, a most important process, follows, and upon this depends the proper development of the peculiar narcotic principle of tobacco. About four to six weeks are required to completely dry the leaves hung in the drying sheds. When dry, they are placed in heaps on a concrete or wooden floor to ferment, each leaf being spread out evenly with the tips all in one direction. The heaps should be turned over at intervals to prevent excessive fermentation; at the end of about six weeks fermentation will have ceased, and the leaves will have acquired the qualities of tobacco. In India a good average yield gives 20 to 24 maunds of cured leaf per acre, valued at about Rs. 5 per maund.

Grading the leaves is an important matter, and is dependent upon their size, aroma, texture, &c. The same plant may produce several different classes of leaf, as *wrapper*, *filler*, *pipe tobacco*, &c. It is said that a parcel of tobacco from the same field can sometimes be graded by an expert into as many as seventy-two different grades; but all that the planter can be expected to do is to keep separate, during the process of cutting, withering, &c., all leaves of a certain size, quality and colour.

† 1 oz. = 875,000 seeds.

CHAPTER XXIII.

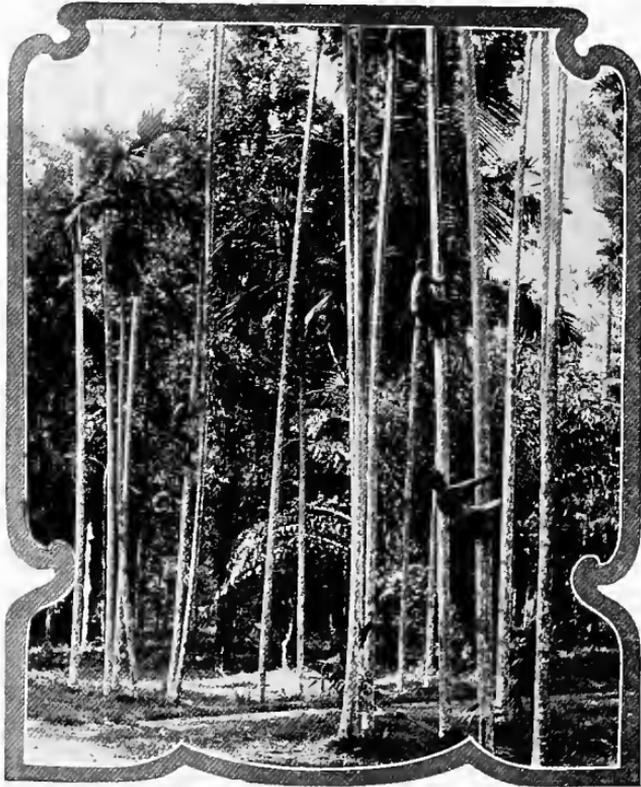
MINOR PRODUCTS OF CEYLON.

[S.=SINHALESE ; T.=TAMIL].

Annatto, or Arnatto. (*Bixa Orellana*. Bixaceae). A large, quick-growing shrub or small tree, native of Tropical America, thriving in Ceylon from sea-level to 2,000 feet in the moist region. It bears at the ends of the branches clusters of dark crimson capsular fruits (covered with fleshy spines), which contain a number of small seeds. The bright crimson covering of the latter affords the Annatto dye of commerce. The fruits are collected when nearly ripe, and as the shells dry they open and disperse the seed, which are then either made into a paste or dried with their covering. Formerly the paste was preferred by manufacturers, but the demand for this has now much declined in favour of the seed. The import of Annatto seed into England is said to be from 75 to 100 tons a year, and the price fluctuates from about $3\frac{1}{2}d.$ to $6d.$ per lb. according to quality and demand. Small plantations of Annatto have been made in Ceylon, chiefly in the Matale district, and the seed is exported (or sometimes used locally) for dyeing. The export of Annatto seed for 1909 is given as 263 cwt., valued at Rs. 4,598. The tree is readily propagated by seed, and a crop may be obtained from the third or fourth year. Two varieties of the tree occur in Ceylon, these differing chiefly in the shape and colour of the fruit, which in one case is oblong and pointed, and in the other rather circular.

Areca-nut, or Betel-nut; "Puwak," S.; Pâk-ku, T. (*Areca Catechu*). A palm 40 to 50 feet high, with a thin cylindrical straight stem, native of Malaya, but naturalised in Ceylon. It is extensively cultivated throughout Tropical Asia for its seeds, which are usually of the size and form of a hen's egg, orange-yellow when ripe. The nut or seed, enclosed in a fibrous husk, is commonly used throughout Ceylon, India, Malaya, &c., as a masticatory (being taken in thin slices, with a little lime, in the leaf of the Betel vine), for which large quantities are consumed. The seeds are also commonly used

for destroying worms in dogs, and in Europe in the preparation of dentifrices. In Ceylon the Arecanut palm thrives in the moist low-country up to 3,000 feet, and requires but little care in cultivation once it is well established. It takes six to seven years to come into bearing, and at maturity an average yield of 250 to 300 nuts per year may be obtained from each tree. The trees continue productive for thirty to forty years, but may live unproductive for



ARECA-NUT PALMS. *Arca Catechu*.

many years longer. At 5 by 5 feet apart, 1,742 may be planted to the acre, the crop from which, estimated at an average of 20 cents per tree, should be worth about Rs. 340. The area under Arecanuts in Ceylon is estimated to be equivalent to about 70,000 acres. The local consumption of the nut is very large, and a considerable quantity is exported, chiefly to South India. The quantity exported in 1909 is given as 149,647 cwt., valued at £158,565. Arecanuts are sold in London at 18s. to 22s. per cwt. Very large

quantities are produced in S. India, Sumatra, Malaya, &c. The Arecanut palm is frequently planted in Ceylon as boundary lines, for which it is well adapted.

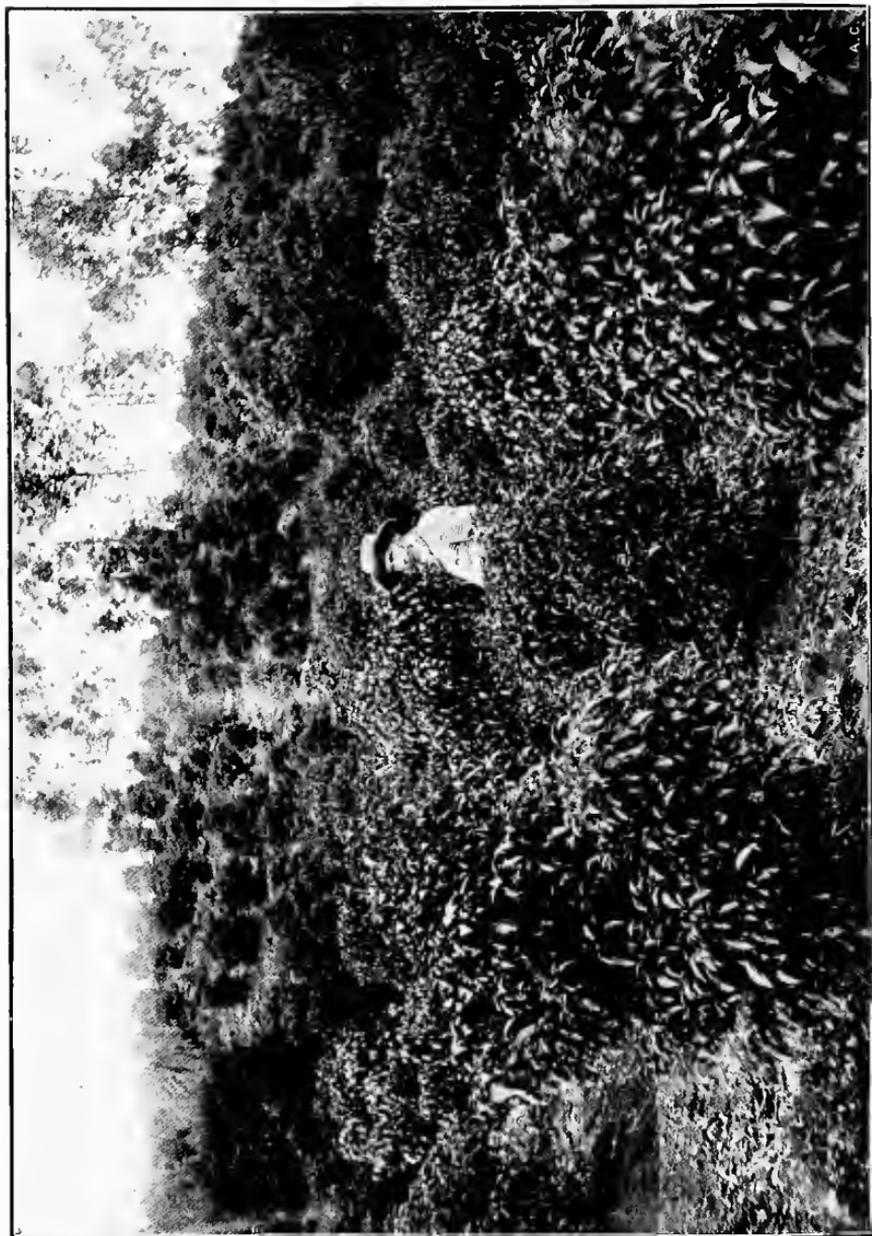
Betel-leaf; Bulath-vel, S.; Veth-thilé, T. (*Piper Betle*. Piperaceæ).—A perennial evergreen climber or creeper, with large heart-shaped leaves, native of Ceylon, India and Malaya, and cultivated throughout Tropical Asia for the sake of the leaves. The latter are universally used in the East for chewing, in a green state, in the masticatory commonly known as "betel," the other constituents of which are a dash of lime and a few scrapings of areca-nut (which see). The leaves have a sharp pungent taste, and when chewed are considered to have sustaining properties. Sir Emerson Tennent expressed the opinion that the habit of betel-chewing is "advantageous to a people of whose ordinary food flesh forms no part, and that it is at once the antacid, the tonic, and the carminative which they require." The plants require a rich humous moist soil and a partially shaded situation. They are readily propagated by cuttings, which are planted against poles, trellises or tree trunks, &c., for supports. In Bengal and Northern India the plant is cultivated in low sheds or "Betel houses."

Camphor; Kapuru-gas, S. (*Cinnamomum Camphora*. Lauraceæ).—A moderate sized much-branched tree, native of Formosa, China and Japan, yielding by distillation of the root, wood, leaves, &c., the camphor of commerce. Camphor is used largely in the manufacture of celluloid, smokeless gun-powder, and in the preparation of disinfectants and medicines. The world's supply at present (10,600,000 lbs. in 1908) comes from Formosa, China and Japan. In recent years Camphor cultivation has been introduced into South India, California, Hawaii and Ceylon. The tree has been established at Peradeniya since 1852. In 1893 experiments were begun at Hakgala Gardens, both in the cultivation of the product and in raising plants from seed, the latter imported from Japan, for distribution to planters. The tree, though naturally a sub-tropical one, has been found to grow well under varying conditions of climate, as at Galle, Anuradhapura, and Peradeniya; but the most uniform and vigorous growth occurs at the higher elevations, as at Hakgala. Some Camphor plantations have been successfully established in Ceylon in recent years at elevations of from 3,000 to 5,000 feet. Here also the tree is sometimes planted as a wind-belt, for which it is well adapted. About 1,000 acres were estimated to be under Camphor in Ceylon in 1908, the export for that year being nearly 15 cwt.,*

* The export for 1909 is given as 9 cwt., valued at Rs. 1,995.



BETEL CULTIVATION.



CAMPBOR CULTIVATION IN CEYLON, AT 4,500 FT. ELEVATION.

valued at Rs. 3,075. In cultivation the trees should be coppiced to a height of about 5 feet; therefore they may be planted at a distance of about 6 feet by 6 feet or 6 by 4 feet, giving from 1,210 to 1,815 trees per acre; in the third or fourth year they are fit for *clipping*, the shoots being cut with a hedge-shears. Clippings have been found to give (on distillation for three hours) a yield averaging about 1 per cent. of pure camphor, in addition to about 30 per cent. of camphor oil. The bushes may be clipped three or four times a year. Mr. W. Nock estimated that an average of 14 lbs. of clippings a year may be obtained from each tree, which should give about 170 lbs. of camphor per acre. In Formosa the annual yield is estimated at 120 lbs. per acre, while in Hawaii the estimated return is placed as high as 750 lbs. per acre. Left to itself, the tree grows to a height of 9 to 12 feet in five years, attaining in time a height of 30 to 40 feet. The tree is propagated by seed, which if fresh will give about 2,000 plants per lb.; the seedlings should be large enough in eight months for planting out. The late Mr. J. K. Nock succeeded in raising a number of plants from root-cuttings, branch-cuttings refusing to strike.

Synthetic Camphor.—A compound prepared from oil of turpentine, the introduction of which has resulted in the price of natural camphor falling from £20 to about £6, 7s. per cwt. during the last two years (1906 to 1908).

Borneo or Sumatra Camphor. (*Dryobalanops aromatica*. Diterocarpeæ).—A large tree, yielding a variety of camphor which is an important article of commerce in China and Japan, but is not imported into Europe. It is said to be preferred by the Chinese to the ordinary camphor.

Cassava. See *Tropical Vegetables and Food Products*.

Cinchona, Peruvian or Quinine Bark.—Quinine and the allied alkaloids *cinchonine*, *cinchonidine* and *quinidine*, consist of the active principle of the bark of several species of *Cinchona*, small upright trees, 25 to 40 feet high, all natives of the mountains of Bolivia, Peru and other parts of South America. The principal species affording the valuable bark are *Cinchona succirubra* (Red-bark), *C. officinalis* (Crown-bark), *C. Calisaya* (Yellow-bark), and *C. Ledgeriana* (Ledger's-bark), the last named being the richest of all in quinine. To these may be added several hybrids. The valuable curative effect of quinine in malarial fevers were first made known in 1638, when the drug was administered to the Countess of Cinchon, wife of the then Viceroy of Peru, after whom the plant was named. *Cinchona*

was introduced at Peradeniya in 1861, but not until about 1870 were the Ceylon planters induced to take up its cultivation, the Government establishing nurseries of Cinchona at Hakgala Gardens, and issuing plants free of charge. The area under Cinchona, however, rose from 500 acres in 1872 to 64,000 acres in 1883, the export of bark at its maximum (1887) being nearly 16,000,000 lbs. The result was great over-production, and consequently a fall in the price of the commercial drug from 15s. to 1s. 3d. per oz.—an immense boon to the public, though a disaster to many planters. At the present time (1909) the area in Ceylon under cinchona is only about the equivalent of 193 acres, the export of bark being for this year 156,081 lb. valued at Rs. 5,073. Cinchona cultivation is still carried on profitably in Java, now the chief producing country, and plantations at Mungpoo and elsewhere in India are worked by Government for the benefit of the local public.

The plant thrives best in a rich humous soil with a porous subsoil. A cool mountainous climate (4,000 to 6,000 ft.), with a moderate rainfall and shelter from strong winds, is essential. *C. succirubra* is, however, an exception, and thrives best between 2,000 and 4,000 ft. The plants may be propagated by cuttings, layering, or from seed, the latter method being usually adopted. The seed is very minute, and should be sown thinly in boxes or on raised nursery beds under cover, finely sifted soil being sprinkled over the surface and the whole carefully watered with a fine rose. In about three weeks the seedlings will be up, and when 2 inches high these should be transplanted to a well-prepared nursery plot so as to harden them off, the shade being reduced gradually. When 8 or 9 inches high, the plants may be planted out in their permanent places. The proper distances for planting varies according to the variety grown and locality. Close planting (4 ft. by 4 ft.) at first, and gradually thinning out later until only half the original trees are left is considered preferable to the wide planting formerly adopted, viz. 12 by 12 ft. The uprooted trees afford a return, the bark being stripped from their stem and roots. Root-bark is the most valuable.

To obtain the bark from the standing trees, four different methods are employed: (1) *lopping*, by which the branches are lopped, and the bark removed from these in longitudinal strips; (2) *coppicing*, the trees being cut down to the ground when about six years old and the stems barked; this induces the production of upright shoots, which in turn are cut down and barked; (3) *shaving* the stem by means of a spokeshave, care being taken

not to reach the cambium; only two sides of a tree are shaved at once; (4) *mossing*,—the bark of trees seven or eight years old being removed in alternate strips $1\frac{1}{2}$ inch wide, the stem is protected by a covering of moss tied on; in about two years the renewed bark, which is richer in quinine than the first bark, is ready for removal. The peeled bark is dried gradually in the sun, and exported in bales, the various forms being kept separate, as “root-bark,” “flat” and “quill-bark,” and “shavings.” 600 lb. of dry bark per acre a year, or 2 lb. per tree (seven years old), is considered a good average yield.

Coca, or Cocaine-plant. (*Erythroxylon Coca*. Linaceae).—A small shrub, 5 to 7 ft. high, native of Peru and Bolivia, and introduced into Ceylon in 1870. It is extensively cultivated in its native country, whence the dried leaves (from which cocaine is obtained) are exported to the extent of about 800 to 900 tons a year, chiefly to Germany and the United States. In the plant's native home the leaves are commonly used as a masticatory, being chewed with a little unslaked lime; the immediate effect is a gentle excitement, with sensations of high enjoyment, lessening the desire for food, and enabling the chewer to undergo an enormous amount of fatigue. The leaves are also infused as tea, the infusion being taken as a drink. The plant thrives best at elevations of 1,000 to 3,500 ft. in Ceylon, where small areas have been successfully established. The dried leaves are exported, and sold at prices varying from about 6*d.* to 1*s.* 3*d.* per lb. according to quality and demand.

The best conditions for cultivation are :—a rainfall not under 70 inches, good friable soil, preferably that of virgin forest, and land of a gentle slope. Good natural drainage is important, and shade is essential until the plants are well established, but not afterwards. The seed must be sown fresh, preferably under cover and in baskets. In South America they are thrown in a heap when fresh, and the heat thus set up induces germination. In other cases they are sown broadcast in rows, the ground being then covered with grass-litter or leaves, and the plants are finally planted out in rows about 3 by 3 ft. apart. The first picking of leaves may be made about eighteen months from the time of planting, or at $2\frac{1}{2}$ years from seed. Several pluckings are made in the year, the mature leaves only being taken. These are best dried gradually in the shade, so as to retain their green colour and flat form. Sun-dried leaves contain less cocaine. The dried leaves should be packed for export in zinc-lined air-tight cases,

as the slightest amount of moisture is injurious to them. The amount of Coca leaves exported from Ceylon in 1909 is given as 607 cwt., valued at Rs. 28,093.

VARIETIES.—Several more or less distinct varieties are recognised, three being grown in the Royal Botanic Gardens, Peradeniya ; of these, two are only slightly dissimilar, but the other is distinct by its more robust habit and its larger leaves, which are somewhat obovate. This latter is probably the variety known as “Nova-granatense” in S. America.

Coffee. Kopai, S. & T.—The coffee of commerce is furnished by *Coffea arabica*, known as “Arabian coffee,” and to a small extent by allied species or varieties (see below). *Coffea arabica* is a small slender tree, native of Tropical Africa, but introduced into all tropical countries and cultivated extensively in Brazil, West Indies, South and Central Africa, South India, Java, &c. The late Dr. Trimen had found that the Arabian Coffee was first introduced into Ceylon in 1690, by Arabian traders. Coffee cultivation in Ceylon on an important scale may be said to have first begun in 1825, when Gangarooka Estate (now Government Experiment Station) was opened as the first upland plantation. In 1869 a serious fungus disease (*Hemeleia vastatrix*), known as the “Coffee-leaf disease,” appeared, and spread with alarming rapidity until in a few years it devastated the whole industry, and ruined many planters. The export from Ceylon has descended from nearly one million cwt. in 1874 to only 1,040 cwt. in 1909.

Coffee requires a moderately humid atmosphere, and is partial to deep humous or loamy and well-drained soil. It is unsuitable for stiff clayey or poor sandy soils. The most suitable climate for the Arabian kind is between 2,000 to 4,500 ft. elevation, while the Liberian coffee is best suited to elevations below 2,000 ft. Propagation is by seed, sown in nursery beds or, preferably, in baskets or bamboo pots. The seed germinates in about six weeks, and the seedlings should be ready for planting out in about eight to ten months. In planting out in the field, the plants are set in lines, the distance apart being about 6 ft. each way for the Arabian kind, and 8 to 10 ft. for the Liberian. Temporary shade must be afforded until the plants are established, permanent shade being unnecessary except at low elevations. Manuring periodically is indispensable, and farmyard manure when obtainable is the best. Pruning is effected mainly to keep the trees in shape and to thin out superfluous or useless branches. The first crop is obtained when the plants are five years old. When in full bearing, an average of 1 lb. dried coffee per tree,

or 5 cwt. per acre, is considered a good yield, though under favourable conditions a much larger return is obtained. The berries are picked when they turn red, and a good worker can pick three bushels a day. A bushel of berries will yield about 10 lb. of dry coffee.

Pulping (i.e., removing the shell or pulp of the berries) is done by a pulping machine; or it may also be done by pounding the berries in a mortar. Each berry contains two seeds ("beans"), with their flat sides facing each other. The mucilaginous substance surrounding the seed is removed by fermentation or by soaking in water for about twenty-four hours. The "beans" are then dried in the sun, when they are known as *parchment* or *plantation coffee*. The parchment or thin shell of the seed is removed by "hulling" machines, or by pounding the seed in wooden mortars. A bushel of parchment coffee will only give about half that quantity of clean beans. The coffee is then put through a winnowing mill to separate the chaff or broken parchment, &c. Sometimes the berries are simply dried whole, the coffee being then known as *native* or *dry berry*. In this form the quality of the coffee is said to be superior, but the drying and subsequent processes are more troublesome.

OTHER KINDS OF COFFEE.

Liberian Coffee. (*Coffea liberica*).—A robust-growing species, native of West Tropical Africa, and introduced into Ceylon in 1870. The tree is distinguished by its considerable height (normally from 30 to 40 ft.), large and thick leaves, also comparatively large berries. It does not require permanent shade, bears fruit almost throughout the year, and the berries do not drop when ripe, as do those of the Arabian coffee. The aroma of the bean, however, is not highly appreciated, which results in a lower market price for the product. The vigorous constitution of the Liberian coffee renders it more resistant to the effects of the leaf-disease. Suited to low elevations only, i.e., up to 2,000 ft.

Congo Coffee. (*Coffea robusta*).—A native of the Congo, recently brought into cultivation. It is not unlike Liberian coffee, having large oval wavy leaves, and is said to give very satisfactory returns in Java for at least a few years. It has been introduced at Peradeniya Gardens in 1900, and thrives well here.

Sierra-Leone Upland Coffee. (*Coffea stenophylla*).—A slender-stemmed species, bearing a profusion of small berries which are black when ripe. This is said to be superior in flavour to all other coffees. The plant has been introduced in 1894 at Peradeniya, where it flourishes and bears fruit in abundance twice a year.

Hybrico Coffee.—A Brazilian variety whose fruits contain four or six instead of two seeds, the quality of which is well-spoken of.

Maragogipe Coffee.—Another kind from Brazil, with large leaves, similar to those of Liberian coffee. This has been established at Peradeniya since 1884, and although the tree flourishes here it is not a prolific bearer.

Hybrid Coffee.—The most important of hybrid coffees growing at Peradeniya is a cross between the Arabian and Liberian species. This obviously partakes of the character of both the parents, and bears an abundance of good-sized berries. The plant is a vigorous grower, and is to some extent resistant to the coffee-leaf disease.

Mocha Coffee.—Arabian-grown coffee is known by this name. It is a variety of *Coffea arabica*, with rather small berries.

Cotton. Pulun, S.—This consists of the delicate hair-like fibres which clothe the seeds of various species of *Gossypium*,—shrubby perennials, but cultivated as annuals. Cotton is the most important of all textile fibres, and has been used in India from time immemorial. The principal cotton-producing country is the United States, those countries coming next in importance being India, Egypt and Queensland. The Cotton plant requires a rich friable soil (black humous soil being considered the best), and a hot rather dry atmosphere. In the principal Cotton-growing districts of S. India the annual rainfall is only about 27 inches. Shade-trees must be avoided. The seed, which must be fresh, should be sown in rainy weather, and at such a time as will result in the crop being picked in the dry season. After the land is ploughed and harrowed, sow the seed in rows, 3 by 3 ft. or 3 by 4 ft. apart (4,800 and 3,600 plants respectively to the acre). It is usual to sow two seeds in each place, 4 inches apart; if both grow, the weaker seedling is afterwards pulled out. 2 lbs. seed is thus sufficient to sow one acre. If sown broadcast, 6 to 7 lbs. seed per acre is required. The crop is ready for picking in eight months from the time of sowing. When ripe, the pods burst, and the cotton bolls are then picked by hand. The cotton is afterwards thoroughly dried in the sun, being then separated from the seed by a ginning machine, after which it is made up into compressed bales for export. An average of thirty to forty pods per plant is considered a fair crop, though some plants may bear as many as 130 pods. Fifty pods yield 1 oz. clean cotton, and an acre may produce from 140 to 500 lbs. or more according to cultivation. The seeds also yield a revenue, these being largely used for cattle food as well as for the extraction of oil.

Cotton by itself has not as yet been found a very remunerative product in Ceylon, but as a catch-crop with rubber, &c., it may furnish a useful source of revenue.

VARIETIES.—*Sea Island* (*Gossypium barbadense*).—Considered the best, owing to the length (about 2 inches) and silkiness of the fibre. *Egyptian Cotton*.—A variety of *Sea Island Cotton*. *Upland* or *American* (*Gossypium hirsutum*).—This is generally considered the most valuable kind, and said to be in greatest demand in commerce. *Peruvian* (*G. barbadense* var.). *Indian* (*G. herbaceum* and *G. neglectum*). *Tree Cotton* (*G. arboreum*).—A small tree, attaining a height of 14 to 20 ft., considered a native of Africa. *Caravonica*.—A perennial, bushy hybrid-cotton, raised recently in Queensland.

Croton oil; "Jayapala," S.—This powerful purgative, used in medicine, is extracted from the seed of *Croton Tiglium* (Euphor-



TREE-COTTON (*Bombax malabaricum*), AS SHED FROM THE TREE.

biaceæ), a small tree or large shrub, native of India. The cultivation of the plant has been undertaken in Ceylon a few years ago, when the seeds were sold in London for 70s. to 80s. per cwt., but a large shipment speedily reduced the price, and the cultivation soon declined. The product is, however, still cultivated here to some extent, the export of the seed in 1909 being given as 633 cwt., valued at Rs. 15,374. The present price of the seed in Colombo is from Rs. 22 per cwt. upwards, according to quality.

Kola-nut, "Bissy" or "Gooroo nuts." (*Cola acuminata*. Sterculiaceæ). A small tree, 30 to 40 feet high, native of West Tropical Africa, cultivated for its large white or pink seeds, which are reddish brown when dried. It bears warty oblong pods, 4 to 6 inches long, which contain from four to ten or more seeds. The

latter are highly prized as a masticatory in Tropical Africa on account of their stimulating and sustaining properties, due to the presence of the alkaloid *caffeine* (also found in coffee), and to a small extent of *theobromine* (present also in Cacao). The dried nuts (seeds) are imported into Europe, &c., and used in medicine as well as for the manufacture of kola wine and other beverages. As a vegetable product, the Kola-nut ranks next in importance to the Oil-palm in West Tropical Africa. The tree has been introduced into Ceylon in 1879, and thrives in the moist low-country up to 1,500 feet; it is cultivated to a small extent as a minor product in conjunction with tea, the seeds being dried and exported. Kola-nuts occur under two different species, viz., *Cola acuminata* and *C. vera*. The seeds of the former possess four cotyledons, and those of the latter, the more valuable, only two.

The tree is propagated by seed, which must be sown perfectly fresh; it bears fruit when six or seven years old, producing two crops a year, equivalent of 500 to 800 pods or about 50 to 120 lbs. of kernels per tree. In cultivation, the trees should be planted 20 feet apart each way. The product is prepared for market by merely drying in the sun. In 1890 kola-nuts were worth 2s. 9d. per lb., while at the present time (1909) the London price is reported as varying from 2½d. to 5½d. per lb. according to quality. They are exported from the West Coast of Africa to some considerable extent. The amount exported from Ceylon in 1909 is given as 87 cwt., valued at Rs. 1,480. The Kola-nut tree has been introduced into various tropical countries, and is said to have become naturalised in the West Indies.

Nux-vomica. Goda-kadura, S., Kanchurai, T. (*Strychnos Nux-vomica*. Loganiaceæ).—A moderate-sized tree, native of Ceylon (forests of the dry region), India and Burma, producing flat circular poisonous seeds. The latter are collected from the wild trees, and exported, chiefly to America, for the purpose of extracting from them the alkaloid strychnine, valued in medicine as a tonic and stimulant. The amount of these seeds exported from Ceylon in 1909 (to England, Germany, and America) is given as 782 cwt. valued at Rs. 3,580.

Orchella-weed (*Rocella Montagnei*).—A pale greenish-grey lichen, with flaccid ribbon-like fronds, found growing in the hot dry districts of Ceylon, close to the coast, especially on sea-shore rocks. The plant is dried and exported for the purpose of manufacturing Litmus, Orchil, &c. The value of Orchella-weed exported from Ceylon in 1909, to Belgium only, is given as Rs. 50. The demand for this is limited, and the collection of the plant is not now a profitable industry.

Palmyra Palm; "Tal-gas," S., "Panna-maram," T. (*Borassus flabellifer*).—An erect dioecious palm, 60 to 70 feet high, with a stout trunk and fan-shaped leaves, indigenous to the dry region of Ceylon, India, and Africa. It is naturally suited to a rather dry climate, is extensively cultivated in India, Burma, Malaya and in the dry northern part of Ceylon, more especially for the sake of the fruit and leaves; these and other parts of the palm are put to numerous uses, like the Coconut-palm in the humid districts. The large black fruits are borne in a cluster at the base of the leaves; the nut contains a refreshing sap, much relished as a cooling drink; the kernels or young seeds are much used as an article of food, being sold in large quantities in the bazaars during the months of April and May; the sap obtained from the flower spathes is collected in large quantities and either fermented and made into "toddy" or "arrack" (an intoxicating drink), or boiled down for making sugar or jaggery. The leaf blades are used for making fans, baskets, buckets, ola, &c.; while the leaf-stalks and mid-ribs furnish an excellent brush-fibre, which forms an article of export. To obtain the latter the trees are stripped of all but three leaves once in two years. The trunk yields a hard and most durable timber, and the husks are in demand for fuel. The annual export of palmyrah fibre from Ceylon is valued at about Rs. 220,000, and of Palmyrah laths Rs. 57,600. Among palms in the East, the Palmyrah ranks next in importance to the Coconut, and the acreage under its cultivation in Ceylon is estimated at approximately 40,000 acres, while that in Tinnevely is said to be about 60,000 acres. It is propagated from seed, which is sown *in situ* in holes made in sandy soil. In about ten years from sowing, the palms should be in flower, when they may be used for drawing toddy and making sugar, the total outlay in ten years for bringing the trees into bearing being usually estimated at Rs 14 per acre. When grown for the fruit, an average return of about 3,500 nuts per acre may be obtained. At the end of eighty years the value of the stems (for timber) per acre is considered to be over Rs. 500.

Sappan-wood. Pattangi, S. (*Cassalpinia Sappan*. Leguminosæ).—A large straggling spiny shrub or small tree, native of India and Malaya, introduced and naturalised in the moist low-country of Ceylon. The heart-wood yields a red dye, and is exported to some extent from Ceylon, the amount exported in 1908 being given as 11,099 cwts. valued at £2,922, while that for 1909 has been only 4,698 cwt., valued at £889. Sappan-wood realises locally from Rs. 35 to Rs. 40 per ton.

Sugar-cane. Uk-gas, S., Karambu, T. (*Saccharum officinarum*, Gramineæ).—The sugar-cane, a large grass whose stout succulent stems afford cane sugar, is essentially a tropical plant and thrives best in a hot humid atmosphere at low elevations, on flat land. Any ordinary soil will suit the plant, provided it contains some lime and is sufficiently moist. Sugar-cane is an exhausting crop, and manuring is indispensable. The plant is readily propagated by cuttings of the stems, these being cut about one foot in length and planted out in furrows (usually 5 feet by 5 feet apart, more or less according to the soil and variety of cane), two cuttings being placed a few inches apart in each hole, in a slanting direction; they will sprout in ten to fourteen days, and it is customary to cut out the first sprout or "mother plant" so as to induce the plant to tiller. Weeding and forking up the soil are essential operations while the crop is growing. All dead leaves (trash) should be left on the ground in dry weather. Harvesting commences twelve to fourteen months from the time of planting, the canes being then ripe and ready for cutting. Good cultivation gives about 30 tons of canes per acre, yielding about 36 cwt. of marketable sugar. The yield, however, varies according to soil, cultivation, and variety of cane. Fawcett considers the average yield in Jamaica to be about 22 tons of canes per acre. After the first crop has been obtained, the plants left in the ground are known as ratoons, and these are called "first," "second," and "third" ratoons according to the number of crops obtained from them. The sweet saccharine juice is expressed from the canes by machinery, and after a process of fermentation, clarification, &c., commercial crystallised sugar is obtained. Raw or muscovado sugar is exported, and after undergoing refinement is made into loaf-sugar, &c. The residue of the cane left after the expression of the juice is called *megass*, which is used as a factory fuel.

Sugar cultivation has been tried on several occasions in Ceylon, but, commercially, has generally proved a failure, owing it is said to "too much water and too little saccharine matter in the juice" of the canes produced. A small area is, however, still cultivated by Mr. Bowman on Baddegama Estate, and sugar is regularly made from the produce. A considerable quantity of sugar-cane is grown for chewing purposes by the Natives, the estimated area thus given for the Galle district alone being about 800 acres. The plant thrives up to 3,000 feet in the moist region. The principal countries producing cane-sugar are the West Indies, Tropical America, Mauritius, Java, and Queensland.

Vanilla. See *Tropical Spices*.

CHAPTER XXIV.

MISCELLANEOUS ECONOMIC PRODUCTS.

EDIBLE PRODUCTS :—

Arabian Tea. “Khat,” “Cat,” or “Cafta” (*Catha edulis*, Celastraceæ).—A small shrub of Arabia and East Tropical Africa, introduced at Peradeniya in 1882, where it flourishes in ordinary soil, without shade. The leaves and young twigs form a considerable article of commerce among the Arabs, who chew them, both in the green and dry state, as a stimulant and to promote wakefulness. A decoction resembling tea is made from the leaves, although these are considered by Europeans to contain no trace of caffeine.

Ayapana Tea. (*Eupatorium Ayapana*, Compositæ).—A small bushy herbaceous plant, 3 to 4 ft. high, with small narrow leaves, native of Brazil. It is said to be cultivated in Mauritius and Reunion for the sake of the medicinal properties of the leaves, from which a decoction like tea is made. The plant is also grown in India, where its value is sometimes similarly esteemed. It is easily propagated by cuttings or division, and thrives on ordinary soil, in partial shade, up to 2,000 ft.

Maté, Yerba de Maté, or Paraguay Tea. (*Ilex paraguayensis*, Ilicineæ).—A small bushy tree with leaves similar to those of the Tea plant. It is a native of South America, where it is largely cultivated, the leaves being used as tea. In Brazil the dried leaf forms an important article of local commerce, being exported in considerable quantities to neighbouring countries. To prepare the tea for market, the leaves and twigs are simply gathered and dried in the sun and open air, after which they are separated, the leaves being broken or coarsely ground. Maté is one of the most important economic products of South America. An infusion from the leaves, which is usually drunk from the spout of a tea-pot, or through a tube with a net-work at the bottom, is the favourite drink of a large proportion of the population of Brazil, Paraguay, Uruguay, and the Argentine Republic, &c. The leaves contain about 0·13 per cent of caffeine, and are occasionally imported into Europe. The

plant has been introduced in 1897 at Peradeniya, where it flourishes but has not as yet produced seed. It appears to be of a constitution that will thrive at different elevations with sufficient moisture, up to at least 3,000 feet.



AYAPANA TEA. *Eupatorium Ayapana*.

Sago Palm.—The sago of commerce is obtained chiefly from the stems of *Metroxylon Sagu*, a pinnate-leaved palm, 30 to 40 ft. high, with a short cylindrical trunk. The palm is a native of Malaya, where it is commonly cultivated for the sake of

the sago. It is found chiefly in damp flat situations, and thrives best in cultivation when these conditions are imitated. The life of the palm extends to fifteen or twenty years, the tree flowering at that age and then dying. The seeds, which are seldom fertile, are said to occupy two or three years in ripening. The tree, however, reproduces itself freely by suckers thrown up near the base. To obtain the sago, the tree is felled when it commences to flower, the farinaceous matter in the stem being then developed; the trunk is cut into pieces of 3 or 4 ft. long, and these are split in two. The farinaceous substance is then extracted and reduced to a powder, which is mixed with water and strained through a sieve. The water being allowed to stand, the starch settles in the bottom, when the water is poured off, and the starch thoroughly washed and afterwards dried. This forms *sago meal*, which is made into *granulated sago* by mixing with water into a paste, and then rubbing it through sieves to cause the granulation, after which it is dried in ovens or in the sun. The process of obtaining and preparing the sago varies, however, to some extent in different localities. England alone imports sago (chiefly from Singapore and Sumatra) to the extent of about 4,000 tons annually. The Sago palm has been introduced in 1880 at Peradeniya, where it flourishes, being grown in a moist situation with loose deep soil. Here it flowers freely and sets fruit, but no fertile seeds have as yet been produced.

Sugar Palm of Java. Gomuti-palm. (*Arenga saccharifera*).—A large erect palm, with a stout trunk and very large stiffish pinnate leaves, native of Malaya. It is cultivated in Java for the production of sugar, which is obtained by evaporation of the sap, obtained from incisions made in the young inflorescence, similar to the manner in which jaggery is produced from the Coconut and Kitul palms in Ceylon. The palm flourishes at Peradeniya and Heneratgoda Gardens. In Java it is said to thrive best at an altitude of about 1,000 ft. A sugar yield cannot be obtained until the tree has reached at least its twelfth year, but the period of sugar production extends to four or five years, *i.e.*, the period of flowering, the tree then dying. A single tree is considered to yield in this time "as much as 450 lbs. of sugar. Thus an acre bearing 100 trees, would yield about 20 tons, which works out at rather more than one ton of sugar per acre per annum." Catch-crops may be grown beneath the palms for at least the first few years. Like many other palms, the heart of the stem contains a large quantity of excellent sago, hence it is sometimes known as the "sago-palm."

Sugar Palm of India, or Wild Date (*Phoenix sylvestris*).—A tall palm with stiff feathery leaves, allied to the Date-palm, native of India, where it is somewhat extensively cultivated for the production of sugar or jaggery. It is estimated that in the Madras Presidency alone there are 22,000 acres under the cultivation of this palm. The method of obtaining the sugar is by tapping the flower-stalk, from which the juice afterwards exudes in large quantities; after collecting the juice, the latter is allowed to evaporate



CUBEBS. *Piper Cubeba*.

in order to produce the sugar. Jaggery or palm-sugar is extracted in large quantities in Ceylon from the "Kitul" (*Caryota urens*) and the Coconut palm, the method of obtaining it being the same as that adopted for the above. In 1890, jaggery was exported from Ceylon to the extent of 6,428 cwts., valued at £2,259; but the figures have declined to 1,207 cwts. and £380 respectively in 1908.

DRUGS.

[See also Plants used in Native Medicine in Ceylon].

[S.=SINHALESE; N. O.=NATURAL ORDER].

Cassia Fistula. "Ehela," S. (Leguminosae).—A large tree, indigenous to the dry region of Ceylon, also to India and Malaya. The long cylindrical pods ($\frac{1}{2}$ to 3 ft. long) are valued in medicine, and are exported from India and the West Indies, being sold in London at about 18s. to 22s. per cwt. The bark of the tree is esteemed in native medicine in Ceylon.

Cinchona.—See *Minor Products of Ceylon*.

Cubeb. (*Piper Cubeba*).—The Cubeb of commerce, which are of importance chiefly in medicine, are the berries of a species of pepper-vine, easily distinguished from the ordinary Pepper by the stalked and larger berries or "corms." The plant is a native of Java, Sumatra, &c., and thrives under similar conditions as Pepper, requiring live or artificial supports and a certain amount of shade. The world's supply of Cubeb is obtained chiefly from Java, where the plant is cultivated. Cubeb thrive at Peradeniya, where they are grown on *Erythrina* trees, and bear fruit freely. The plants are best propagated by cuttings taken from among the top or fruitful shoots, such plants being more productive than those taken from near the base.

Ginseng.—This is the Chinese name for the root of *Panax (Aralia) quinquefolia* (N.O. Araliaceæ), a small plant with palmate leaves, native of North China. Ginseng cultivation is a Government monopoly in Corea, and the dried root forms the principal article of export from that country to China. During 1905, China received from Corea 107,480 lbs. of "Red Ginseng" of the value of £112,350. This variety of Ginseng ranks in quality next to Manchurian or "Imperial," and is prepared for export by steaming the roots for about four hours in wicker baskets placed over boiling water. So highly valued is Ginseng as a tonic and stimulant medicine in China that "it is sold at from 20 to 250 times its weight in silver, sometimes for 500 times this amount." From a supposed resemblance of the root to the human form, Chinese physicians ascribe miraculous powers to it, believing that it wards off all diseases and restores exhausted animal powers, even making old people young. The root is slightly bitter and aromatic, but is not regarded by European medical men as having any medicinal value. A variety of Ginseng is also furnished by a similar species found in North America. This is

cultivated to some extent in the United States, where the roots are sold at from two to four dollars per pound for exportation to China as a substitute for the Eastern product. This variety is ranked by the Chinese as fourth in quality, next to this being Japanese Ginseng, which is the least esteemed. The plant thrives best in a rich loamy loose soil, and requires light shade as well as a moderate amount of moisture.

Ipecacuanha. (*Psychotria (Cephalis) Ipecacuanha*. Rubiaceæ).—A small bushy plant with semi-creeping stems, native of the dense humid forests of Brazil. From its peculiar annulated roots an extract is obtained which is used in medicine as a well-known emetic, also as a specific for dysentery. The supply of the root comes from Brazil, and this is frequently adulterated with roots of a similar appearance. Ipecacuanha is imported into England to the extent of about 50,000 lbs. a year, and commands a price of 4s. to 5s. per lb. The plant responds to cultivation under conditions similar to those of its native habitat. A loose humous soil suits it best. As the roots penetrate the ground deeply, the soil should be trenched to a depth of about $2\frac{1}{2}$ ft. Lawson, the late Government Botanist, Madras, found that "a healthy plant will yield ten to twelve good roots of the necessary quality, these when dried weighing from 3 to 4 ounces." Proudlock estimated from experiments made at Octacamund, in a hot-house, that $2\frac{1}{2}$ oz. of the dried root could be obtained per square yard, or 625 lbs. per acre, allowing the plants to be planted in raised beds. The Ipecacuanha plant has been introduced into Ceylon in 1866, and thrives both in Peradeniya and Heneratgoda Gardens, more especially at the latter, under the shade of trees and in well drained humous soil. The plant is said to be grown successfully in parts of the Straits Settlements, whence the dried roots are sometimes exported to some small extent.

Menthol, or "Peppermint Camphor." (*Mentha piperita*. Labiatae).—A dwarf creeping herb with a very strong odour of peppermint, which it readily imparts as the hand is drawn over the leaves. A volatile oil obtained from the plant is well-known in medicine as an antiseptic, stimulant, and carminative; this also yields the crystalline camphor-like substance known as "menthol," commonly used for neuralgia, &c. Menthol and menthol-oil are exported from Japan, the former being worth from 16s. 6d. to 17s. 6d. per pound. The plant thrives at Hakgala Gardens, forming a dense carpet on the surface of a raised bed of rich soil.

Sarsaparilla.—A drug used for rheumatism, gout, &c., and obtained from the roots of various species of *Smilax* (N.O. Liliaceæ).

The latter is a climbing genus of plants, characterised by more or less thorny stems and large leaves, found in a wild state in the West Indies, Central America, Mexico, &c. Jamaica Sarsaparilla is obtained from *Smilax officinalis*, while other different species of *Smilax* furnish the Brazilian and Mexican Sarsaparillas. *S. officinalis* thrives at Peradeniya, where it has been introduced in 1880. Several species of *Smilax* are indigenous to the moist region of Ceylon up to about 4,000 ft. The collection of Sarsaparilla is effected by scraping away the earth covering the roots, which run horizontally under the ground; when laid bare, they are cut off near the crown, a few slender roots being allowed to remain to assist the plant in renewing its growth. The collected roots are then dried and packed in bundles for exportation. The present price of Sarsaparilla in London is from 1s. to 1s. 3d. per lb.

Indian Sarsaparilla; "Iramusu," *S. (Hemidesmus indicus. Asclepiadæ)*.—A small slender twining plant, found wild in the moist low-country of Ceylon, also in India. The roots are much used as a tonic medicine, being included in the British and Indian Official Pharmacopœias.

Senna Leaves.—The dried leaves of several species of *Cassia*, imported into Europe, &c., for use in medicine, being well-known for their laxative properties. Tinnivelly Senna, the best known in commerce, is furnished by *Cassia angustifolia*, a small shrub, native of Arabia and East Africa, and largely cultivated in parts of South India. "Alexandrian" or "Nubian Senna" is obtained from *Cassia acutifolia*, a shrub about 2 ft. high, considered to afford the best quality. Jamaica, Italian, or Tripoli Senna is obtained from *Cassia obovata*, a shrubby plant of Egypt, now naturalised in Jamaica. Senna leaves fetch at present from 4d to 6d per lb. in London.

OILS.

Castor-oil; Endaru-tel, S.—This is obtained from the seed of *Ricinus communis* (Euphorbiacæ), a tall, quick-growing annual with large palmate leaves. Besides its use in medicine, castor-oil is largely employed for lubricating purposes, also in soap manufacture, &c. Important bi-products are obtained after the expression of the oil from the seed, viz. *castor poonac*, used as cattle-food, and *castor cake*, a valuable manure. The Castor-oil plant has become naturalised in Ceylon, and often occurs as a weed in cultivated ground in the moist low-country up to about 3,000 ft. It is cultivated commercially in India, Southern Europe, United States, &c. The

plant thrives in ordinary soil, but does best in open friable, humous or alluvial soil. About 10 lb. of seed is sufficient to sow an acre ; the seed should be set in rows 5 by 6 ft. apart, two to three seeds being sown in the same place a few inches apart, and the seedlings afterwards thinned out to one in each hole. The plants begin to bear in about four months from the time of sowing, and the harvest should be completed two months later. Under favourable conditions the yield should be from 20 to 40 bushels of seed per acre. In the Southern United States the yield is said to be about the same as that of wheat, varying, like it, with the fertility of the soil. Good seed for oil production is usually worth about 5s. per bushel in Europe. Enormous quantities of Castor seed and poonac are imported annually into India, Ceylon, Malaya, &c.

Gingelly-oil ; Sesame ; "Til or Benni ;" "Tel-tala," S. (*Sesamum indicum*. Pedaliaceae).—An annual plant, 2 to 3 ft. high, native of Ceylon, S. India and Tropical Africa, extensively grown in India on account of the small seeds, which are rich in oil. Gingelly-oil, obtained from the seed by expression, resembles almond-oil, and is used to adulterate the latter. It is a good table oil, and is used throughout India and Ceylon in cooking and medicine ; in England it is used chiefly in soap-making, but also for mixing with olive-oil. In France it is said to be commonly used for salads. The plant may be grown as a summer crop in a sub-tropical climate, as Italy and the Southern United States. The seed is sown broad-cast after the land is ploughed, and the crop is ripe in three or four months' time. The plants being cut, they are tied in bundles to dry, and the pods upon drying burst and disperse the seeds. About 20 bushels of seed may be obtained from an acre, which will yield about .63 gallons of oil. The residue, known as "gingelly poonac," forms an excellent food for cattle. It is reported that in the Madras Presidency about a million acres is usually cultivated with Gingelly. The plant is also occasionally cultivated in Ceylon, more especially in the Northern Province. Very large quantities of the oil and seed are imported into Ceylon from India.

Oil Palm, African.* (*Elaeis guineensis*).—This important palm is a native of West Tropical Africa, where it forms one of the principal commercial products of the country. The fruit supplies the Natives with a favourite article of food, from the stem they extract an intoxicating drink, while with the leaf-stalks and leaves they build and thatch their houses. The fruit kernels, which are

* See *Kew Bulletin*, 1892.

of the size of almonds, yield a valuable commercial oil, and are largely exported on this account. The present annual exports of oil and kernels from the Gold Coast are valued at about £200,000. The Oil-palm has a tall straight trunk, 40 to 50 ft. high, with a crown of large handsome pinnate leaves. It occurs naturally over enormous areas in its native home, being also commonly cultivated, more especially in Southern Nigeria. It has been successfully introduced into various other parts of the tropics, its introduction into Peradeniya Gardens dating from 1850. Here it grows luxuriantly and bears fruit annually. It thrives best in a rather moist stiff soil, flourishing especially in hot damp valleys. In its native country it begins to bear fruit in its fourth or fifth year, the produce increasing until its fifteenth year, and continues to bear for at least sixty years. A tree is said to produce, on the average, from four to seven bunches of fruit every year. The fruits have a fleshy fibrous outer layer, from which the ordinary palm-oil of commerce is obtained. Distinct from this is the white oil, known as "*nut-oil*," produced by the kernel of the fruit. The former is used chiefly in the manufacture of soap and candles, while the kernel oil is used in making margarine or artificial butter. The Natives extract the oil by boiling the fruits in earthenware pots. The kernel oil is expressed in Europe by hydraulic presses, the resulting cake affording a valuable cattle food. A single tree may yield from 1 to 3 gallons of oil per annum, the quantity varying according to rainfall and the character of the soil. The price of palm-oil on the London market is about £14 to £15 per ton.

Sunflower Oil. (*Helianthus annuus*. Compositae).—Sunflower-oil is an important article of commerce, and is obtained from the seed of the familiar annual plant of the same name, while the seed is also a nutritious food for cattle and poultry. The plant is originally a native of Peru, grows 5 to 6 ft. or more in height, and thrives in ordinary soil in any warm climate with sufficient moisture. In Ceylon it flourishes at all elevations, more especially from 3,000 to 5,000 ft. It is extensively cultivated in Russia for its edible seed as well as for its oil. The seed may be sown in rows $2\frac{1}{2}$ ft. apart, and about 1 ft. apart in the rows. About 6 lbs. of seed is thus required to sow an acre; a crop is obtained in four months from date of sowing, and a yield of 50 to 60 bushels of seed per acre is considered a good return. The soil between the rows should be forked up or tilled occasionally in the early stages of the crop. The method of harvesting is similar to that of maize, the heads being gathered and dried, then thrashed or rubbed out by hand over a rough grating.

The seed is said to be usually worth about £17 per ton for the purpose of extracting the oil. A bushel of seed on an average is estimated to yield a gallon of oil.

OTHER IMPORTANT OIL-YIELDING PLANTS OF THE TROPICS.

[See also *Standard and Minor Products of Ceylon*].

Those marked * are indigenous or common in Ceylon.

[S.=SINHALESE].

Botanical & Common Name.	Natural Order & descriptive notes.	Parts from which extracted.	Principal uses.
* <i>Aleurites triloba</i> . Candle-nut oil	<i>Euphorbiaceae</i> . A tall tree	Fruit kernels	Lighting.
* <i>Amoora Rohituka</i> . "Hingul," S.	<i>Meliaceae</i> . A moderate-sized tree	Seed	"
* <i>Anacardium occidentale</i> . Cashew-nut oil	<i>Anacardiaceae</i> . A spreading tree	Fruit	Antiseptic.
* <i>Andropogon citratus</i> . Lemon-grass oil	A perennial grass	Leaves	Medicine and perfumery.
* <i>A.—nardus</i> var. <i>Citronella</i> ; Citronella oil ; "Pangiri," S.	"	"	Medicine, soap-making, &c.
<i>A.—muricatus</i> . "Cus-cus" grass. Vetiver-oil	"	Leaves and roots	Perfumery.
<i>A.—Schoenanthus</i> . Geranium-, Rusa-, or Palmarosa-oil. Ginger-grass	"	Leaves	Perfumery, &c.
<i>Arachis hypogæa</i> . Groundnut-oil	<i>Leguminosae</i> . A low annual	Seed	Culinary and soap-making.
<i>Argania sideroxylo</i> n. Argan-oil	<i>Sapotaceae</i> . A medium-sized tree	"	Culinary.
* <i>Azadirachta indica</i> . Margosa-oil ; "Kohamba-tel," S.	<i>Meliaceae</i> . A small tree	"	Medicine and lighting.
* <i>Bassia latifolia</i> . Mahwa-oil	<i>Sapotaceae</i> . A large tree	"	Lighting, culinary, &c.
<i>B.—longifolia</i> . "Mee-tel," S.	"	"	"
* <i>Brassica juncea</i> . Mustard-oil	<i>Cruciferae</i> . Small annual	"	Culinary, medicine, &c.
* <i>Cinnamomum zeylanicum</i> . Cinnamon-oil	<i>Lauraceae</i> . A large tree	Bark & roots	Medicine, antiseptic.
* <i>Cocos nucifera</i> . Coconut-oil	See "Standard Products of Ceylon"	Nut	Lighting, lubricating, medicine.
* <i>Calophyllum Inophyllum</i> . "Doma-tel," S.	<i>Guttiferae</i> . Medium-sized tree	Seed	Medicine and lighting.
* <i>Dipterocarpus glandulosus</i> . "Dorana-tel," S.	<i>Dipterocarpaceae</i> . Tall erect tree	Resin exuded from stem	Medicine.
* <i>Eucalyptus globulus</i> . Blue-gum ; <i>Eucalyptus</i> -oil	<i>Myrtaceae</i> . A tall tree	Leaves	Medicine, antiseptic.
<i>Eugenia caryophyllata</i> . Clove-oil	<i>Myrtaceae</i> . A small erect tree	Cloves	" "
* <i>Garcinia echinocarpa</i> , "Madol-tel," S.	<i>Guttiferae</i> . Small tree	Seed	Medicine.

Botanical & Common Name.	Natural Order & descriptive notes.	Parts from which extracted.	Principal uses.
* <i>Gossypium vitifolium</i> , and other spp. Cotton-oil	See under "Fibres"	Seed	Culinary.
<i>Guizotia abyssinica</i> . Rantil, or Niger-oil	<i>Compositac.</i> An annual	"	Culinary, medicine, &c.
<i>Gynocardia odorata</i> . Chaulmugra-oil	<i>Bixaccac.</i> A large tree	Bark & seed	Medicine.
* <i>Isonandra grandis</i> . "Mihiria-tel," S.	<i>Sapotaccac.</i> A medium-sized tree	Seed	Culinary, lighting & medicine.
* <i>Kokoona zeylanica</i> . Kokuna-oil	<i>Celastraccac.</i> A very large tree	"	Lighting and medicine.
<i>Melaleuca leucadendron</i> . Cajuput-oil	<i>Myrtaccac.</i> Tall tree	Leaves and branches	Medicine, antiseptic.
<i>Melia azedarach</i> . Indian lilac. Neem-oil	<i>Meliaccac.</i> Small tree	Seeds	" "
<i>Pogostemon Patchouli</i> . Patchouly-oil	<i>Labiataec.</i> A perennial herb	Foliage	Perfumery and soap-making.
<i>Quillaja saponaria</i> . Soapbark-oil	<i>Sapinduccac.</i> A small tree	Bark	Medicine and domestic uses.
<i>Santalum album</i> . Sandalwood-oil	<i>Santalaccac.</i> A small tree	Wood	Perfumery, antiseptic.
<i>Sapindus saponaria</i> . Soapberry-oil	<i>Sapinduccac.</i> A small tree	Covering of seed	Saponaceous.
* <i>Schleichera trijuga</i> . Ceylon-oak ; "Kon-tel," S. Macassar-oil	} <i>Sapinduccac.</i> A large tree	Seeds	Medicine.

FIBRES.

Bowstring Hemp; Niyanda, S. (*Sansevieria zeylanica*. Hæmadoraceæ).—A herbaceous stemless plant, with succulent, rigid, somewhat cylindrical furrowed leaves, blotched with grey and attaining a height of 2½ to 3 feet. From these a fine white, tough and elastic fibre is obtained, which is used by the Natives for weaving into fine mats, also for bow-strings and twine. The plant is indigenous to Ceylon, India, &c., being found in rocky or sandy places, chiefly in rather dry regions. It thrives, however, in a moist climate up to 2,500 feet or more. The plant is readily propagated by seed, division, or leaf-cuttings, the latter means being the more preferable. It may be planted in rows about 2 feet apart each way, or about 10,500 plants to the acre, and the return of fibre is estimated at 1½ tons per acre per annum, the fibre being usually worth in London about £30 per ton.

Jute, or Gunny-fibre.—This valuable fibre is obtained from the stems of *Corchorus capsularis* and *C. olitorius* (Tiliacæ), annual plants with long thin stems and yellow flowers, attaining a height of 8 to 12 feet, native of Ceylon, India and Malaya. The cultivation and manufacture of Jute forms a large industry in Bengal, where about two million acres are yearly under this product. The fibre is separated by steeping the stems in water, and is extensively used

for making cordage, coarse cloth, fishing nets, gunny bags, &c. A hot damp atmosphere suits the plant best. The crop is raised either from seed sown broadcast in the field, or from plants raised in nurseries and transplanted in rows. Harvesting takes place three months later, when the plants commence to flower. The Jute plants are indigenous to Ceylon, occurring at low elevations, but are not cultivated here.

Manila Hemp, or Abaca. (*Musa textilis*. Scitamineae).—A large herbaceous plant of the Banana family, native of the Philippines, where it is extensively cultivated for its excellent and well-known fibre. The plant requires a hot and humid climate, with a heavy and evenly distributed rainfall, and its habit of growth and treatment under cultivation are similar to those of the Plantain or Banana. Hemp plantations in the Philippines are confined chiefly to areas where, in addition to the conditions mentioned, there is rich volcanic soil, as in the eastern side of the Islands. Propagation is entirely by suckers, which are planted when about 3 feet high, at distances of 8 or 9 feet apart. These produce numerous stems (suckers), forming a clump. The first crop is obtained two years from planting, and a full crop in the fourth year, the plantation continuing to yield for fifteen or twenty years. The soft watery stems (formed by the leaf bases) are cut down just before they begin to flower (*i.e.*, when they are best for fibre), about a foot from the ground, being then stripped into ribbons. To obtain the fibre, these latter are drawn repeatedly by hand between a blunt knife and a hard smooth board, the fibre being then dried in the sun. The inner portion of the stem yields the finest quality of fibre. The usual return is said to be from 500 to 700 lbs. of dry fibre per acre from the fourth year, or roughly 1 lb. per tree. The price of the fibre fluctuates somewhat from £25 to £35 per ton in London.

Mauritius Hemp, or Green Aloe (*Fourcraea gigantea*. Amaryllideae).—A large succulent stemless perennial, native of Tropical America, bearing succulent leaves 5 to 8 feet long. It has been introduced into Ceylon before 1824, and has become naturalised along the railway line up-country, where it was first planted to form a boundary. It has become equally common in parts of India, where, however, as in Ceylon, no commercial use is made of the fibre. The yield of the latter is said to be only about $1\frac{1}{2}$ to 2 lb. per 100 leaves, as compared with 5 to 6 lb. for Sisal Hemp. The plant is similar in appearance, as well as in cultural requirements, to the Sisal Hemp, but is distinguished from it by the leaves being spiny along the margins towards the base.

New Zealand Flax. (*Phormium tenax*. Liliaceæ).—A handsome perennial shrubby plant of New Zealand, often grown for ornament, having long sword-shaped variegated leaves, which are either green, or margined and streaked with white. These measure from 5 to 7 feet in length, and give upwards of 15 % of their green weight in cleaned fibre ; the latter is of a silky lustre, nearly white in colour, “with a breaking strain higher than that of hemp or flax.” It is estimated that an annual yield of 12 to 15 tons of green leaves per acre may be obtained, furnishing from 2 to 2½ tons of clean fibre, which is worth from £20 to £25 per ton. The plant grows freely at Hakala Gardens and neighbourhood, and is readily propagated by division.

Sisal Hemp. (*Agave rigida*, var. *Sisalana*. Amaryllideæ).—A perennial stemless plant of the Amaryllis order, native of Mexico and introduced into Ceylon in 1890. The plant furnishes a valuable fibre, known as Sisal-hemp, from its leaves, and is extensively cultivated in parts of South America, Hawaii, German East Africa, &c. It bears long, thick succulent leaves 4 to 6 ft. long, usually smooth-edged and with a terminal spine. The plant flowers about the seventh or eighth year, and in order to preserve the quality of the fibre the pole or flowering scape should be cut at 4 ft. from the ground, all suckers being also removed. Each pole if allowed to grow will bear from 2,000 to 3,000 bulbils. The plant is suited to a dry or wet climate, and is considered to thrive best on a limestone formation. It flourishes, however, on almost any soil that is well drained, as may be seen from its progress in Peradeniya Gardens. Propagation is by bulbils (produced by the flowering *pole*) or suckers, and on average soils the plants may be planted out at 8 by 8 ft. apart, or 680 plants to the acre. The first cutting of leaves takes place in the third or fourth year from planting, and under good cultivation this will average twenty-five mature leaves per plant. Subsequent cuttings may be made at intervals of about six months, until an average of about 260 leaves in all have been obtained from each plant ; this will occupy a period of about eight years from the time of planting, and should afford a total crop of 10 lb. 6 oz. of fibre per plant, or 7,055 lbs. per acre.* The return, however, is variously estimated. Sir Daniel Morris' estimate is 60 lbs. of fibre from 1,000 leaves, 33 leaves per plant, 650 plants to the acre ; total yield, 1,200 lbs. fibre per acre per annum. The price of the fibre fluctuates from £25 to £35 per ton.

* “Cultivation of Sisal in Hawaii,” by Frank E. Couter.

Panama-hat Plant, or Toquilla Palm. (*Carludovica palmata*. Cyclanthaceae).—A stemless plant with large palmate leaves, similar to those of a fan-palm, with stalks 5 to 6 ft. long. The flowers, followed by the seed, are produced in cones borne on stalks 1 ft. to 1½ ft. high. It is a native of Tropical America, and is extensively cultivated in parts of Ecuador, Colombia, &c., for the sake of the leaves from which the well-known Panama hats are made. The plant is fully developed at about two to three years old, and is said to live from forty to fifty years. The young leaves are taken every month just as they begin to unfold, the stalk being cut some distance below the leaf to facilitate handling. Each leaf is torn into plaits about ½ inch wide (the outer plaits being rejected), and finally into shreds by means of an instrument consisting of a piece of wood in which needles are properly arranged. These shreds, constituting the "straw," are then submerged in boiling water for some time, being afterwards dried, first in the shade and subsequently in the sun. At the present time the "straw" (prepared leaves) sells in its native country at from ½ to ⅔ of a dollar per lb., the price having advanced considerably in the last five or six years owing to the increased popularity of Panama hats in Europe. Some of the higher grade hats, being valued for fineness of fibre and excellent workmanship, command a price of 100 to 125 dollars (£20 to £26). The *Carludovica* plant has been introduced into Peradeniya Gardens in 1866. It grows luxuriantly in a moderate moist, loose loamy or humous soil, and prefers light shade, but the latter is not essential. A hot humid climate is indispensable.

Jippi-jappa Hats, which are similar to the Panama article, are made from the leaves of *Carludovica Jamaicensis*, a plant which closely resembles the Tropical American species.

Ramie, Rhea-fibre, or China Grass. (*Bahmeria nivea*. Urticaceae).—A perennial shrub of the Nettle family, 5 to 6 ft. high, with large heart-shaped leaves which are greyish white beneath, native of tropical and sub-tropical Asia. From the inner bark of the stems is obtained the Rhea fibre of commerce, one of the most valuable of all textile fibres; it is pure white, of a silky lustre, and is used in the manufacture of fine linen, incandescent gas mantles, &c. The plant is easily grown, thrives best in a loamy, alluvial or humous soil up to 2,000 or 3,000 ft., and requires either a moist climate or irrigated land. No shade is necessary once the plants are established. These are readily propagated by division of the root-stock or by cuttings; they may also be raised from seed, which is very small.

The soil being dug or ploughed to a depth of 7 or 8 inches, the plants may be planted 2 by 4 ft. apart, in rows. A small crop of stems may be obtained in eight to ten months from the time of planting, and afterwards three or four crops a year. The production of straight clean unbranching stems is essential, as these furnish the best fibre. 15 to 20 tons of stems is an estimated annual yield per acre, 1 ton of stems yielding about 150 lbs. of fibre, which is valued at £25 to £30 per ton in Europe, according to quality. The difficulty of obtaining suitable machinery for degumming and decorticating the fibre has long been an obstacle to its cultivation, but this is said to have been now overcome. It is stated that a field will not require replanting for five to six years, the plants being kept within limits by chopping the sides of the rows occasionally. The crop is an exhausting one; therefore manuring is essential, and all refuse and mulch should be returned to the soil.

VARIETIES.—*B. nivea*, var *tenacissima* has smaller leaves (green underneath), and is suited to higher elevations than the above. *B. pulchra* has large dark velvety-looking leaves, and is worth growing for ornament.

Sunn (or San) Hemp; Hana, *S.* (*Crotalaria juncea*. Leguminosæ).—An erect annual, 3 to 5 ft. high, with bright yellow flowers, native of Tropical Asia generally and commonly occurring in the dry region of Ceylon. It is cultivated practically all over India, and to a small extent also in the north or north-western districts of Ceylon, for the sake of the strong and useful fibre obtained from the stems by retting. It is also sometimes cultivated as a green fodder plant for cattle, as well as for green-manuring. In cultivation, seeds are sown thickly, either broadcast or in drills, at an average rate of about 70 lb. per acre. The plant is invariably grown as a catch-crop, not mixed with other products. The crop is sown with the beginning of the rains, occupies the ground for four or five months, and is usually cut when the plants blossom. In harvesting, the plants are usually pulled up by the roots (though sometimes cut close to the ground), and left on the field for a few days to wither; they are then stripped of the leaves, and tied in bundles of about a hundred stalks. The bundles are dried for two or three weeks, then placed in pools (preferably of still shallow water) and weighted down with stones or wood logs; they are thus left for five or six days to ret. The fibre is afterwards stripped off, washed, bleached, and plaited into tails. A good average yield is considered to afford about 640 lb. (or 80 maunds) of clean fibre per acre. The price of the fibre varies greatly in

India, according to quality, from about Rs. 11 to Rs. 18 per cwt. The best grade is said to come from Bombay, and is about 4 ft. long. In London the fibre is said to be worth about £16 per ton. The chief use of the fibre in India is for cordage for fishing nets. With cultivation, the plant may be grown on almost any soil, but a light rich soil is considered to suit it best, a clayey or inundated land being the least suitable for it.

OTHER IMPORTANT FIBRE AND TEXTILE PLANTS OF THE TROPICS.

(See also Chapters XXII and XXIII).

Those marked * are common in, or indigenous to, Ceylon.

[S.=SINHALESE].

Botanical and Common Name.	Descriptive notes. Natural Order in Italics.	Purpose for which principally used.
<i>Abroma augusta</i>	<i>Sterculiaceae</i> . Perennial shrub.	Cordage.
* <i>Allæanthus zeylanicus</i> . "Alandu," S.	<i>Urticaceae</i> . A spreading tree.	Ropes, &c.
* <i>Ananas sativum</i> . Pineapple fibre	<i>Bromeliaceae</i> . A herb-aceous perennial.	Textile fabrics.
* <i>Anodendron paniculatum</i> . "Gerandi-dul" S.	<i>Apocynaceae</i> . A huge climber.	Ropes.
<i>Anona reticulata</i> . Bullock's-heart. "Anoda" S.	<i>Anonaceae</i> . Small tree.	Fine lace-like fibre; wrappers, &c.
* <i>Antiaris innoxia</i> . Sack Tree.	<i>Urticaceae</i> . A large tree.	Bark cloth.
<i>Arenga saccharifera</i> . Gomuti-fibre. Sugar Palm	A large palm.	Ropes, brushes, &c.
<i>Asclepias curassavica</i> . Jamaica Ipecacuanha	<i>Asclepiadaceae</i> . Shrub	Cordage.
<i>Attalea funifera</i> . Piassaba, or Dass-fibre	<i>Palmae</i> . A handsome palm.	Bass brooms, &c.
<i>Bauhinia racemosa</i> . "Mayila" S.	<i>Leguminosae</i> . Small tree.	Ropes and cordage.
<i>Borassus flabelliformis</i> . Palmyra-fibre	A tall erect palm.	Brooms, ropes, &c.
<i>Broussonetia papyrifera</i> . Paper Mulberry	<i>Urticaceae</i> . Quick-growing tree, with large leaves.	Tapa cloth, &c.
* <i>Calotropis gigantea</i> . "Wara," S. "Madar-fibre."	<i>Asclepiadaceae</i> . A shrub.	Ropes and cordage.
<i>Cannabis sativa</i> . Indian Hemp, Ganja, or Bhang.	<i>Urticaceae</i> . An annual shrub.	Paper, textiles, &c. (Also an important drug).
* <i>Caryota urens</i> . "Kitul," S.	<i>Palmae</i> . A handsome bi-pinnate palm.	Brushes, brooms.
* <i>Cocos nucifera</i> . Coco-nut Palm	See <i>Standard Products</i> of Ceylon.	Ropes, brooms, &c.
<i>Cryptostegia grandiflora</i> .	<i>Asclepiadaceae</i> . A woody climber.	..
* <i>Debregeasia velutina</i> . "Gas-dul," S. "Wild Rhea."	<i>Urticaceae</i> . A small tree	..
* <i>Eriodendron anfractuosum</i> . Kapok; Silk Cotton "Imbul" S.	<i>Malvaceae</i> . A large tree.	Silky floss from pods used for stuffing; worth 4 <i>d</i> to 6 <i>d</i> . per lb.

TANS.

Divi-divi Pods.—The fruit of *Cæsalpinia coriara* (Leguminosæ), a moderate-sized spreading tree with finely pinnate leaves and sweet-scented flowers, native of Central America and the West Indies. The tree has been introduced into Ceylon, and thrives up to 2,000 ft. in moist as well as in moderately dry districts. It is considered especially suited to localities with a low rainfall. In the Trincomalie district with an annual rainfall of about 63 inches, the tree has been planted as a commercial product, and its growth is reported to be satisfactory. Divi-divi is cultivated in certain parts of South America, more especially in the Island of Curacou. Seeds are best sown in baskets; the seedlings should be ready for planting out five months after germination, and may be planted at distances of about 16 ft. apart each way. In course of time it may become necessary to thin the trees out, a space of 32 feet apart each way being finally allowed, or say forty-two trees to the acre. The small twisted pods are picked when fully ripe, the proper condition being indicated when the seeds can be heard to rattle in the pods. These are exported as *first quality*, all fallen pods being classed as *second quality*. The yield per tree may be from 40 lb. to 80 lb. annually, only one crop a year being produced. Divi-divi pods are a valuable tanning material, and are largely exported from South America, and to some extent from the West Indies. They are valued in England at from £9 to £11 per ton.

Gambier; Terra Japonica. (*Uncaria Gambier*. Rubiaceæ).—A large climbing shrub, native of Malaya, where it is sometimes cultivated as a catch-crop with Pepper. An astringent extract, used by tanners and dyers, is obtained by boiling down the leaves and shoots; it is exported and commands about 37s. per cwt. in London. The Gambier plant has been introduced into Ceylon in 1887, and flourishes in the moist heat of Heneratgoda Gardens. It is probably unsuitable for cultivation above 1,000 feet elevation.

Wattle Bark.—The bark of several species of *Acacia* are described as “the best of Australian tan barks, and among the richest tanning barks in the world.” The more important of the wattle barks are:—Black-wattle or Green-wattle (*Acacia mollissima*), Tan-wattle (*A. decurrens*), Silver-wattle (*A. dealbata*), and Golden-wattle or Broad-leaved wattle (*A. pycnantha*). All these and other wattles or *Acacias* have been introduced into Ceylon, and established at elevations of 4,000 to 6,000 ft. A few years ago Mr. Kellow, of Albion Estate (elevation about 4,500 ft.), disposed of a large quantity of the bark of *Acacia decurrens*, for use by tanners

in Colombo, at about Rs. 140 per ton. Wattles are also cultivated in India, South Africa, &c. Of Black-wattle bark, 17,513 tons valued at £102,666, were exported from Durban during 1905. Apart from the bark, most of the wattles afford excellent timber. The small flattish seed of these trees is extremely hard, and should be soaked in almost boiling water for at least twenty-four hours previous to sowing. A pound contains from 30,000 to 50,000 seeds. Seedlings are best raised in baskets or joints of bamboo or reed. The tall grass *Arundo Donax* affords useful reeds for this purpose. The cultivation of Wattle-barks is very simple. They will thrive in almost any barren soil, provided there is sufficient depth for the initial roots to penetrate. The plants should be planted about 12 to 15 ft. apart. The bark may be profitably peeled from trees six to eight years old, an average yield of 28 lbs. per tree being obtained at this age. Full-grown trees, which supply the best quality, yield as much as 1 cwt. of bark, very large trees giving much more. To obtain the bark, the trees are cut down and stripped at once. Wattle-bark is said to be now worth from £8 to £10 per ton in London.

OTHER IMPORTANT TANNIN PLANTS.

[S.=SINHALESE; T.=TAMIL]

Botanical and Common Name.	Native Country, &c	Parts from which tannin is obtained.
<i>Acacia Catechu.</i> Cutch	N. India, Burma, &c. A small tree	Heart-wood and pods.
<i>Areca catechu.</i> Arecanut ; "Puwak," S.	Malaya. An erect slender palm }	Seeds
<i>Careya arborea.</i> "Kahata," S.	Ceylon, India, &c. A small tree	Bark
<i>Cassia auriculata.</i> "Ranawara," S. Matara Tea.	Ceylon and India. A shrub	„
<i>Diospyros Embryopteris.</i> "Timbiri," S.	Ceylon, India, and Malaya. A medium-sized tree	Fruits
<i>Mimusops hexandra.</i> "Palu," S.	Ceylon and India. A moderate-sized or large tree	Bark
<i>Phyllanthus Emblica.</i> "Nelli," S.	Ceylon, India, Java, &c. A small tree or shrub	Fruits
<i>Rhizophora mucronata.</i> } Man- "Kadol," S. "Kandal," T. } grove <i>Ceriops Candolleana.</i> } Barks	Ceylon and Eastern Tropics. Moderate-sized spreading trees }	Bark and extracts used for tanning and dyeing.
<i>Rumex hymenocarpus.</i> "Canaigre."	Mexico. A low tuberous perennial	Roots
<i>Terminalia belerica.</i> Myrobolans ; "Bulu," S.	Ceylon, India, Malaya. A very large tree	Fruits
T.— <i>chebula.</i> "Aralu," S.	Ceylon, India, Malaya. A moderate-sized tree	„

VEGETABLE WAX, GUMS, RESINS, &c.

Carnauba Wax.—A product of the Brazilian wax-palm (*Copernicia cerifera*), a moderately large, handsome palm, 30 to 40 feet high, found in abundance in the forests of Brazil. On the underside of the leaves is deposited a wax, which is collected either by gathering the leaves and exposing them in a dry place to wither, when the wax cracks and peels off in flakes, or by scraping the wax from the leaves, it being afterwards melted and poured into moulds. Another mode of collecting it is by cutting the leaves into pieces and boiling them in water, when the liquified wax rises to the surface, and is skimmed off. The leaves are cut twice a month, in the dry season, and about six to eight leaves are obtained yearly from one palm. It is said that 3,500 leaves yield 34 lbs. of wax. The collection of the wax is an important industry in Brazil, where the annual export of the article is said to amount to about 2,000 tons, valued at £200,000. Carnauba-wax is an article of high commercial value. It has been used during many years past for the manufacture of fine-quality candles, also as a basis for boot-polish. Recently it has been found to be the most suitable substance for the manufacture of phonograph and gramophone records, and the additional demand thus created has had the effect of materially increasing the value of the wax, which at present realises from £170 to £225 per ton. The value of the wax is dependent upon three factors, viz.- tint, texture, and richness in oil. For trade purposes it is graded into three qualities; the best quality is of uniform pale-cream tint, smooth and homogeneous in texture and rich in oil, the inferior grades being darker and less uniform in colour, somewhat porous in texture and less rich in oil.

Wax-palm of New Grenada. (*Ceroxylon andicola*).—This differs from the above, in that the wax is deposited on the trunk and not on the leaves. The palm is also suited to a higher elevation and cooler climate than the Brazilian species, and thrives in a sheltered spot in Hakgala Gardens, Ceylon, where it has been introduced about 22 years ago. It grows to about 30 feet in height, and the trunk is usually distended half way up. The wax is deposited between the leaf-scars on the trunk, often so thick that it can be removed in flakes. The wax forms an article of trade in New Grenada, and is used for making candles. The average yield per tree is said to be about 25 lbs.

Vegetable (or Chinese) Tallow.—A product of *Sapium sebiferum* (Euphorbiaceæ), a small tree, 25 to 30 feet high, native of China and Japan. The fatty or waxy matter obtained from the layer

surrounding the seeds is used in China in place of animal tallow for the manufacture of candles and soap, also in cloth-dressing. A brownish yellow oil is obtained from the seed kernels, which is used as a burning-oil, and also in the preparation of varnishes, on account of its drying properties. A mixture of the oil and fat is stated to be a good substitute for lard used for industrial purposes. Vegetable-tallow is exported from China to Europe, &c., in hard white cakes, weighing about 1 cwt. each. The tree is said to be cultivated on a large scale in China. It has been introduced into Ceylon before 1824, and grows freely at elevations over 4,000 feet. It has become naturalised at Hakgala Gardens, where it seeds abundantly.

Ivory-nut Palm, or Corozo-nut (*Phytelephas macrocarpa*).—A slow-growing palm, with handsome pinnate erect leaves, 10 to 15 feet long, native of Central America. It has been introduced at Peradeniya Gardens in 1850, where it has flowered and fruited irregularly during the last fifteen years. For many years stemless, the palm forms in time a short prostrate stem. It is diœcious (male and female flowers being borne on different plants), so that it is necessary to have a plant of both sexes in order to obtain fertile seed. The large whitish seeds (contained in large round clusters of spikey fruits, produced at the base of the palm) become very hard as they ripen, and are known as "vegetable ivory." They are in demand for making buttons, articles of ornaments, &c., and are said to command at present about 34s. per cwt. The source of supply is confined to Central America.

OTHER SOURCES OF GUMS, RESINS, VEGETABLE-WAX, GAMBOGE, &c.

[S.—SINHALESE].

Botanical & Common Name.	Native Country, &c.	Nature of Product and how obtained.
<i>Acacia arabica</i> . Gum-arabic	N. India, Arabia, Soudan. A small tree	Gum exudes from branches, sometimes assisted by incisions.
<i>Butyrospermum Parkii</i> . Shea Butter	W. Trop. Africa. A large tree	Fat obtained from seed kernels, used in soap-making, &c.
<i>Canarium strictum</i> . Black Dammar	India. A large tree	Resin obtained by incising and firing base of tree.
<i>C.—zeylanicum</i> . "Kekuna," S.	Ceylon only. A large tree	A fragrant gum-resin exudes abundantly from base of trunk.
<i>Copaifera Lansdorffii</i> . Balsam of Copaiba	Brazil. A large tree	Balsam or gum-resin obtained from stem.
<i>Dosona zeylanica</i> . "Dun," S.	Ceylon. A tall tree	A fragrant gum-resin exudes abundantly from base of trunk.

Botanical & Common Name.	Native Country, &c.	Nature of Product and how obtained.
<i>Dryobalanops aromatica</i> . Sumatra Camphor	Sumatra. A tall tree	Clear resin exudation obtained from trunk.
<i>Garcinia morella</i> . Gamboge ; "Gokatu," S.	Ceylon, India, &c. A small tree	Yellow gum or gamboge exudes from stem.
<i>Gardenia latifolia</i> . "Galis," S.	Ceylon and S. India. A small tree or shrub	Gamboge or gum deposited on leaf-buds.
<i>Guaiacum officinale</i> . Lignum Vitæ	Trop. America. A small very slow growing tree	A green resin obtained from incisions in trunk, or by heating portions of the wood.
<i>Hymenæa verrucosa</i> . Copal-resin	Madagascar. A tree 40 ft. high	Resin obtained from bark incisions.
<i>Liquidambar orientalis</i> . Liquid Storax	Asia Minor. A tree 40 ft. high.	Resin extracted from inner bark by boiling in water.
<i>Myroxylon Pereiræ</i> . Balsam of Peru	Trop. America. Large tree	Exudation of gum-resin at base of tree.
<i>Odina Woodier</i> . "Hik," S.	Ceylon, India, Java, &c. Small tree	Gum obtained from stem.
<i>Pistacia Terebinthus</i> . Turpentine Tree	Asia Minor. A small tree	} Oleo-resin obtained by incisions in bark.
P.— <i>Lentiscus</i> . Mastic	Mediterranean. A small tree	
<i>Pterocarpus marsupium</i> . "Gambamalu," S. ; Kino	Ceylon & S. India A tree 50 ft. high	Gum-resin exudes from bark.
<i>Raphia ruffia</i> . Raffia Palm	Madagascar. A palm with large feathery leaves	Wax obtained by beating dried leaves on a mat.
<i>Rhus succedana</i> . Japan Wax	China, Japan, &c. A small tree	Wax deposits on fruits
<i>Vatica Roxburghiana</i> . "Mendora," S.	Ceylon & S. India A tree 50 ft. high.	} A clear yellowish resin exudes abundantly from the stem.
<i>Vateria acuminata</i> . "Hal," S.	Ceylon only. A large handsome tree.	
V.— <i>indica</i> . Indian Copal, or "White Dammar."	S. India. A moderate-sized tree.	

IMPORTANT DYE PLANTS.

Annatto.—See *Minor Products of Ceylon*.

Indigo.—A blue dye obtained from species of *Indigofera*, chiefly *I. Anil* (of the West Indies) and *I. tinctoria* (of India and Africa). Both are shrubby plants of the Leguminous family, and occur in a wild state in Ceylon up to about 2,000 feet. India and Java are almost the only indigo-producing countries. Owing partly to the unhealthiness of the operations in connection with its production, but chiefly to the introduction of synthetic indigo, the cultivation of the plant has in recent years been largely abandoned. Of late, however, the industry appears to have somewhat recovered, the natural indigo being preferred by many manufacturers to the artificial production. The best conditions for the profitable

cultivation of the plant are a rich loamy soil with a free sub-soil, and a moist hot atmosphere; a temperature below 60° Fah. is unfavourable to the crop. The land being ploughed and harrowed, the seed is sown in lines about 2 feet apart. The seed being small, 10 to 15 lb. is required to sow an acre. It germinates in three or four days, and about three months later the flowers appear, when the plants are ready for harvesting. The plants are usually cut down to within a few inches of the ground, tied up in bundles, and carried fresh to the factory. The stumps left in the ground will afterwards "ratoon," and two to four cuttings may be obtained from the same roots within the year. To produce the dye the whole plant is subjected to a process of fermentation and churning. The freshly cut bundles are placed in huge vats provided with a tap at the bottom; the top is weighed down with planks, and water laid on so as to cover the whole. Fermentation sets in and is allowed to go on for twelve to sixteen hours, being stopped when the leaves become a pale colour. The liquid is run off by the tap into a second cistern, and is kept constantly agitated by either wading coolies, who beat with paddles, or by a mechanical contrivance, for two or three hours, after which the indigo settles in the bottom in the form of bluish mud. This, after draining off the water, is put into bags which are hung to dry, being afterwards cut into squares and stamped, and further dried for export. About 8 lbs. of leaves will yield $\frac{1}{2}$ oz. of indigo. Good cultivation yields an annual return of from 300 to 500 lbs. of indigo per acre.

Logwood. (*Hæmatoxylon Campechianum*. Leguminosae).—A small slow-growing Leguminous tree, native of Central America, but introduced and naturalised in several West Indian Islands. The heart-wood as well as the roots are extensively exported for the extraction of logwood dye, which is valuable in the manufacture of woollen and silk goods, and for numerous other purposes. The tree has been introduced in 1845 at Peradeniya, where it has made slow growth, and not yet flowered or fruited. It is considered to thrive best in a hot arid climate. Propagation is by seed, and the seedlings may be planted out about 15 by 15 feet apart (200 to the acre). At the age of ten years the trees are ready for felling; the sap-wood, being valueless, is chipped off and discarded, and the heart-wood, which is brownish-red, is made up in bales for export.

Sappan-wood. See *Minor Products of Ceylon*.

Turmeric.—See under *Spices*.

OTHER IMPORTANT DYE PLANTS.

[S.=SINHALESE; T.=TAMIL].

Botanical & Common Name.	Native Country, &c.	Parts from which dye is obtained.
<i>Artocarpus integrifolia</i> . Jak; "Kos" S.	India. A large tree	Heart-wood; yellow dye.
<i>Carthamus tinctorius</i> . Safflower	India (?). An annual, 2 to 3 ft. high	Dried flowers; red and yellow dyes.
<i>Chlorophora tinctoria</i> . Fustic.	Central America. A large tree	Wood; a yellow dye.
<i>Hedyotis umbellata</i> .	See <i>Oldenlandia</i>	
<i>Hibiscus Rosa-sinensis</i> . Shoe-flower	India, &c. Tall shrub	Flowers; a red dye, used in cookery, &c.
<i>Nyctanthus Arbor-tristis</i> . "Sepalika," S.	Central India. A large shrub	Flowers yield a yellow dye, used in India for dyeing cotton cloths.
<i>Oldenlandia umbellata</i> . Indian Madder; Chaya-root; "Saya," S; "Chaya" T.	Ceylon and India. Small annual.	A pinkish purple dye obtained from root. Once a Ceylon Government monopoly.
<i>Pterocarpus santalinus</i> . "Red-sanders."	India. A small tree	Heartwood affords a reddish brown dye, used for dyeing woollen cloths.
<i>Semecarpus Anacardium</i> . Marking-nut	India, Malaya, &c. A moderate-sized tree	Juice of nut mixed with quicklime is used for marking linen, &c.

GUTTA-PERCHA AND BALATA.

Gutta-percha is a substance similar to rubber, being a waste product of a certain group of trees which are chiefly indigenous to the Malay Archipelago. It is usually obtained by felling the trees and ringing the bark; consequently the trees yielding it have become scarce. In recent years, however, this depletion is reported to have been somewhat obviated by planting up the tree in forests and reserves. It is computed that an average yield of 16 lb. of gutta per tree may be obtained from trees in the wild state. Unlike rubber, gutta softens in moderate heat. Its principal use is for insulating cable wires, &c., but it is also largely employed for making soles for boots and shoes. The following are the principal gutta-yielding trees:—

Palaquium (Dichopsis) Gutta, known as "Taban Gutta" or "Taban Merah;" *P. Maingayi* ("Gutta-puteh," or "Gutta Tabban Simpoo"); *P. pustulata* ("Gutta Taban Puteh"); *P. obovata* and *P. Treubii*. *P. grandis*, or "Kiri-hembiliya," S., is a native of the moist low-country forests of Ceylon. *Payena Leerii*, introduced to Ceylon in 1880, and now established at Peradeniya and Heneratgoda Gardens, yields the "Gutta Sundek;" while "Gutta Singgarip" is obtained from the climber or liane known as *Willughbeia firma*.

Balata is a product analagous, but inferior, to gutta-percha, obtained chiefly from *Mimusops globosa* or "Bully-tree," belonging to the same family as *Palaquium* (*viz.* Sapotacæ), and native of tropical South America, whence the article is exported.

IMPORTANT TIMBER AND CABINET WOODS OF THE TROPICS.

[S.—SINHALESE].

Common and Botanical Name.	Natural Order.	Native Country, &c.
Black wattle. <i>Acacia decurrens</i>	<i>Leguminosac</i>	S. Australia.
Black-wood. <i>A.—melanoxyton</i>	"	"
Billion. <i>Eusideroxyton Zwagerii</i>	<i>Lauracac.</i>	Borneo.
Brazilletto-wood. <i>Peltophorum Linnæi</i>	<i>Leguminosac.</i>	West Indies.
Calamander. <i>Diospyros quæsitâ</i>	<i>Ebenacac</i>	Ceylon.
Cam-wood. <i>Baphia nitida.</i>	<i>Leguminosac</i>	West Tropical Africa.
Chittagong-wood. <i>Chickrassia tabularis</i>	<i>Meliacac</i>	Burma.
Dattock. <i>Detarium guineense</i>	<i>Leguminosac</i>	Tropical Africa.
Ebony, Ceylon. <i>Diospyros Ebenum</i>	<i>Ebenacac</i>	Ceylon.
—, Jamaica. <i>Brya Ebenus</i>	<i>Leguminosac</i>	Jamaica and Cuba.
—, Malabar. <i>Diospyros melanoxyton</i>	<i>Ebenacac</i>	S. India.
Green-heart. <i>Nectandra Rodicæi</i>	<i>Lauracac</i>	West Indies
Hal-milla. See Trincomalie wood		
Indian Red-wood. <i>Soyimida febrifuga</i>	<i>Meliacac</i>	Central India, &c. Said to be immune to termites.
Iron-bark, Australian. <i>Eucalyptus Leucoxyton.</i> Several other species	<i>Myrtacac</i>	New South Wales, &c.
Iron-wood, Ceylon. <i>Mesua ferrea</i>	<i>Guttiferac</i>	Ceylon.
Jak-wood. <i>Artocarpus integrifolia</i>	<i>Urticacac</i>	India, Ceylon, &c.
Jarrah. <i>Eucalyptus marginatus</i>	<i>Myrtacac</i>	West Australia.
Lignum Vitæ. <i>Guaicum officinale</i>	<i>Zygophyllacac</i>	Tropical America.
Mahogany. <i>Swietenia Mahogani</i>	<i>Leguminosac</i>	Trop. S. America.
—, African. <i>Khaya senegalensis</i>	<i>Meliacac</i>	West Trop. Africa.
—, Australian. See Jarrah		
—, Indian. <i>Cedrela Toona</i>	"	India, Java, &c.
Milla, S. <i>Vitex altissima</i>	<i>Verbenacac</i>	Ceylon and India.
Mirabow. <i>Azelia palembanica</i>	<i>Leguminosac</i>	Borneo and Malaya.
Mora. <i>Dimorphandra mora</i>	"	British Guiana.
Mosquito-wood. <i>Mosquitoxyton Jamaicense</i>		West Indies.
Mountain Mahoe. <i>Hibiscus elatus</i>	<i>Malvacac</i>	"
Nedun, S. <i>Pericopsis Mooniana</i>	<i>Leguminosac</i>	Ceylon.
Oak, African. <i>Lophira alata</i>	<i>Ochnacac</i>	W. Trop. Africa.
—, Ceylon. <i>Schleichera trijuga</i>	<i>Sapindacac</i>	Ceylon, India, Java.
—, She. <i>Casuarina equisetifolia</i>	<i>Casuarineac</i>	} Queensland & New South Wales.
—, Silky. <i>Grevillea robusta</i>	<i>Protacac</i>	
Padouk. <i>Pterocarpus indicus</i>	<i>Leguminosac</i>	Burma.
Palu, S. <i>Mimusops hexandra</i>	<i>Sapotacac</i>	Ceylon, India.
Pehimbiya, S. <i>Filicium decipiens</i>	<i>Burseracac</i>	Ceylon, W. India.
Purple-heart. <i>Copaifera pubiflora</i>	<i>Leguminosac</i>	British Guiana.
Rosewood. <i>Macherium firmum</i>	"	Brazil.
—, Indian. <i>Dalbergia latifolia</i>	"	Bengal and S. India
—, Seychelles. <i>Thespesia populnea</i>	<i>Malvacac</i>	Brazil.
Sal. <i>Shorea robusta</i>	<i>Dipterocarpeac</i>	India, Burma, &c.
Sandalwood. <i>Santalum album</i>	<i>Santalacac</i>	Central India

Common and Botanical Name.	Natural Order.	Native Country, &c.
Satinwood. Chloroxylon Swietenia Suriya, or Tulip Tree. Thespesia populnea	<i>Meliaceae</i> <i>Malvaceae</i>	S. India and Ceylon. Ceylon, Tropical Asia.
Tamarind-wood. Tamarindus indica Teak. Tectona grandis —, African. Oldfieldia africana	<i>Leguminosae</i> <i>Verbenaceae</i> <i>Euphorbiaceae</i>	India. Burma. Sierra Leone.
Toona Tree. See "Indian Mahogany" Trincomalie-wood. Halmilla, S. Berrya Ammonilla	<i>Tiliaceae</i>	Ceylon, S. India and Burma.
Tulip Tree. See Suriya Tulip-wood, Australian. Harpullia pendula	<i>Sapindaceae</i>	Queensland.
Wewarani, S. Alscodaphne semecarpifolia	<i>Lauraceae</i>	Ceylon, dry region.



CHAPTER XXV.

PERFUME-YIELDING PLANTS, HONEY PLANTS, ORNAMENTAL SEEDS, HISTORICAL OR ORDEAL POISONS.

PERFUME-YIELDING PLANTS :—

The extraction of perfume from flowers affords an important industry in some countries, notably in France, where roses, orange blossoms, jasmine, violets, tuberoses, &c. are used by the ton for the purpose. The two principal methods of extraction adopted by perfume manufacturers are *distillation* and *maceration* or *enfleurage*, and flowers which are adapted for treatment by either of these methods may be unsuited to another. The following notes apply to such perfume-yielding plants as may be suitable for cultivation in Ceylon or in similar tropical countries :—

Bergamot. (*Citrus bergamia*. Rutaceæ).—A kind of Orange yielding a valuable perfume from the rind, known as “bergamot.” 1,000 fruits will yield about 30 oz. of oil, which when pure is worth from £1, 10s. to £2 per lb. The tree requires much the same treatment as the ordinary Orange, and in plantations is generally planted about 12 feet apart each way.

Cedrat. (*Citrus medica*).—A highly-scented oil obtained from the rind of the Citron, worth about 18s. or more per lb. It is not much used for scenting soaps, being too costly for that purpose, but it enters largely into the composition of handkerchief perfumes.

Frangipanni. (*Plumeria alba*. Apocynaceæ).—Temple Tree. The perfume known by the name frangipanni is said to be distilled from the flowers of this tree, which is common at low elevations in Ceylon, especially near temples. The scent may also be obtained from the flowers by maceration in liquid fat, being afterwards extracted by infusion in rectified spirit.

Geranium. (*Pelargonium capitatum*. Geraniaceæ).—This plant, which may be easily grown up-country, is cultivated extensively in Northern Africa and Southern Europe for the sake of the

delightful rose-smelling oil obtained from the leaves and stems by distillation. This oil is worth about 4s. per oz. In plantations 3,000 to 4,000 plants are allowed to the acre ; one planting lasts four years, and three cuttings of leaves, &c., are obtained from the plants in one season.

Jasmine. (*Jasminum spp.* Oleaceæ).—The perfume obtained from Jasmine flowers by absorption on clarified fat is said to be one of the most prized by perfumers, on account of its sweet and delicate odour and the impossibility of imitating it. The otto or essential oil of jasmine is very costly, being worth about £9 per fluid ounce. In France, about 8,000 Jasmine plants go to the acre ; these will yield about 5 cwt. of blossoms, which in turn will perfume 1½ cwt. of fat, valued at about 12s. per lb.

Lemon-grass, or Verbena-oil. (*Andropogon citratus.* Graminæ). The oil obtained by distillation from the leaves is generally employed in the perfuming of scented soaps, also in adulterating "otto of roses" and true "verbena oil." It is sold in London at about 6d. per ounce.

Patchouli. (*Pogostemon Patchouli.* Labiateæ).—A small herbaceous plant, about 2 feet high, native of Sylhet, Penang, and Malacca. By distillation of the leaves and young tops a volatile oil is obtained, and from this Essence-of-Patchouli is prepared. Patchouli perfume is highly popular in India as well as in Europe, and is much used in the preparation of other perfumes. With care, the plant will grow at medium elevations in Ceylon, though probably not sufficiently well to be profitable. In England, Patchouli leaves are said to be sold at 9d. to 1s. 3d. per lb., and the pure oil at 2s. 6d. to 3s. 9d. per ounce.

Tonka, or Tonga Beans. (*Dipteryx odorata.* Leguminosæ).—A large tree, native of Tropical America, introduced at Peradeniya in 1881. The almond-like seeds are very fragrant, possessing the odour of new-mown hay, and are largely used by perfumers for bouquets, as well as in the preparation of sachet powders. They are also employed in scenting snuff. Tonka Beans are at present worth about 1s. 7d. per lb. in London.

Tuberose. (*Polianthes tuberosa.* Liliaceæ). A tuberous herbaceous plant, much cultivated in the South of France for the extraction of perfume from its powerfully scented flowers. The plant grows and flowers freely at medium and high elevations in Ceylon.

Ylang-ylang, or Ilang-ilang ; "Wana-Sapu," S. (*Cananga odorata.* Anonaceæ).—A large, quick-growing tree, 60 to 80 feet

high, native of the Philippines, Java, &c. The large greenish-yellow flowers are strongly scented, and yield by distillation the popular scent Ylang-ylang or Ilang-ilang. A full-grown tree may be considered to yield 100 lb. to 120 lb. of fresh flowers during the flowering season. From 150 to 200 lb. of flowers are said to yield 1 lb. of Ilang-ilang essence, the collection and distillation of which is said to form an important industry in the Philippines. Here it is estimated that an acre planted with 150 trees may give 3,250 lb. of flowers, yielding about 16 lb. of essence.

In addition to the foregoing, the following are also noted for the fragrance of their flowers or leaves :

TREES :—

Caesalpinia coriaria.	" Divi-divi."	Murraya exotica.	" Etteriya," S.
Citrus Decumana.	Pumelo.	Myristica Horsfieldii.	
Fagraea fragrans.	" Tembusi."	Nyctanthes Arbor-tristis.	"Night-flowering Jasmine."
Mesua ferrea.	Iron-wood ;		
	" Na-gaha," S.	Pterocarpus marsupium.	
Michelia champaca.	Champak ;	Santalum album.	Sandal-wood.
	" Sapu," S.	Tabernaemontana coronaria.—	
Mitrephora Heyneana.			Wax-flower.
		T.—dichotoma.	

SHRUBS :—

Brunfelsia bicolor.		Magnolia grandiflora.	
Capparis zeylanica.		Michelia fuscata.	Mathanakama, T.
Clerodendron infortunatum.		Ocimum basilicum.	Sweet Basil.
Gardenia florida		O.—sanctum.	" Maduru-tala," S.
Jasminum Sambac.		Stemmadenia bella.	
Lippia citriodora.	" Lemon-Scented	Talauma mutabilis.	
	Verbena."	Wrightia zeylanica.	"Sudu-idda," S.

CLIMBERS :—

Artobotrys zeylanicus.	" Petika-wel," S.	Jasminum flexile.	
Asparagus falcatus.	" Hatawariya," S.	Lonicera Hildebrandtii.	Giant Honey-suckle.
A.—racemosus.		Odontadenia Harrisii.	
Camoensia maxima.		Stephanotis floribunda.	

HONEY PLANTS.

Bees have their likes and dislikes in regard to the flowers they visit for extracting honey from, and the quality of the honey produced by them largely depends on the kind of flowers which they frequent. Persons who have taken up bee-keeping in Ceylon must have sometimes experienced a difficulty in providing a sufficient supply of suitable flowering plants or trees for their bees. To those who wish to plant up trees or shrubs specially suited for the purpose, the following list may be a guidance. Mr. C. Drieberg, who has given the subject much attention, states that Ceylon-bees

seem to travel great distances in search of honey-flowers, apparently preferring trees to shrubs and smaller plants. In the West Indies, "Logwood" honey is considered to be about the best, the flowers of the Pigeon Pea ("Rata-tora") and lime-tree being also considered to yield excellent honey.

SELECTED HONEY-FLOWERS FOR BEES.

[T.=tree; Cl.=climber; S.=shrub; A.=annual; S.=Sinhalese].

Name.	See above.	Name.	See above.
Acacia dealbata.	Silver-wattle. T.	Kleinhovia hospita.	T.
Antigonon leptopus, & other species.	Cl.	Lantana, several species.	S.
Bassia longifolia.	"Mi," S. T.	Logwood (Haematoxylon)	T.
Cæsalpinia coriaria.	"Divi-divi." T.	Mangifera indica.	
Cajanus indicus.	Pigeon Pea. S.	Mango.	T.
	"Rata-tora," S.	Michelia Champaca.	Sapu. T.
Canarium commune.	Java Almond. T.	Mignonette (Reseda odorata).	A.
Caryota urens.	Kitul Palm. T.	Murraya exotica.	S. or T.
Cassia grandis.	Horse Cassia. T.	Nasturtium (Tropæolum).	A. Cl.
Citrus Limetta.	"Lime." Also various other species of Citrus. S. or T.	Pometia exima.	T.
Cocos nucifera.	Coconut Palm. T.	Porana volubilis.	Cl.
Durio zibethinus.	Durian Tree. T.	Portulaca oleracea.	A.
Elæocarpus serratus.	Wild Olive. S.	Pterocarpus indicus.	T.
Glycosmis pentaphylla.	S.	Rhus glabra.	T.
Guizotea olifera.	A.	Sarcocephalus esculentus.	Cl. S.
Grevillea robusta.	Silky Oak. S.	Schleichera trijuga.	T.
Humboldtia laurifolia.	S.	Strobilanthes, various species.	S.
Ipomœa carnea.	Cl.	Terminalia Belerica.	
		"Bulu," S.	T.

ORNAMENTAL SEEDS.

In the tropics there is found a large number of curious or ornamental seeds suitable for making articles of ornament or utility, as beads, necklaces, rosaries, mats, buttons, &c. It is noteworthy that the majority of such seeds are furnished by the natural orders of Leguminosae and Palmae, although many are produced also by the orders Euphorbiaceæ, Apocynaceae and Scitamineæ. Boring the seeds for necklaces, &c., may be done by fixing the seed firmly and using a fine drill, or by passing a red hot needle through it. No attempt should be made to soften the seed by soaking in water, which will result in loss of brilliancy in colour, if not in the swelling and splitting of the seed. The following are some of the more striking of such seeds :—

Abrus precatorius. "Crab's Eyes."—Seeds scarlet with a black spot, used for rosaries, necklaces, goldsmiths' weights, &c.

Adenanthera pavonina. "Bead Tree."—Seeds bright scarlet, used for necklaces, &c., also for jewellers' and apothecaries' weights.

A.—bicolor. Seeds half-black and half-red, very ornamental,

- Caesalpinia Bonducella.** "Nicker Seeds." Large grey, polished and very hard, round or oval.
- Canna indica.** "Indian Shot."—Seeds black, round or oval, of the size of small peas, very hard.
- Coix Lachryma-Jobi.** "Job's Tears."—Very hard, grey, polished seed; popular for rosaries, bead-work, &c.
- Corypha umbraculifera.** Talipot Palm.—Seed round, of the size of marbles, hard and grey, used for buttons and ornaments.
- Elæocarpus Ganitrus.** Fruits used as heads for hat-pins.
- Entada scandens.** "Elephant Creeper."—Remarkably large flat brown seeds.
- Erythrina corallodendron.** Coral-bean Tree.—Seeds scarlet, with a black spot, strung as beads in chaplets.
- Hevea brasiliensis.** Para Rubber Tree.—The large roundish mottled and blotched seeds make excellent heads for hat-pins.
- Oroxylum indicum.** "Totilla," S.—Seeds with curious membranous flat circular wing.
- Ormosia dasycarpa.** "Necklace Tree."—Seeds large, oval or roundish, bright scarlet, blotched with black or brown. Very popular for making buttons, necklaces, and ornaments.
- O.—coccinea.** Seeds similar to the preceding species, but smaller.
- Manihot Glaziovii.** Ceara Rubber Tree.—Oblong flattened hard seed, mottled grey and brown.
- Metroxylon Sagu.** Sago Palm.—Round or cone-like reddish fruits, with a rind formed of hard polished small scales.
- Mucuna pruriens.** "Horse-eye Bean."—The large oval seed resembles the eye of a horse.
- Poinciana regia.** Flamboyante.—Seeds hard, oblong, and mottled grey.
- Phyllanthus cyanosperma.** Seeds rather small, wedge-shaped, bright shiny blue.
- Phytelephas macrocarpa.** Ivory-nut palm.—The large hard white ivory-like seeds are used as a substitute for ivory, being employed in the manufacture of buttons, &c. Exported from S. America.
- Raphia ruffia.** Raffia palm.—Round or conical large brown polished scaly fruits, suitable for heads for hat pins.
- Rhyncosperma cyanosperma.**—Violet-black seeds, used as ornaments by hill people in India.
- Sapindus saponaria.** "Soap Berry."—Round black seeds, often strung as beads or rosaries, sometimes used as buttons.
- Thevetia nerrifolia.** "Lucky-beans," or "Lucky-seeds."—In the West Indies the hard oblong seeds are mounted and used as pendants and charms.

HISTORICAL OR ORDEAL POISONS.

- Hippomane mancinella** (*Euphorbiaceae*).—Manchineel Tree of S. America and W. Indies.
- Erythrophloeum Guineense** (*Leguminosae*).—"Sassy Bark" of Sierra Leone.
- Antiaris toxicaria** (*Urticaceae*).—Upas Tree of Java.
- Physostigma venenosum** (*Leguminosae*).—Ordeal Beans of old Calabar.
- Cerbera Tanghin** (*Apocynaceae*).—Ordeal-poison of Madagascar.

CHAPTER XXVI.

PASTURE, GRAZING, AND FODDER PLANTS.

[S.=SINHALESE ; T.=TAMIL].

A striking feature of tropical planting is the scarcity of pasture for grazing stock. The average small native owner of cattle seldom makes any attempt to provide pasture or fodder for his stock, which are generally allowed to pick up what they can, and in periods of drought will eat almost anything. Further, the system of unmixed crops which usually obtains on estates, and the absence, as a rule, of the practice of crop rotation, are factors which neither encourage nor promote grazing conditions. The most suitable land for growing fodder or permanent pasture consists, usually of low-lying flats or ravines, where the soil is of a moist sandy or alluvial nature. A certain amount of shade is beneficial, both for the growth of the grass and for the shelter of cattle, so that a few suitable shade trees, if they do not already exist, should be planted at wide distances apart. The ground should be well ploughed or trenched, the coarsest roots, stones, etc., removed, and the surface rendered tolerably smooth. When forming pasture from seed, a mixture composed of suitable species of grasses, with also a proportion of herbaceous leguminous or clover-like plants, should be procured, the seed being sown broadcast, and afterwards harrowed or raked into the soil. If the latter be of a loose or uneven nature, it should be rolled so as to secure a moderately firm and even surface. Perennial grasses are easily propagated by division of the roots, which if planted out in wet weather, at distances of about 1 to $\frac{1}{2}$ foot apart, should cover the ground in a short space of time. In order to supply the best yield of fodder, the ground must be kept free of rank weeds, and manured at intervals. The following four are the most important fodder grasses cultivated in Ceylon :

Panicum maximum. "Guinea Grass;" "Rat-tana," S.—A perennial species, native of Tropical Africa, and naturalised in Ceylon. It is one of the most valuable of tropical fodder grasses and, like the Mauritius Grass, is commonly grown in the low-country of Ceylon for supplying green fodder for horses and cattle.

It thrives best in a moist alluvial sandy soil, and under good cultivation has been found to give an annual yield of about 105 tons per acre in five or six mowings. This grass seldom produces seed, and propagation is invariably effected by planting out shoots in wet weather.

P.—molle (or P. muticum). Mauritius Grass; "Diya-tanakola," S., Para Grass, Water Grass, or Buffalo Grass.—A perennial of Tropical America, 3 to 5 feet high, with a spreading scandent habit, introduced and naturalised in Ceylon. It is one of the most valuable of tropical fodder grasses, and is largely grown in the low-country of Ceylon for supplying stall feed for horses and cattle. It thrives up to about 3,500 ft., flourishing in moist sandy soils, as on the banks of rivers or streams, and gives six to eight cuttings a year. In British Guiana the annual yield of an unmanured area was found to aggregate in five mowings, 41½ tons per acre; but much larger yields are said to be obtained.

Paspalum dilatatum. Golden Crown-grass.—A perennial strong-growing grass, suited to medium and high elevations, easily established and affording excellent fodder. In Australia it is said to be one of the best grasses "for dairy cattle and for forming a permanent pasture, standing grazing well." It has been found useful in binding railway banks up-country in Ceylon. 5 to 8 lbs. of seed will sow an acre; once established the plants are readily propagated by division of the roots.

Cynodon Dactylon. Doob-, Doub-, Bahama, or Bermuda Grass; "Arngam Pillu," T.—A small spreading perennial, specially adapted for dry regions. In India, Egypt, &c., this is a favourite lawn grass; it also forms one of the best grasses for pastures and hay-making. In an experiment in British Guiana it gave a crop of green fodder aggregating, in twelve monthly mowings, 22 tons per acre.

OTHER IMPORTANT FODDER AND PASTURE GRASSES:—

Ammophila arundinacea. Marram Grass.—Much esteemed in Australia, both as a fodder plant in dry districts, and for binding sand dunes. Large areas of shifting sands are reported to have been reclaimed by it. Propagated by division or seed.

Andropogon halapensis. Johnson Grass.—A tall perennial, 6 to 10 feet high.

A.—pertusus.—A slender grass, 1 to 2 ft. high, common from sea-level to 3,000 ft. in Ceylon. "An excellent fodder grass, green or dry." (Ferguson).

Anthistiria ciliata. Kangaroo-grass of Australia.—Abundant in many parts of Ceylon up to intermediate elevations. Ferguson said: "Often cut and dried for fodder."

Astelba pectinata. Mitchell Grass.—A perennial, 2 to 3 ft. high, native of Queensland, highly regarded as a fodder grass.

Bromus unioloides. Prairie Grass.—A good pasture and hay grass in Australia. Thrives best on heavy soils.

Cenchrus. See *Pennisetum*.

Chrysopogon (Andropogon) aciculatus. "Tutteri," S. Love-grass.—A perennial, very common in Ceylon up to 4,000 ft. Forms good grazing grass, also a good turf.

Euchlaena (Reana) luxurians. Teosinte.—A tall annual, reaching a height of 8 to 10 ft., native of S. America, and highly esteemed for fodder. It is best planted in rows 3 by 5 ft. apart, and prefers rich alluvial moist soil. It yields 50 tons or more green fodder per acre.

Ischaemum ciliare. "Rat-tana," S.—A perennial, sometimes cultivated in the low-country, and brought into Colombo as food for cattle.

I.—muticum. Common near Colombo in damp places, used as fodder for horses.

Panicum curvatum.—A perennial, occurring frequently in the hotter parts of Ceylon; a good fodder grass, commonly brought into Colombo as fodder for horses and cattle.

P.—javanicum.—An annual, 1 to 2 ft. high, common in India at the margins of paddy fields. Ferguson stated: "common near Colombo, and greedily eaten by cattle."

P.—prostratum. "Samay-pillu," T.—Common in the hotter parts of Ceylon; relished by cattle.

P.—repens. "Et-tora," S.—A perennial, 1 to 3 ft., common up to 6,000 ft. A good fodder plant, largely sold in Colombo. Sandy or marshy soils.

P.—spectabile. "African Wonder-grass."—A vigorous perennial, 5 to 6 ft. high, considered one of the best fodder grasses in Western Australia, thriving in both dry and moist situations. Easily propagated by division.

Paspalum conjugatum. Barbados Sour-grass; "Thumbatana," S. A small perennial, introduced from the West Indies and naturalised in Ceylon. It is specially adapted for growing in shady places, and is relished by cattle.

P.—sanguinale. "Gurwal," S. A perennial, 6 to 18 inches high. Common throughout Ceylon up to 4,000 ft., much relished by cattle.

Pennisetum cenchroides. Congayam-grass. A perennial grass, 10 to 12 inches high, specially suited to dry districts, said to afford good fodder in South India.

Sorghum. See *Andropogon*.

Tricholaena rosea. Natal Red-top Grass. An elegant perennial, 1½ to 2 ft. high, much valued for pasture and hay, more especially in combination with other species. Thrives at medium and high elevations.

OTHER FORAGE PLANTS. (LEGUMINOUS).

Chester J. Ht

Cytissus proliferus. Tagasaste ; Tree-lucerne.—A small tree, common in the mountains of the Canary Islands. The leafy branches form a valuable food for cattle in dry sub-tropical climates.

Desmodium tortuosum. Beggar-weed of Florida.—An annual shrub, 3 to 5 feet high, highly regarded as fodder in Florida, &c.

D.—gyrans. Telegraph Plant, "Chanchala," S.—An erect perennial, about 2 feet high, indigenous to the moist low-country of Ceylon up to 3,000 ft.

D.—heterophyllum. "Maha-undu-piyala," S.—A small spreading perennial herb, common in the moist low-country of Ceylon up to 2000 ft.

Glycine hispida. Soya Bean—A quick-growing annual, 15 inches high, producing a heavy crop of herbage, much relished by stock. See *Tropical Vegetables*.

Hedysarum coronarium. Soola, or Sulla clover.—A bushy plant, 2 to 3 ft. high, much esteemed in Australia for fodder ; considered very nutritious, said to give a yield of 50 tons per acre. Requires moist, deep, calcareous soil.

Medicago sativa. Lucerne, or Alfalfa.—A herbaceous perennial, highly esteemed in sub-tropical countries for green fodder and ensilage, being very nutritious and much relished by stock of all kind ; not well suited to a tropical climate. Mr. W. Nock grew it successfully at Hakgala, but found the cost prohibitive. Rich humous moist soil is most suited to it, and it may be sown in drills at the rate of 6 lbs. of seed per acre, or broadcast at 12 lbs.

Mucuna utilis. Florida Velvet Bean.—An annual, vigorous-growing climbing bean, with short black velvety pods ; extensively grown in the Southern United States for fodder and as a soil renovator. Thrives in Ceylon at low and medium elevations.

MISCELLANEOUS FODDER PLANTS :—

Amaranthus gangeticus. "Sudu-tampala," S. ; " Chirukirai," T.—An annual herb, 2 to 3 ft. high, common at low elevations, often cultivated in native gardens as a vegetable or pot-herb.

A.—spinosa. "Katu-tampala," S. " Mudkirai," T.—An annual herb, 1 to 1½ ft. high, common in waste ground in the tropics. Cattle relish it, especially in dry weather.

Atriplex nummularia. Salt-bush.—This and other species of *Atriplex* (perennials) thrive in arid districts and in sandy soil near the sea-coast. In Australia they form an important food for stock in time of drought. The plants are propagated by seed or cuttings, grow from 2 to 6 ft. high according to species, and are of a soft succulent nature. Seed very small, 20,000=1 lb.

A.—repens. "Elechevi" T.—A small prostrate shrub, common on the sandy sea-shores in the dry region of Ceylon, S. India, &c. The Tamils of Jaffna eat this as a vegetable.

Opuntia Dillenii. Prickly Pear.—A species of prickly Cactus, native of South America, introduced and become a pest in Queensland, also naturalised in the North of Ceylon and in other countries. In periods of drought the plants are crushed or boiled and used as fodder for stock, which are said to fatten on it.

PRINCIPAL PLANTS USED IN NATIVE MEDICINE
IN CEYLON.

[S.=SINHALESE ; T.=TAMIL.]

Botanical and Native Name.	Natural Order.	Purposes for which used.
<i>Abrus precatorius</i> Olinda-wel, S. Indian liquorice.	<i>Leguminosae</i>	Juice of green leaves used for purifying the blood ; root taken for sore throat, rheumatism, etc.
<i>Abutilon asiaticum.</i> Anoda, S.	<i>Malvaceae</i>	Root a tonic, also used for piles.
<i>Acalypha indica.</i> Kuppamenya, S.	<i>Euphorbiaceae</i>	Vermifugal and carminative ; also externally applied to sores.
<i>Achyranthes aspera.</i> Karal-sebo, S.	<i>Amarantaceae</i>	Juice of leaves used for dysentery.
<i>Acorus Calamus.</i> Wada-kaha, S.	<i>Araceae</i>	Used in bowel complaints of children.
<i>Adhatoda Vasica.</i> Adatoda, S.	<i>Acanthaceae</i>	Whole plant used in diseases caused by excessive phlegm ; also in menorrhagia.
<i>Alternanthera triandra.</i> Mukunuwenna, S.	<i>Amarantaceae</i>	A local cooling application for giddiness.
<i>Areca Catechu.</i> Puwak, S.	<i>Palmae</i>	Applied externally to ulcers, and for strengthening the gums ; also for worms in animals.

Botanical and Native Name.	Natural Order.	Purposes for which used.
<i>Ægle Marmelos.</i> Beli, S.	<i>Rutaceae</i>	Root, bark and leaves used in flatulency. The unripe fruit boiled, and then baked under hot ashes, checks diarrhœa and dysentery. The tender fruit dried and boiled as tea is used for chronic diarrhœa. Ripe fruit cooling and laxative, taken for piles.
<i>Aerva lanata.</i> Pol-kudupala, S.	<i>Amaran-taceae</i>	Much employed in coughs and as a vermifuge for children.
<i>Asparagus falcatus.</i> Hatawariya, S.	<i>Liliaceae</i>	Tuberous roots commonly used in cooling medicines, also for venereal diseases, &c.
<i>Azadirachta indica.</i> Kohombo, S.	<i>Meliaceae</i>	Juice of leaves for injuries to the eyes, for intestinal worms. Fruit a vermifuge and purgative; oil from seed for rheumatism.
<i>Brassica juncea.</i> Aba, S.	<i>Cruciferae</i>	Seeds pungent, used as poultice in gout and inflammation; leaves promote appetite.
<i>Cæsalpinia Bonduc.</i> Kumburu-wel, S.	<i>Leguminosae</i>	Tender leaves for toothache, also for worms in children.
<i>Calophyllum Inophyllum.</i> Dombo, S.	<i>Guttiferae</i>	Kernel of fruit for ulcers, and hoof disease of cattle; root and bark for rheumatic pains.
<i>Calotropis gigantea.</i> Wara, S.	<i>Asclepiadeae</i>	Green leaves applied locally to dispel swellings. Root a tonic. Milk of the plant taken internally for leprosy.
<i>Caryota urens.</i> Kitul, S.	<i>Palmae</i>	Bark and roots applied to cuts and wounds.
<i>Cassia auriculata.</i> Ranawara, S. Matara Tea.	<i>Leguminosae</i>	Bark and root used as an alterative; dried leaves used as tea.
<i>Cassia Fistula.</i> Ehelu, S.	,,	Tender leaves as a mild purgative in rheumatic fever; bark with other medicines used for rheumatism.
<i>Celastrus paniculata</i> Duhudu, S.	<i>Celastraceae</i>	Bark considered to strengthen the brain, purify the blood, cure sores, &c.
<i>Cannabis sativa.</i> Cansa, S. Ganja; Indian Hemp.	<i>Urticaceae</i>	Juice of the leaves in composition with other medicine given as a vermifuge.
<i>Cissampelos Pareira.</i> Diyamitta, S.	<i>Menispermaceae</i>	Roots used in fever and diarrhœa.
<i>Cocos nucifera.</i> Pol, S.	<i>Palmae</i>	Oil applied to head for cooling. Pulp of young fruit given in sun-stroke. Roots for strengthening the gums, &c.
<i>Cratœva Roxburghii.</i> Lunuwarana, S.	<i>Capparidæ</i>	Leaves for gouty swellings. Bark to sharpen the appetite.
<i>Croton Tiglium.</i> Jayapala, S.	<i>Enphorbiaceae</i>	Seeds a powerful purgative; poisonous.
<i>Curcuma longa.</i> Kaha. S.	<i>Scitamineae</i>	Used in skin diseases, also in ophthalmia.
<i>Cyperus rotundus.</i> Kalanduru, S.	<i>Cyperaceae</i>	Tubers used in fever, diarrhœa, dyspepsia, and stomach complaints.
<i>Dæmia extensa.</i> Medahangu, S. Veliparatti, T.	<i>Asclepiadaceae</i>	Emetic, given as an expectorant in bronchitis.
<i>Datura fastuosa.</i> Attana, S.	<i>Solanaceae</i>	Roots used in bites from mad dogs; supposed to cure insanity; whole plant dried and smoked as tobacco for asthma.

Botanical and Native Name.	Natural Order.	Purposes for which used.
<i>Eclipta erecta</i> . Kikirindi, S.	<i>Compositac</i>	Used to purify the blood.
<i>Embelia Ribes</i> . Wal-embilla, S.	<i>Myrsinacac</i>	Bark and leaves acid and astringent ; taken for boils and skin diseases.
<i>Emilia sonchifolia</i> . Kadupahara, S.	<i>Compositac</i>	Used for cuts and wounds.
<i>Erythroxylum lucidum</i> , Bata kirilla, S.	<i>Linacacac</i>	Leaves chewed to expel worms, also to appease hunger.
<i>Feronia elephantum</i> . Diwul, S.	<i>Rutacacac</i>	Green fruit checks diarrhoea. Ripe fruit taken for throat and kidney affections.
<i>Ficus religiosa</i> . Bo-tree, S.	<i>Urticacacac</i>	Juice of bark used as mouth-wash for toothache and for strengthening the gums.
<i>Garcinia Cambogia</i> . Goraka, S.	<i>Guttiferac</i>	Bark and leaves for constipation ; also to heal cuts and wounds.
<i>Gynandropsis pentaphylla</i> . Wéla, S.	<i>Capparidacac</i>	Reputed cure for cobra-bite ; also used for earache, toothache, &c.
<i>Gynura pseudo China</i> . Ala-beth, Chena ala, Mul-beth, S.	<i>Compositac</i>	Tuberous roots largely used in cooling medicines, also for leprosy.
<i>Hemidesmus indicus</i> . Iranusu, S. Indian Sarasparilla.	<i>Asclepiadacac</i>	Root to purify the blood.
<i>Herpestis Monniera</i> . Lunuvila, S.		Whole plant used as a mild purgative for children ; also as fomentation for erysipelas and elephantiasis.
<i>Hibiscus micranthus</i> . Perumaddi, T.	<i>Mulvacacac</i>	A valuable febrifuge. (Trimen).
<i>Hydrocotyle asiatica</i> . Hin-gotu-kola, S.	<i>Umbelliferac</i>	A good tonic, chiefly for children. Puri- fies the blood, promotes digestion, and cures nervousness.
<i>Hygrophila spinosa</i> . Katu-ikiri, S.	<i>Acanthacacac</i>	Whole plant used in diabetes.
<i>Ipomoea Turpethum</i> . Trastawalu; S.	<i>Solanacacac</i>	Roots used in fever, dropsy, &c.; a good purgative.
<i>Ixora coccinea</i> . Ratambala, S.	<i>Rubiaccacac</i>	Flowers and bark used for bloodshot eyes ; leaves for sores, ulcers, &c.
<i>Lasia spinosa</i> . Kohila, S.	<i>Aracacac</i>	A common remedy for piles.
<i>Lasiosiphon eriocephalus</i> . Noha S.	<i>Thymelac- acacac</i>	Bark used externally.
<i>Limonia alata</i> . Tumpat- kurundu, S.	<i>Rutacacac</i>	Leaves and bark used in fomentations for rheumatic pains.
<i>Mimusops Elengi</i> . Munanal, S.	<i>Sapotacacac</i>	Bark used for decaying gums ; also for snake-bite.
<i>Modecca palmata</i> . Hondala, S.	<i>Passifloracacac</i>	Juice of the leaves and root used exter- nally for skin diseases. Fruit poi- sonous.
<i>Moringa pterygosperma</i> . Murunga, S. Horse-radish Tree.	<i>Moringacac</i>	Bark, leaves and root acrid and pungent ; juice taken internally to promote appetite and help digestion ; used externally as a rubefacient.
<i>Munronia pumila</i> . Bin-kohomba, S.	<i>Meliaccacac</i>	Whole plant very bitter, used in cases of debility and remittent fever. A good substitute for chiretta.
<i>Nelumbium speciosum</i> . Nelun, S.	<i>Nymphae- acacac</i>	Stem used in intermittent fever and dysentery. Stamens for bleeding piles and in parturition.

Botanical and Native Name.	Natural Order.	Purposes for which used.
Ocimum sanctum. Maduru-tala, S.	<i>Labiatae</i>	Fragrant and aromatic, used in decoctions for cough and catarrh, sometimes chewed as a substitute for betel.
Oroxylum indicum. Totila, S.	<i>Bignoniaceae</i>	Bark a bitter tonic; checks fever, diarrhoea, &c.
Phyllanthus Emblica. Nelli, S.	<i>Euphorbiaceae</i>	Fruits a cooling laxative, used in dyspepsia.
Piper Betle. Bulat-wel, S. Betle-leaf.	<i>Piperaceae</i>	Carminative and stimulant; a common masticatory.
Piper longum. Tippili, S.	..	Roots and dried flower-spikes used in cough, hoarseness and dyspepsia.
Plectranthus zeylanicus. Iri-variya, S.	<i>Labiatae</i>	Whole plant aromatic; used as a carminative, blood-purifier, &c.
Plumbago coccinea. Rat-netul, S.	<i>Plumbaginaceae</i>	Roots commonly used for producing abortion.
Pongamia glabra. Magul-karanda, S.	<i>Leguminosae</i>	Root used as a tooth-brush. Juice of root-bark used for sores, &c.
Punica granatum. Delun, S.	<i>Lythraceae</i>	Fruit rind used for diarrhoea. Leaves boiled and used as eye-wash.
Randia dumetorum. Knkuruman, S.	<i>Rubiaceae</i>	Root used for diarrhoea and biliousness.
Ricinus communis. Endaru S. (Castor Oil.)	<i>Euphorbiaceae</i>	Oil commonly used as a purgative.
Saccharum officinarum. Sugar-cane.	<i>Gramineae</i>	Juice commonly used in decoctions.
Sesamum indicum. Wal-tala, S.	<i>Pedaliaceae</i>	Oil used for cooling the body. Seeds pounded with jaggery purify the blood.
Solanum indicum. Tibhatu, S.	<i>Solanaceae</i>	Used for catarrhal fever, asthma, &c.
S.—xanthocarpum. Ela-batu, S.	..	
Spilanthes Acmella. Akmella, S.	<i>Compositae</i>	Leaves and flowers used for toothache and sore throat, also to check diarrhoea of women at child-birth.
Strychnos Nux-vomica. Nux-vomica. Goda-kaduru, S.	<i>Loganiaceae</i>	Bark and seeds used as a tonic in nervous debility, rheumatism, &c.
S.—potatorum. Ingini, S.	..	
Tamarindus indica. Tamarind. Syambala, S.	<i>Leguminosae</i>	Tender leaves used as poultices for boils, also as fomentations; seeds for chronic diarrhoea.
Tephrosia purpurea. Pila, S. Kavilai, T.	..	Common village medicine for children (Trimen).
Terminalia chebula. Aralu, S.	<i>Combretaceae</i>	Bark of nut good for fever, asthma, chronic diarrhoea, heart and skin diseases.
T.—belerica. Bulu, S.	..	Nuts very astringent, used in eye diseases, &c.
Tinosperma cordifolia. Rasa-kinda, S.	<i>Menispermaceae</i>	Stem used in fever, skin disease, jaundice, and syphilitic affections.
Trichosanthes cucumerina. Dummella, S.	<i>Cucurbitaceae</i>	Roots used for expelling intestinal worms, leaves and stems for bilious disorders, cutaneous diseases, and as an emmenagogue.
Vernonia anthelmintica. Sann-nayan, S.	<i>Compositae</i>	Used in fever with convulsions, &c.

Botanical and Native Name.	Natural Order.	Purposes for which used.
V.—cinerea. Monara-kudumbia, S.	<i>Compositae</i>	Wounds and sores; used internally to promote perspiration.
Vitex Negundo. Nika, S.	<i>Verbenaceae</i>	Leaves, bark and root used in toothache and rheumatism, in eye diseases, as a tonic, carminative, and vermifuge.
Withania somnifera. Amukkara, S.	<i>Solanaceae</i>	Used for cough and asthma.
Zingiber officinale. Inguru, S. Ginger.	<i>Scitamineae</i>	A well-known stimulant, stomachic, and aromatic, used in indigestion and fever.

EDIBLE HERBS, &c., COMMONLY USED AS FOOD
IN CEYLON BY THE
POORER NATIVES, BUT NOT CULTIVATED.

S.=SINHALESE; T.=TAMIL.

Botanical and Common Name.	Natural Order.	Parts used.
Acalypha indica. Kuppamaniya, S.	<i>Balanophoraceae</i>	} Leaves.
Achyranthus aspera. Gas-karal-heba, S.	<i>Amaranthaceae</i>	
Acrosticum aureum. Kerè-koku, S.	<i>Filicaceae</i>	Tender fronds
Ærva lanata. Polkudu-pala, S.	<i>Amaranthaceae</i>	Stems and leaves
Allmania nodiflora. Kumatiya, S.	"	Leaves
Alternanthera triandra. Mukunu-wenna, S.	"	} Tender stems and leaves.
Amarantus gangeticus. Sudu-tampala, S.	"	
A.—polygonoides. Kura-tampala, S.	"	
A.—spinosus. Katu-tampala, S.	"	"
Aponogeton crispum. Kekatiya, S.	<i>Naiadeae</i>	Tuberous roots
Argyrea populifolia. Giritilla, S.	<i>Convolvulaceae</i>	Tender leaves
Asparagus falcatus. Hatawariya, S.	<i>Liliaceae</i>	Young shoots and roots
Asplenium esculentum. Miwana-kola, S.	<i>Filicaceae</i>	Tender fronds
Boerhaavia diffusa. Petasudupala, S.	<i>Nyctaginaceae</i>	Leaves
Cassia occidentalis. Peni-tora, S.	<i>Caesalpiniciaceae</i>	} Leaves and flowers
C.—tora. Peti-tora, S.	"	
Celosia argentea. Kirihenda, S.	<i>Amaranthaceae</i>	Stem and leaves
Ceratopteris thalictroides. Kudamahuweralla, S.	<i>Filicaceae</i>	Succulent fronds
Commelina benghalensis. Diya-meveriya, S.	<i>Commelinaceae</i>	} Stems and leaves
C.—clavata. Girapala, S.	"	
Costus speciosus. Tebu, S.	<i>Scitamineae</i>	Tuberous roots
Cycas circinalis. Madu, S.	"	Pith (sago) from stem
Dregia volubilis. Kirianguna, S.	<i>Asclepiadeae</i>	Leaves
Gynandropsis pentaphylla. Wela, S.	<i>Capparideae</i>	Leaves
Hibiscus furcatus. Napiritta, S.	<i>Malvaceae</i>	Tender leaves
Hydrocotyle javanica. Maha-gotukola, S.	<i>Umbelliferae</i>	Stalk and leaves
Impatiens flaccida. Kudalu, S.	<i>Geraniaceae</i>	Stem and leaves
Ipomœa aquatica. Kankun, S.	<i>Convolvulaceae</i>	" "
And other species of Ipomœa.	"	" "
Klugia notoniana. Diya-nilla, S.	<i>Gesneraceae</i>	Leaves

Botanical and Common Name,		Natural Order.	Parts used.
<i>Lasia spinosa</i> .	Kohila, S.	<i>Araceae</i>	Tender leaves
<i>Leucas zeylanica</i> .	Geta-tumba, S.	<i>Verbenaceae</i>	Leaves
<i>Lippia nudiflora</i> .	Herimenakola, S.	"	"
<i>Marsilea quadrifolia</i> .	Diya-embul-embeliya, S.	<i>Rhizophoraceae</i>	Stalk and leaves
<i>Monochoria hastaeifolia</i> .	Diya-habarala, S.	<i>Pontederiaceae</i>	Tender stalk and leaves
<i>Nasturtium officinale</i> .	Kakutu-pala, S.	<i>Cruciferae</i>	Stems and leaves
<i>Nelumbium speciosum</i> .	Nelun, S., Tamarai, T.	<i>Nymphaeaceae</i>	Seeds
<i>Nymphœa lotus</i> .	Olu, S.	"	"
<i>Oxalis corniculata</i> .	Hin-embul-embiliya, S.	<i>Geraniaceae</i>	Stalk and leaves
<i>Pandanus odoratissima</i> .	Rumpi, S.	<i>Pandaneaceae</i>	Young leaves for flavouring.
<i>Polypodium quercifolium</i> .	Baindaru, S.	<i>Filicæe</i>	Young fronds in bud
<i>Portulaca oleracea</i> .	Genda-kola, S.	<i>Portulacaceae</i>	} Stems and leaves
<i>P.—quadrifida</i> .	Hin-genda-kola, S.	"	
<i>P.—tuberosa</i> .	Urugenda-kola, S.	"	} Tender fruits
<i>Solanum indicum</i> .	Tibbotu, S.	<i>Solanaceae</i>	
<i>S.—nigrum</i> .	Kalukanweriya, S.	"	Stem and leaves
<i>S.—Xanthocarpum</i> .	Ela-battu, S., Kandan-kathrikai, T.	"	Yellow fruits
<i>Typhonium trilobatum</i> .	Panu-ala, S.	<i>Araceae</i>	Tender leaves.

EDIBLE FLOWERS IN THE TROPICS.

Various flowers are edible and relished in different countries, either for flavouring or as an article of food. In Europe violets, primroses, pot-marigolds and other flowers are eaten as salads or in preserves, while in other countries rose-buds are esteemed in preserves, &c. The following are some of the principal flowers used for food in tropical or sub-tropical countries:—

Abutilon esculentum.—Flowers commonly eaten as a vegetable in Brazil.

Banana.—Young flower heads commonly eaten as a vegetable in Ceylon, &c.; used also in China for pickling.

Bassia latifolia. Illipi; Mahwa; Butter-tree. }
B.—longifolia. "Mee." S. }
 (In India the fleshy flowers of both species, produced in February, are dried and eaten by the Natives; the average yield per tree being estimated at 200 lbs.)

Bombax malabaricum. Red cotton-tree.—The fleshy calyces of the large red flowers, collected as they drop during January and February, are much relished as a curry vegetable by the Burmese.

Calligonum polygonoides. Phogalli.—Flowers eaten in Northern India, being made into bread, or cooked with butter.

Hibiscus Sabdariffa. Rozelle.—Cultivated for the fleshy persistent enlarged calyces, which are used for flavouring and for making jelly.

Lilium Thunbergi.—The flowers of this lily form a choice culinary delicacy in China.

Sesbania (Agati) grandiflorum.—In Ceylon the flowers are much relished when boiled or fried.

CHAPTER XXVII.

ENEMIES AND FRIENDS OF GARDENS AND ESTATES.

GARDEN AND ESTATE ENEMIES:—

Besides destructive insects, there are numerous animal pests which the cultivator of the soil has to contend against in the tropics. The following are the principal enemies in Ceylon which come under this head.

Squirrels.—These are sometimes very destructive in the low-country to fruits and edible seeds. They do considerable damage to Cacao pods, Mango fruits, Pineapples, &c., also to Rubber nurseries by picking out and cracking the seed. Shooting, or driving them away is about the only practical remedy, unless recourse is had to poisoned baits.

Rats are very destructive, especially to Coconuts and root-crops. Baits poisoned with arsenic is perhaps the best way of extirpating them. They may be prevented from climbing coconut palms and other trees by nailing a piece of tin, about 10 to 12 inches wide, on to the trunk of the tree.

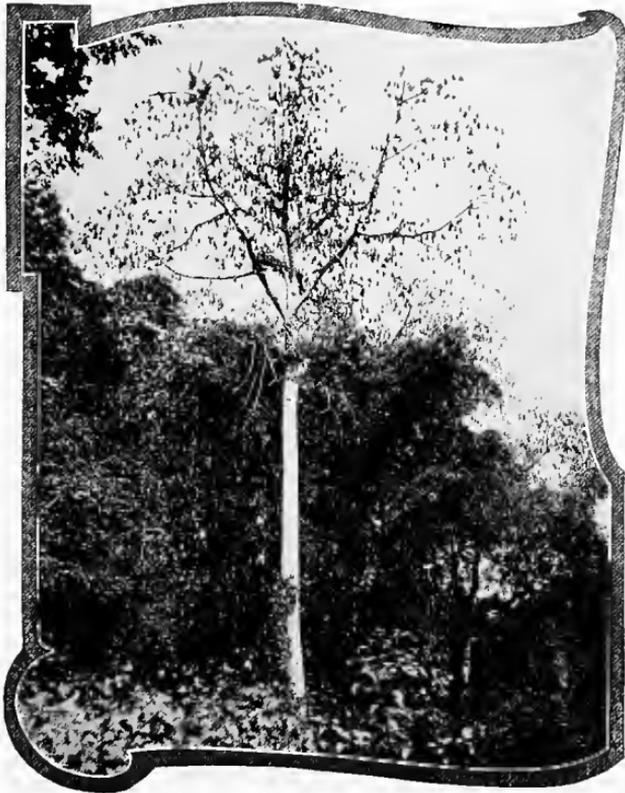
Hares.—These, where they abound, do considerable damage in a garden. A fence of wire-netting is the best protection against them.

Civet-, and palm-cats.—These are sometimes destructive to fruits, especially pineapples. Watching for them at night and shooting them is perhaps the most effectual remedy. The native watcher lures these animals by means of a light carried on his head; the light dazzles the cats and enables the watcher with his gun to come close up to his game.

Deer or elk.—In the Hill districts these sometimes do a great deal of damage by browsing on all tender plants that come within their reach. A substantial wire fence of about six strands serves as a barrier against them.

Porcupines.—These constitute perhaps the worst animal pest at Hakgala and other up-country gardens. They root up bulbs and

tubers of every description, doing serious damage in a single night. Poisoning and entrapping are the usual methods adopted for their destruction, but these appear to be seldom effectual. Spring-guns are apparently more effective, and Mr. Green, Government Entomologist, mentions that "one beast which defied all my efforts for months, fell a victim to a spring-gun the very first night it was set."



FLYING FOXES

Seen suspended from every branch, with their feet upwards, having completely defoliated the tree.

Cattle.—Trespassing cattle, in many places in the low-country, are a most troublesome nuisance. Nothing short of a barbed-wire fence or a solid wall forms an effective barrier against them. Impounding when caught trespassing may tend to greater vigilance on the part of their owners.

Flying-foxes.—These are often an annoyance in the low-country. They commit their depredations on ripening or fleshy fruits by night. A net is the only safeguard against them. Continuous firing at them with a gun drives them away for a time.

Crows are sometimes formidable enemies to bulbs and certain young plants. The usual protective means is to shoot one occasionally, and hang it up where it is desired to scare others. It may sometimes be necessary to protect the plants or seeds with a net. A method adopted in California to prevent crows from attacking corn or maize seed is to dip the seed in tar before sowing. (See *Journal of Economic Entomology*, Aug. 1909).

Sparrows and other birds.—Where these abound in great numbers they are a most destructive pest. They have a special fondness for tender annuals, and in a short time will do considerable damage by clearing off young seedlings. Stringing the seed-beds or rows with black cotton often has the effect of scaring them off, but nets are about the only reliable protection against them. In the case of seed-beds, it is recommended to dress the seeds, before sowing, with red-lead made into a thin paste with water. Among other birds, Mr. Green gives the following as the principal grain feeders: Weaver Bird (*Ploceus philippinus*), Black-bellied Munia (*Munia Malacca*), Spotted Munia (*Munia punctata*), White-backed Munia (*Munia striata*), Brown Munia (*Munia malabarica*). Ceylonese Lorikeet (*Loriculus indicus*), Alexandrine Parakeet (*Palæornis eupatrius*), Rose-ringed Parakeet (*Palæornis torquatus*).

Thieves.—These form a pest against which constant watch has to be kept. Unlike the other pests named, their depredations are not confined to edible products, but include anything movable. Unfortunately catching in the act, followed by suitable punishment, is not always an effectual deterrent. Fruit crops especially, such as Coconuts, Cacao, &c., are liable to attack by night thieves, and the employment of night watchers is therefore indispensable. Dried coconut leaves tied round the stems of the trees, as is often adopted in the low-country, give a loud rustling noise if a person attempt to climb the latter, and so give a warning of the presence of pilferers.

GARDEN AND ESTATE FRIENDS.

Injurious insects, fortunately, have natural enemies which usually keep them in check. These should be encouraged, and may sometimes be introduced with success when not already present. The following are among the worst enemies of insects, but the best friends of gardens and estates.

Insectivorous birds.—These play an important part in the prevention of insect pests by feeding on grubs, caterpillars, &c. It has been estimated that one bird will consume at least fifty

caterpillars a day, so that a family of five would account for 250. Mr. Green, the Government Entomologist, gives the following as among the more useful insectivorous birds in Ceylon : “(1) The Common Hawk Cuckoo (*Hierococcyx varius*), (2) Blue-Tailed Bee-Eater (*Merops philippinus*), (3) Black Drongo (*Buchanga atra*), (4) Ceylonese White-Bellied Drongo (*Buchanga leucopygialis*), (5) Grey-Headed Flycatcher (*Culicicapa ceylonensis*), (6) Magpie Robin (*Copsychus saularis*), (7) Grey-backed Titmouse (*Parus atriceps*), (8) Common White-eye (*Zosterops palpebrosa*), (9) Ceylonese White-eye (*Zosterops ceylonensis*), (10) Ceylon Myna (*Acridotheres melanosternus*), (11) Black Crow (*Corvus macrorhyncha*). Number 1 feeds principally upon caterpillars. Numbers 2 to 9 are generally insectivorous. The larger species may often be observed taking toll of the winged termites when these are in flight. Numbers 10 and 11 frequent cattle and help to rid them of biting flies and ticks.” The scarcity of bird-life in the higher districts of Ceylon has often been commented on, and has been attributed, among other causes, to the felling of extensive tracts of forest land for growing tea, &c. One of the best means of encouraging the increase of birds is to extend the growth of trees or shrubs which produce fruit for bird food, such as *Aberia* or Ceylon Gooseberry, *Antidesma*, *Bridelia*, *Duranta*, *Eugenia* (different species), *Ficus* (several species), Guava, Lovi-lovi, Mulberry, Wampi, Lantana, &c.

Carnivorous insects.—In maintaining the balance of insect life in Nature, there occur in different countries various insects of carnivorous habits, and these may as a rule be regarded as the friends of the cultivator. Among the most beneficial of such check-insects are the Lady-bird beetles (*Vedalia*), which subsist on scale bugs, &c.

Pollinating insects.—In the cultivation of fruits, flowers and vegetables, bees play an important part; they carry the pollen from one flower to another, thus ensuring the fertilisation or cross-fertilisation of the plants, and thereby making fruit or seed more plentiful than would otherwise be the case. A large number of plants are wholly dependent on insects for the fertilisation of their flowers. Mr. Green, Government Entomologist, informs me that the cultivation of the Smyrna Fig, which is dependent on the Fig insect (*Blastophaga*) for the fertilisation of its flowers, has within recent years been successfully established in the United States, owing to the artificial introduction of this insect.

Frogs and Toads.—These are most useful creatures in the garden for destroying injurious insects. In Europe and America

toads are often especially protected and encouraged to multiply for the purpose of consuming beetles, snails, wireworms, weevils, and other destructive insects. It is said that in England the value of toads in gardens is now so well recognised that a high price is sometimes paid for them for colonising purposes.

Lizards of all sorts are beneficial as well as interesting creatures in a garden. They feed mainly on beetles, grubs, &c., and therefore should be encouraged to multiply.

Rat-snakes are somewhat of a mixed blessing, most people having a repulsive feeling against all snakes. Yet rat-snakes in particular, which are harmless, are very destructive against rats.

NOXIOUS WEEDS AND MEANS FOR THEIR DESTRUCTION.

Weeding enters largely in the economy of garden and estate work in the tropics. Any plant deemed a weed in a garden should, of course, be suppressed as far as is practicable. On estates, however, the proper degree of weeding and the best system of carrying it out are disputed points.

Most planters believe in *clean-weeding*, while few will deny the merits of any system which secures the suppression of rampant weeds, until at least the crops are well established and have gained a mastery over these. In the case of tree-crops, as Coconuts, Rubber, &c., weeding becomes less necessary as the trees cover the ground, but even then certain noxious weeds are liable to assert themselves if not kept in check. The benefit of weeding does not consist wholly in preventing useless plants from using up the food which should go to the crops; the operation ensures tillage and aeration of the soil, and when the weeds are buried they serve as a green-manure. Therefore in this, and perhaps



COMBINED WEED-FORK
AND HOE.

in other respects, weeds have sometimes a redeeming feature. On steep land certain weeds serve to bind the soil, as in the case of Oxalis; while others, as Lantana, occupy waste and impoverished land and in course of time enrich it considerably with humus.

On estates in Ceylon, the usual system of performing the weeding is to lease out certain areas on contract to the kanganies (headmen of the labour force). The amount paid depends on local

conditions and the nature of the crop; thus Re. 1 to Rs. 2 a month per acre is about the usual contract price for weeding established Tea, but on new clearings the cost of keeping down weeds may vary from Rs. 3 or Rs. 6 per acre. It is estimated that the average cost of weeding Tea fields in Ceylon ranges from 2 to 3 cents per lb. of made tea.



DUTCH HOE.

Green-mannring). The following have been more or less successfully used in Ceylon as ground-cover for checking and destroying weeds: *Passiflora foetida* (creeper), *Mikania scandens* (creeper), *Ipomœa spp.* (creepers), *Commelina nudiflora* or "Girapala," S. (creeping annual), *Crotalaria*, &c. See under *Green-mannring*.



A WEEDING FORK.



A WEEDING SCRAPER.

The most effectual means of exterminating deep-rooted or tuberous weeds, as the pestiferous Lalang of the Straits and the Oxalis of up-country districts in Ceylon, is to starve out the roots by persistently cutting down the leaves and preventing the plants from seeding. The same effect may

be obtained by placing a layer of mana-grass or other covering over the infested ground. According to an old maxim, as showing the importance of preventing weeds from seeding:—

One year's seeding,
Is seven years' weeding.

In some cases, as in Coconut cultivation, it is possible to keep down weeds by grazing cattle, which also benefit the land by their manure.

Poison weed-killers.—Destroying weeds by means of poisons or weed-killers is not practicable among crops, except perhaps on young clearings. Bamber recommends nitrate of soda for killing out weeds on young Rubber clearings, when it is impossible to eradicate these by ordinary means. For roads, paths, railway tracts, tennis courts, compounds, &c., poison weed-killers can however be efficiently applied. Of commercial weed-killers, there are various kinds, some in powder form, others in liquid. Those consisting of compounds of carbolic or arsenic are the most effective, but other substances, as sulphate of copper, kerosine, common salt, &c., are also sometimes used for the purpose with more or less success. Arsenate of soda has in some cases been found effectual in destroying troublesome weeds, and Mr. Bamber has recommended it against "Iluk" (*Imperata arundinacea*) and "Nut-grass" or "Kori-grass" (*Cyperus rotundus*), two of the most noxious weed-pests in Ceylon. Where a commercial weed-killer is not available, for use as above suggested, any of the following mixtures may be employed:—(1) Mix one oz. carbolic acid with one gallon



A DRAW-HOE.

water, and apply through the rose of an ordinary watering can. (2) Take one part kerosine to three of boiling water, and emulsify with soap. (3) Dissolve one lb. common salt in one gallon of boiling water, and apply as hot as possible through the rose of a watering pot, at the rate of one gallon to every two square yards of weedy surface. (4) Take 9 lbs. white arsenic and 3 lbs. washing soda, boil in one gallon of water till dissolved. For use add half pint of solution to one gallon of water. In using poisonous weed-killers gloves should be worn to prevent contact with the skin; care should be taken to keep the solution clear of clothes and boots, whilst going too near grass verges, plant-edgings, &c. must also be avoided.

Water weeds, scum on ponds, &c.—The question of dealing with aquatic weeds frequently confronts one in the tropics, and in some cases involves very large expenditure of money. For submerged weeds, removal by hand or mechanical means is the only effectual way of dealing with them. Certain floating weeds

may, however, be destroyed by spraying with a solution of sulphate of copper, say 1 lb. sulphate to a gallon of water. In America, the Bordeaux Mixture has been used with good results on weeds of this nature, the solution being sprayed on the surface, if necessary at intervals of a few days or weeks. It is said that if the solution is not used very strong, it will not injure any fish that may be in the water. A small quantity of copper sulphate placed in a sack, and dragged back and fore on the surface, is sometimes successful in destroying certain water-weeds, but experiments with this method at Peradeniya did not prove effectual for such submerged weeds as *Hydrilla* and *Limnanthemum*.

TABULAR LIST OF THE PRINCIPAL NOXIOUS WEEDS OF CEYLON.

[° Indigenous to Ceylon ; † worst weeds amongst crops].

Botanical Name.	Common Name.	Locality where chiefly troublesome.
† <i>Ageratum conyzoides</i>	Hulantala, S. Goat-weed.	2,000 to 4,000 feet.
<i>Aloe vera</i> , var. <i>littoralis</i> .	Katalai T.	Dry region, sea coast.
† <i>Artemisia vulgaris</i> .	Wal-kolundu, S.	1,000 to 4,000 feet.
* <i>Bidens pilosa</i> var. <i>bipinnata</i> .	Wal-te-kola, S. Spanish Needle.	Throughout moist region, cultivated ground.
* <i>Amaranthus spinosus</i> .	Kalu-tampala, S.	Semi-dry region.
* <i>Cassia mimosoides</i> .	Bin-siyambala, S.	Low-country.
<i>Chenopodium ambrosioides</i>	(Introduced.)	3,000 to 5,000 ft. wet districts.
† <i>Cyperus rotundus</i> .	Kalanduru, S. ; Kori, T., Nut-grass.	Moist low-country up to 2,000 ft.
* <i>Elephantopus scaber</i> .	Et-adi, S; Elephant's Foot.	Low-country, lawns and pasture.
† <i>Erigeron linifolius</i> .	Alavanga-weed.	2,000 to 6,000 feet.
<i>Galinsoga parviflora</i> .	(Introduced.)	2,000 to 5,000 ft., cultivated ground.
† <i>Gnaphalium multiflaue</i> .	Wild mignonette.	5,000 to 6,000 feet.
* <i>Halopyrum mucronatum</i> .	Couch-grass.	4,000 to 6,000 feet.
* <i>Hydrilla ovalifolia</i> .	Colombo Lake weed	Up to 2,000 feet.
† <i>Imperata arundinacea</i> .	Illuk, Lalang.	Moist low-country, under 2000, ft.
<i>Lagascea mollis</i> .	(Introduced.)	About Kandy, Teldeniya, &c.
<i>Lantana aculeata</i> .	Katu-hinguru S ; Lantana Weed.	Low-country up to 3,000 ft.
* <i>Leucas zeylanica</i>	Tumba, S.	Low-country, waste ground.
* <i>Limnanthemum indicum</i> .	Olu, or Maha-ambalu, S.	Ponds and streams up to 1,500 ft.
* <i>Loranthus</i> , 6 species	Pilali, S ; Kuru-vichai, T.	Low-country.
* L. ———, 3 " }		Dry region.
* L. ———, 7 " }		Montane zone.
* <i>Mikania scandens</i> . (Climber)	Mikania Weed.	Low-country generally.
<i>Mimosa pudica</i> .	Sensitive-plant.	" "
<i>Opuntia Dillenii</i> .	Katu-patuk, S.	Dry region.

Botanical Name.	Common Name.	Locality where chiefly troublesome.
† <i>Oxalis corniculatus</i> .	Hin-embul-embiliya, S.	2,000 to 5,000 ft., wet region.
† <i>O.</i> — <i>violacea</i> .	Manick-wattie Weed.	3,000 to 5,500 ft. ..
* <i>Portulaca oleracea</i> .	Genda-kola, S ; Pulik-kirai, T.	Low-country, cultivated ground.
<i>Sonchus aspera</i> .	Sow-thistle.	Medium elevations, cultivated ground.
<i>Solanum indicum</i> .	Tibbatu, S.	Up to 5,000 feet., waste ground.
<i>Synedrella nodiflora</i> .	(Introduced.)	Bentota, Peradeniya, &c.
<i>Tridax procumbens</i> .	..	About Kandy and Peradeniya 1,600 ft.



CHAPTER XXVIII.

INSECT PESTS.

The extent of the destruction to crops by various insect pests in different countries is incalculable. According to a recent return issued by the United States Agricultural Department, the direct and indirect yearly losses caused by insects, in that country alone, amount in the aggregate to the enormous total of over 700,000,000 dollars (£140,000,000). The loss to Tobacco crops is put down as 5,000,000 dollars, to Cotton 30,000,000 dollars and to Apple crops, 20,000,000 dollars. Though Ceylon possesses a large variety of insect life, it has practically no insect-pest, on the authority of Mr. Green, of an alarming nature as compared with some other countries. Spasmodic outbreaks are, however, liable to occur here as elsewhere, and it should always be remembered that prevention is better than cure. There are many simple precautions which are sufficiently obvious to anyone who practises agriculture or horticulture intelligently, and the following, briefly stated, may afford a guidance, being more or less adaptable according to the nature of the crops or local circumstances. It should not be forgotten that proper rotation of crops, a system of intercrops, green-manuring, good cultivation, or the application of certain fertilisers (as kainit, nitrate of soda, &c.), all have the most beneficial effect in the suppression of insect pests. Finally it should be remembered that one of the most important safeguards against insect pests or fungus diseases is in many cases to maintain a vigorous condition of the plants or crops cultivated. Thus in reference to shot-hole borer (perhaps the most troublesome pest of Tea in Ceylon) Mr. Green has stated: "I have repeatedly observed that a vigorous condition of the plant results in a tendency to choke out the insects. The mouth of the tunnel is invaded by an ingrowth from the vigorous cambial tissues. New wood is then formed, covering up the old wound, and the plant is able to carry on all its functions without interruption. The object of the planter, therefore, should be to induce by suitable pruning and cultivation such a vigorous condition that the damage is automatically and continuously repaired."

PREVENTIVE OR REMEDIAL MEASURES.

Handpicking is recommended by Mr. Green whenever practicable, as in the case of borers, large caterpillars, &c. ; these may be killed when collected by dropping them into diluted kerosine oil, boiling water, or in a pot of tar.

Light traps and Smoke.—Lights are useful traps for certain insect pests, especially such as fly at night. *Acetylene lamps* are thus used with good effect in the vineyards of Europe as a means of catching moths and other injurious insects. The method adopted is to set the lamps out at night (preferably on dark nights) at distances of about 500 yards apart. The insects are attracted in swarms by the flame, and are killed in a weak solution of kerosine which is placed in a shallow basin adjusted a few inches below the burner. In a similar way an ordinary *kerosine lamp* with reflectors, hung over a broad tray containing jaggery and water, or water with a film of kerosine, may be used for catching cockchafers, moths, ants and other insects. *Smoke from fires* is a deterrent to some insects, and is sometimes recommended for such as attack Rice and other dense crops.

Rolling pasture-land, net-dragging, &c.—For caterpillar pests in rice fields and such like, Mr. Green recommends wooden-rollers to be drawn over the pasture land in the neighbourhood if practicable. The use of a bag or a net dragged over the ground is also advised by Mr. Maxwell Lefroy, thus :—“ A bag can be made to suit all circumstances ; with a width of about 12 feet and an opening 3 feet high or less, it is attached to the frame of bamboos, and a single man draws it between the rows of crops, along grass strips, or in any narrow places. The simplest pattern has only two upright bamboos to hold open the sides ; a better one has four bamboos, the two cross ones with projecting handles, and this pattern closes up automatically at the end of each sweep. In some cases it is desirable to smear the inside of the bag with oil or tar to catch the insects as they fly in.”

Parasitic fungus remedy.—Locusts or grass-hoppers and beetles are sometimes successfully destroyed by means of a parasitic disease ; this is distributed by inoculating live locusts or beetles, which on being let loose spread the disease amongst their fellows with fatal results.

Trap crops, vegetation belts, &c.—A successful way of warding off an attack by insects of an omnivorous nature, is to sow a quick-growing crop intermixed with the main crop ; thus the former, furnishing food for the insects, will detract their attention from the

latter. Locusts are sometimes destroyed in large masses by planting belts of quick-growing shrubs (such as the Castor-oil plant), which at the season of the locust attack are heavily poisoned by a strong insecticide, such as arsenic compounds.

Insect traps.—Trenches or holes cut in the earth are sometimes found to be successful as traps for caterpillars, which, falling into these at night, are unable to climb out again, and may then be collected and destroyed. Empty jam tins sunk level with the surface soil will form good pitfalls. Also large leaves or pieces of cut vegetation laid on the ground form useful traps, as many injurious insects will hide under these during part of the day, especially in the early morning, when they should be looked for and destroyed.

Mechanical protection against insect pests.—In spite of all precautionary measures it is often necessary, especially in up-country gardens, to protect young tender seedlings by placing a tin cylinder around each plant until it has outgrown its liability to be attacked by grubs, &c. These tin “collars” may be obtained locally at about Rs. 2 per hundred. Empty jam and condensed-milk tins, or even a roll of stout paper, may also be used successfully for the purpose.

Plants as insect-preventives.—Certain plants have the reputation of possessing properties which drive away insects. Thus tomato leaves are, in some countries, spread around young tender plants, and by reason of their strong odour are supposed to afford protection from injurious insects. *Acorus calamus* (“Wadakaha”) and several species of *Alocasia* (“Habarala”) are considered to be effective against termites (white-ants). Thus Mr. Ridley, Director of Botanic Gardens, Singapore, mentions that the roots of the former plant “are pounded to powder, spread around the base of trees attacked by white-ants, when all the latter will die” (see *Straits Agricultural Bulletin* for 1904). Cultivators of market gardens up-country use the chopped-up leaves of the “Wild Lobelia” or “Kiri-bamboo” (*Lobelia nicotianifolia*) as a protection from the destructive black-grub, while in the low-country tobacco leaves are considered by some to have a deterrent effect on certain insects.

USEFUL INSECTICIDES.

Insecticides act in two ways; viz., as a *stomach poison* when taken internally by the insect with its food, or as a *contact poison* in the case of insects which obtain their food by sucking, as bugs generally. Some contact poisons also kill by *asphyxiation*, i.e., by forming a coating around the insects and thus prevent their

breathing ; scale insects are affected chiefly in this way. Generally speaking, the remedies for aphid (green-fly, &c.), are in the nature of a *contact poison*, as emulsions, tobacco juice, &c., while for beetles, caterpillars and grasshoppers *stomach poisons*, such as Paris Green, London Purple, &c., are more effectual. Insecticides in liquid form (with water) may be applied by a fluid sprayer or syringe capable of emitting a fine spray or mist that distributes the liquid evenly over the whole plant ; while those in the form of powder mixed with lime, dust, flour, &c., may be dusted from a powder-sprayer or bellows.

Arsenate of Lead. (Sugar of Lead).—This compound is considered to have special advantages over "Paris Green" ; it is much lighter than the latter, does not scorch the foliage, and can therefore be used more freely. Satisfactory results have been obtained by using from 1 to 2 lb. of arsenate of lead to 150 gallons of water. The following formula is recommended :—Acetate of lead $2\frac{3}{4}$ oz., arsenate of soda 1 oz., water to make up to 10 gallons. Place the materials in the water and stir till dissolved, when it is ready for use. One lb. of treacle may be added to render it adhesive.

Arsenate of Lime.—As a substitute for the above the following may be used :—1 lb. arsenic, 4 lb. washing soda, and 2 gallons water. Boil till dissolved. Make up to 4 gallons with water. Add one pint of the mixture to 4 gallons of water, and add to this 4 oz. lime.

Borer Wash:—1 pint crude carbolic or phenyle ; 2 lb. soft soap (or hard soap $2\frac{1}{2}$ lb.) ; 1 gallon hot water. Dissolve soap in hot water, stir in the carbolic or phenyle. Add ten gallons of water and enough clay to thicken it.

Carbon Bisulphide.—A highly volatile and inflammable clear liquid, the vapour of which is given off at a low temperature and is fatal to insect life. It is used successfully in the destruction of ground insect pests, where these are numerous or in colonies, as termites. The poison is best applied to termites' nests by saturating balls of cotton wool with it, and dropping one of these in each burrow, the latter being then quickly closed up. The vapour, being heavier than air, sinks to the bottom of the crevices and permeates the whole nest.

Caustic Soda.—A white solid substance, very soluble in water, acts as a caustic, is powerfully alkaline, and is deliquescent on exposure to the air. In temperate countries it is generally used in conjunction with potash as a spray fluid on dormant trees and bushes, when, in addition to cleansing the trees, it proves

destructive to many forms of insect life. The solution is made as follows:—Caustic soda, 1 lb.; soft soap, $\frac{1}{2}$ lb.; carbonate of potash 1 lb.; water, 10 gallons. Dissolve the soft soap in hot water, and add to cask or vessel containing 10 gallons of water in which the soda and potash have been dissolved.

Emulsions.—Kerosine, paraffin, petroleum, &c., in the form of emulsion afford one of the most effective insecticides known for sucking insects. Many formulas have been devised, but the following will serve all practical purposes:—Kerosine (paraffin or petroleum), 1 gallon; soft soap, 1 lb.; boiling water, 1 gallon. Dissolve soap in boiling water, and add, boiling hot, to the kerosine. Churn the mixture thoroughly until a cream-like emulsion is formed. This should thicken to a jelly on cooling, and adhere without oiliness to the surface of glass. The hotter the mixture, the easier the emulsion is formed. For use, add 1 part emulsion to 10 parts water. No form of emulsion should be applied to foliage during sunshine.

Gondal Fluid:—4 oz. gum*, 8 oz. asafoetida, 8 oz. bazaar aloes, 3 oz. castor cake. Mix well with water, add clay to thicken, and paint on the base of trees which are liable to be attacked by white ants or other insects. Gondal fluid is an Indian preparation and has been specially recommended by Sir George Watt as a preventive against white-ants on Tea bushes.

Hot water as an insecticide.—Up to a temperature of 170 or 200 degrees (Fah.) of heat, hot water will destroy many destructive insects without injuring their host plants. Even boiling water applied by a syringe will usually cool sufficiently between the syringe and plant to avoid injury to the latter, while it is still hot enough to kill the insects.

London Purple:—A fine powder arsenical preparation of similar use to "Paris Green," but generally considered to be less safe than the latter. It is a by-product obtained in the manufacture of aniline dyes.

Paris Green.—Also known as "Emerald Green," "Mitis Green," and "French Green." A powerful irritant and poisonous compound of arsenic, copper, and sulphuric acid, which has the appearance of a fine powder with a clear green colour. Take one ounce of the powder and mix it in 12 gallons of water. Like other arsenite compounds, it should be applied in the form of fine spray, the liquid being meantime kept constantly stirred, and regulated in strength according to the nature of the plants sprayed.

* Gum of *Gardenia gummifera* is used in India.

Quassia.—A vegetable insecticide, consisting of the bitter active principle of the tree *Picraena excelsa*, which is fatal to many forms of sucking insects, particularly aphides :—Use quassia chips, 1 lb. ; soft soap, 1 lb. ; water, 10 gallons. Boil the quassia with half the soap and half the water for one hour, strain off the liquid and boil the residue for another hour with the remaining soap and water. Mix the whole together, and make up to 10 gallons with water. Never spray trees or plants bearing edible fruit or leaves with quassia, as it imparts a bitter taste not easily got rid of.

Resin or Rosin.—This enters into the composition of a valuable spray fluid which effectually destroys different forms of scale insects, and is suited to deciduous trees especially. It acts by depositing a covering over the insect, thus killing the latter by preventing its breathing. The following formula is recommended :—Resin, 4 lb., fresh oil (seal or train oil), 2 pints ; caustic soda, $1\frac{1}{2}$ lb. ; water, 10 gallons. Boil the first three ingredients mixed with water until the resin is dissolved, then make up to 15 gallons of water. Before using this solution it must be diluted with nine times its quantity of clear water. The wash is recommended in America for use against the "Sooty-mould" on Orange and other Citrus trees.

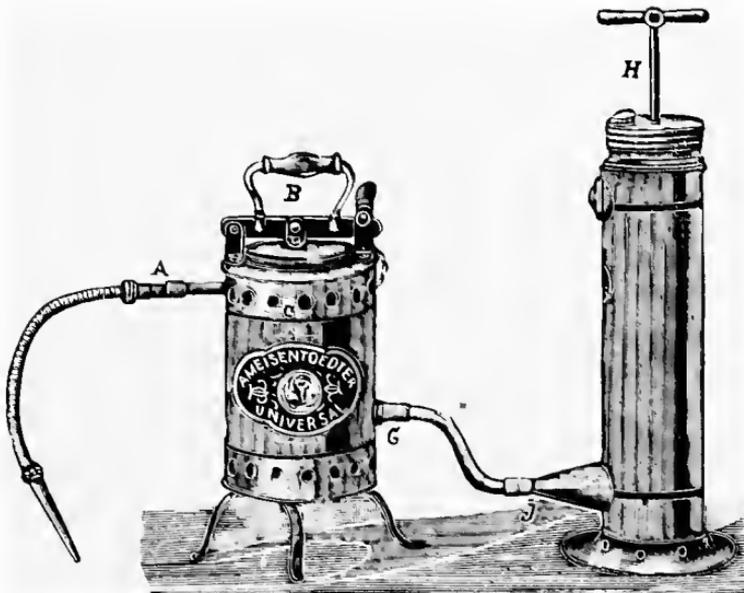
Tobacco Juice.—This is an efficacious insecticide (also a fungicide) for aphides, and is used largely in Europe, America, &c., more particularly in plant-houses. The juice when of the standard strength is diluted with 100 parts of water for spraying purposes. The plants should be sprayed after sunset, and syringed with clear water on the following morning. The juice may be prepared by soaking $\frac{1}{2}$ lb. common tobacco leaf to a gallon of hot water.

Tobacco-smoke is used chiefly for fumigating plants in glass-houses, being a powerful insecticide for certain insects. It is obtained by burning tobacco, or paper steeped in tobacco juice. More effective, however, than tobacco-smoke, and less harmful to tender plants, is the vapour caused by the heating of the newer Nicotine Vaporisers, such as the "X. L. All Vaporiser" and others, which are probably compounds of nicotine obtained from tobacco and alcohol. These are proprietary remedies, and directions for their use are issued by the manufacturers.

Vaporite.—A grey powdered preparation, called "vaporite," made by the Vaporite Coy., in London. It is one of the most efficacious of insecticides adapted for applying to the ground, giving off when mixed with the moist soil an insect-killing vapour. Vaporite destroys grubs, eelworms, millepedes, cockchafers, &c.,

in the soil, without apparently in any way injuring plant life. It may be obtained locally from Messrs. E. B. Creasy & Co., Colombo.

Quicklime.—Fresh air-slaked pure lime, especially coral lime, is of great value as an insecticide when dusted over the ground. It is also useful as a diluent of poisonous powders, and to a large extent in the preparation of some of the more active insecticides and fungicides to avert their caustic action on foliage. When quicklime is applied in the form of a wash or spray it leaves a coating over the part so treated, and thus probably prevents fungi from obtaining a footing on the leaves, &c.

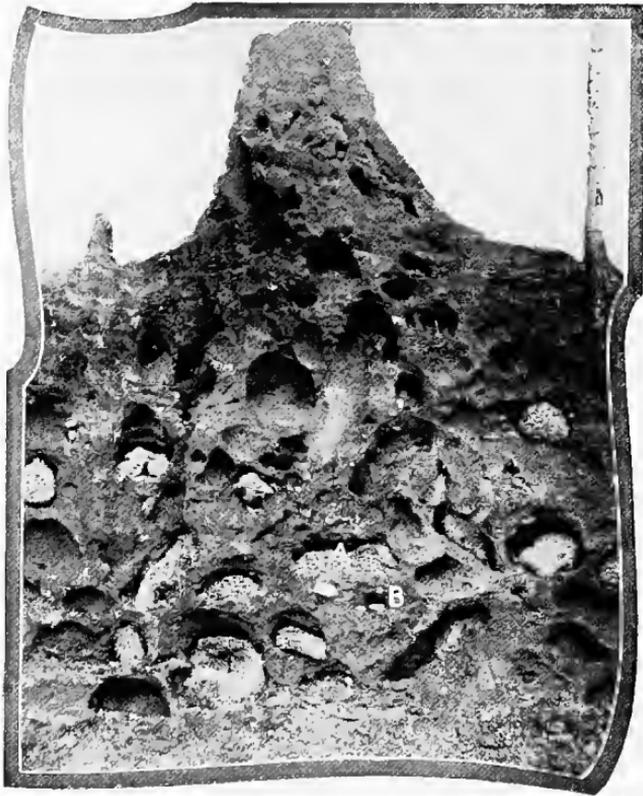


THE ANT EXTERMINATOR.

MEANS FOR DESTROYING TERMITES OR WHITE-ANTS.

The "Ant Exterminator." Of the various devices as yet adopted for destroying termites' nests, this is probably the best. It "consists," says the Government Entomologist, "of a small charcoal furnace in connection with an air-pump. Some glowing charcoal is placed in the furnace; a spoonful of the mixture (composed of white arsenic eighty-five per cent. and sulphur fifteen per cent.) is thrown on to the charcoal and the lid firmly clamped into position. A flexible nozzle (A) is pushed into the main entrance of the nest, and all supplementary holes are plugged with clay.

The pump (H) is then worked, and drives the vapour into the nests, forcing it into all the ramifications of the galleries. Little jets of smoke will soon arise from crevices and unsuspected openings for several yards round the main entrance. These should be immediately stopped with clay or pounded earth. After a few minutes of pumping, the nozzle may be withdrawn and the hole plugged with clay. The nest should remain undisturbed for a week, when the mound may be levelled. If opened immediately



A VERTICAL SECTION OF A WHITE-ANTS' NEST.

A.—Royal cell. B.—The queen termite.

after the application, some of the insects will revive. In some few cases there may be feeble signs of renewed activity, in which case a second application will complete the work of destruction; but this is seldom necessary."

Exploding termites' nests. The Government Entomologist in New South Wales recommends as follows: "Pour a little bisulphide of carbon down each hole, and throw a wet bag over the nest

immediately afterwards. Remove it in a couple of minutes, and apply a lighted stick over each opening. The fumes explode, wreck the nest, and burn all the ants beneath. The lighted stick should be 5 or 6 feet long to enable the operator to stand out of danger."

Poisonous baits for ants. Destroying termites and other ants by laying down poisonous baits has been often recommended. A mixture of arsenic, sugar, flour, tallow, &c., made into a paste, and strewn about in small pellets where the ants are troublesome is found to have a good effect in destroying these. Where it is dangerous to use arsenic, a syrup of borax may answer the purpose to some extent. A stiff dough made of "Paris Green" (one oz.), flour (3 lb.), and sugar (3 oz.), being formed into pellets and placed in holes near the plants, &c., attacked, has been found effective.

Preventives against white-ants, &c.—It is always advisable when sowing seed, planting out or transplanting plants in a locality which is subject to white-ants, to fork in with the soil a mixture which will act as a preventive against these destructive insects. Lime and sulphur, or lime alone, are recommended for the purpose, while Vaporite or carbolic disinfectant powder are found efficacious at Peradeniya. Watering the ground with a solution of Jeyes' disinfectant also acts as an excellent preventive, which is often adopted at Peradeniya in the case of rose beds, &c., in the Flower-garden. The smell of tar is obnoxious to insect life of all kinds, and water impregnated with tar may sometimes be applied to the ground with good effect. For painting on the base of trees as a preventive against termites, diluted tar and "Gondal Fluid" (See *Insecticides*) are used with good results.

FUMIGATING.

Destroying insect pests by means of fumes of poisonous gas, tobacco smoke, &c., is commonly adopted wherever plants are grown in closed structures, and also in the field where fruit-growing is practised on systematic lines. For cheapness, efficiency and facility of application, the hydrocyanic gas process of fumigating has been found to be the most satisfactory yet discovered. It is extensively practised in America for orchards as well as for general nursery stock, more especially against scale-insects, which are difficult to destroy by other means. The gas is a deadly poison, and the greatest care is needed in using it. It is generated from cyanide of potassium (or sometimes sodium cyanide) and sulphuric acid, and is fatal to insect or animal life by inhalation. When applied to trees or shrubs in the open, special collapsible

tents are used for the purpose of enclosing these. Small or movable plants may be treated in any stationary enclosure, provided it is sufficiently air-tight. An ordinary Wardian case with a capacity of about $7\frac{1}{2}$ cubic feet is used for the purpose at Peradeniya. The proportions recommended by Mr. Green for this are: $\frac{1}{4}$ oz. cyanide of potassium (90%), $\frac{1}{4}$ oz. sulphuric acid, and $\frac{1}{2}$ oz. water. Place the water in a small earthen-ware bowl; add the acid; drop in the cyanide, and close the case immediately, stopping up all crevices with wet clay to prevent the gas escaping. After the expiration of half an hour, open the case and leave it for several hours. The principle is the same when the process is applied on a larger scale. When fumigating plant-houses, the cyanide is usually wrapped in small paper bags, being thus dropped into the acid and water by means of a trap-door, which is released from outside by a string attached. The proper amount of cyanide to be used varies according to the nature of the pest and plants, but the proportions, as above stated, should always be approximately the same. Experts recommend four-fifths of a grain cyanide for every cubic foot of free space. It is considered by some that the water should be boiling when the acid is added (the cyanide being then dropped into it), but this does not appear to be essential. A necessary condition in any method of fumigating is that, contrary to spraying, the foliage be dry; otherwise the plants are liable to be injured. The plants should not be watered immediately before fumigation, neither should they be exposed to the sun for several hours after treatment. Fumigation should always be carried out only after sunset, unless the plants are in the shade under cover.

Spraying.—See *Fungus Diseases of Plants*.

TABULAR LIST OF COMMON INSECT PESTS OF CEYLON.

ARRANGED ACCORDING TO THE CROPS OR PLANTS ATTACKED.
ESTATE PRODUCTS :—

* Only brief and provisional remedies can be given here; these are omitted where more complicated treatment is required.

Host Plant.	Name of Insect.	Parts attacked.	* Brief remedies or preventive measures.
Albizzia	Case-, or Cadis-worms (<i>Psyche spp.</i>)	Leaves	—
	Caterpillar (<i>Terias sylhetana</i>).		—

Host Plant.	Name of Insect.	Parts attacked	° Brief remedies or preventive measures.
Annatto	"Mosquito Blight" (<i>Helopeltis antonii</i>).	Young shoots	Emulsion spray.
	Borer (<i>Arbela quadri-notata</i>).	Stem	Plug holes in bark with tar.
Cacao	Bug (<i>Helopeltis antonii</i>).	Fruit & young foliage	Emulsion spray.
	Pod-borer (<i>Dichocrocis punctiferalis</i>).		Collect & destroy affected fruits.
	White stem-borer (<i>Monohamus fistulator</i>).	Stem	Cut out and destroy attacked parts, and apply tar.
Camphor	Caterpillar (<i>Papilio clytia</i>).	Leaves	Spray with lead arsenate.
	Shot-hole Borer (<i>Scolytid sp.</i>).	Stem and branches	Cut out and destroy affected parts.
	Bug (<i>Ischnodemus uoculus</i>).	Foliage	Emulsion spray.
Cardamon	Pod-borer (<i>Lampides clpis</i>).	Fruit	---
	Root-borer (<i>Hilarographa caminodes</i>).	Rhizomes	Apply Vaporite to soil.
	Stem-borer (<i>Dichocrocis evaxalis</i>).	Stem	Cut out and destroy affected stems.
Castilloa-rubber	Mealy-bug (<i>Dactylopius crotonis</i>).	Young branches	Emulsion spray.
Castor-oil Plant	Bug (<i>Aleurodes sp.</i>).	Foliage	Emulsion spray.
Cinnamon	Caterpillar (<i>Arctia ricini</i>).	..	Lead arsenate.
Citronella-grass	Gall-mite (<i>Eriophyses boisii</i>).	..	Sulphur.
	Scale-bug (<i>Chionaspis graminis</i>).	..	Emulsion spray.
Coconut Palm	Red-weevil (<i>Rhynchophorus signaticollis</i>).	Stem and crown	} Collect and destroy.
	Black-beetle (<i>Oryctes rhinocerus</i>).	Crown	
	Black-headed caterpillar (<i>Nephantis serinopa</i>).	Foliage	Cut and burn infested fronds.
Coffee, Arabian and other kinds.	Green-bug (<i>Lecanium viride</i>).	..	Emulsion spray.
	Brown coffee-bug (<i>Lecanium hemisphaericum</i>).	..	..
	Coffee-borer (<i>Zenzera coffea</i>).	Stem and branches	Cut out and destroy infested parts.
	Cockchafer-grubs, various species.	Roots	Vaporite.
Cotton	Black-bug (<i>Lecanium nigrum</i>).	Branches	Emulsion spray.
	Cotton Stainers (<i>Disdercus cingulatus</i> , <i>Serineltha augur</i> , <i>Oxycaenus lugubris</i>).	Lint	Spread lint in sun.
	Pink Boll-worm (<i>Gelechia gossypiella</i>).	Pods	Destroy infested bolls.
	Mealy-bug (<i>Doclylopius virgatus</i>).	Foliage and young branches	Emulsion spray.
	Croton-oil Plant	Defoliator (<i>Amyua selcnampha</i>).	Foliage	Lead arsenate.

Host Plant.	Name of Insect.	Parts attacked.	* Brief remedies or preventive measures.
Ground-nut	Pod-borer (<i>Dorytus orientalis</i>).	Fruit	Vaporite.
	Leaf-miner (<i>Anacamptis uertaria</i>).	Foliage	Emulsion spray.
Hevea (see Para-rubber)			
Lagos Rubber (<i>Funtumia</i>)	Leaf-roller (<i>Capriua conchylalis</i>).	"	Lead arsenate.
Mahogany	Caterpillar (<i>Attacus atlas</i>).	"	"
Mulberry	Scale-bugs (<i>Aspidiotus aurantii</i>).	Branches	Emulsion spray.
Nutmeg	Flat-bug (<i>Lecanium expansum</i>).	Foliage	"
Para Rubber	Cockchafer-grub (<i>Lepidiota pinguis</i>).	Roots	Vaporite.
	Black-bug (<i>Lecanium nigrum</i>).	Foliage & young branches	Emulsion spray.
Pepper	Scale-bug <i>Lecanium marsupiale</i>).	Foliage	"
	" (<i>L. Peradeniyense</i>).	"	"
Rhea, or Ramie	Leaf-roller (<i>Sylepta sabiusalis</i>).	"	Lead arsenate.
Rice	Arrakkodian worm (<i>Spodoptera maurittia</i>).	"	Burn grass, &c. in vicinity.
	Paddy-bug, or Rice Sapper (<i>Leptocorisa acuta</i>).	Flower	Catch by hand, or by screens smeared with gum.
	Paddy weevil (<i>Catantopus oryzae</i>).	Grain	Naphthalin.
	Shot-hole Borer (<i>Xyleborus fornicatus</i>).	Branches	Cut out and destroy affected stems; burn prunings on field.
	White-ant or Termite (<i>Colotermes militaris</i>).	Live stems	See under <i>Insecticides</i> .
	Tea Bug, or "Mosquito Blight" (<i>Heteroptella antonii</i>).	Foliage	—
Tea	Tea-mites (<i>various species</i>).	"	Dust with sulphur.
	Nettle-grubs (<i>Limacodidae spp.</i>).	"	Hand-pick.
	Case-worms (<i>Psychidae spp.</i>).	"	"
	Tea-tortrix (<i>Capua coffearia</i>).	"	Collect and destroy egg masses.
	Lobster Caterpillar (<i>Stauropus alterrus</i>).	"	Hand-pick.
	Thrips (<i>Physopus rubrocincta</i>).	"	Sulphur.
Teak	Leaf-eater (<i>Hyblæa puera</i>).	"	Lead arsenate.
Tobacco	Stem-borer (<i>Gnorimoschema heliofa</i>).	Stem	Cut out grub; destroy badly attacked plants.

FRUITS :—

Host Plant.	Name of Insect.	Parts attacked.	* Brief remedies or preventive measures.
Cherimoya, Custard- apple and other spp. of <i>Anona- cace</i>	Scale-bug (<i>Lecanium nigrum</i>).	Branches	Emulsion spray.
		Jambu, Rose- apple, &c.	Gall-fly (<i>Psylla</i> sp).	Foliage —
Mango	Fruit fly (<i>Dacus ferrugineus</i>).	Fruit	Collect and destroy in- fested fruits.
	Mango-weevil (<i>Cryptorhy- chus Mangiferae</i>).	"	"
	Scale-bug (<i>Lecanium Mangiferae</i>).	Foliage	Emulsion spray.
Orange, Lime, Lemon, &c.	Scale-, or Sooty-mould bug (<i>Lecanium viride</i>), (<i>Mytilaspis citricola</i> and <i>Pulvinaria psidii</i>).	Foliage	Emulsion spray.

VEGETABLES :—

Host Plant.	Name of Insect.	Parts attacked.	* Brief remedies or preventive measures.
Tomatoes	Gall-worm (<i>Hettrodere radicicola</i>).	Root	Vaporite.
Bandakka (<i>Hibiscus esculentus</i>).	Leaf-roller (<i>Sylepta multilinealis</i>).	Foliage	Lead arsenate.
Beans (<i>Phase- olus</i>)	Fly-maggot (<i>Agromyza phaseoli</i>).	Stem and foliage	Sprinkle Vaporite on ground about the plants.
	Sucking-bugs (<i>Coptosoma cribrarum</i> and <i>Reptortus fuscus</i>).	Foliage	Hand-pick
Brinjal (<i>Sola- num</i>)	Stem-borer (<i>Leucinodes orbonalis</i>).	Young shoots	Cut off and destroy in- fested shoots.
	Sucking-bug (<i>Urentius chinus</i>).	" "	Emulsion.
Cabbages (<i>Brassica family</i>)	Caterpillar (<i>Plutella maculipennis</i>).	Foliage	} Hand-pick.
	" (<i>Crocodolomia binotalis</i>).	"	
	Black-grub (<i>Agrotis segetis</i>)	"	Hand-pick ; sprinkle Va- porite about the plants.
Gourds, Pumpkins, &c.	Sucking-bug (<i>Leptoglossus membranaceus</i>).	"	Vaporite.
	Leaf-beetle (Several spe- cies of <i>Chrysomelidae</i>).	"	Arsenic spray.
	Fruit-fly (<i>Dacus ferrugineus</i>).	Fruit	Hand-pick. Collect and destroy infested fruits.
Potato	Bulb-borer (<i>Dorylus oricntalis</i>).	Tuber	Vaporite.

ORNAMENTAL PLANTS :—

Host Plant.	Name of Insect.	Parts attacked.	* Brief remedies or preventive measures.
Amaryllis	Caterpillar (<i>Polytela gloriosae</i>).	Foliage	Lead arsenate.
Bamboos	{ Scale-bug (<i>Asterolecanium bambusae</i>).	Stem	Emulsion
	{ Aphis (<i>Oregma bambusae</i>).	Stem	
	{ Caterpillar (<i>Cyaniris puspa</i>).	Foliage	
Cycas	{ .. (<i>Calachrysois pandava</i>).	Young foliage	} Lead arsenate.
Dahlia	Bulb-borer (<i>Dorylus orientalis</i>).	Tuber		Vaporite.
Ferns	Flea-beetle (<i>Hypnophylla flavipennis</i>).	Foliage	} Lead arsenate. Destroy infested flower buds.
Hibiscus	{ Leaf-roller (<i>Sylepta multilinealis</i>).	"	
	{ Flower-beetle (<i>Mylabris pusularis</i>).	Flower	
Ipomoea, different spp.	Hairy caterpillar (<i>Enchromia polymena</i>).		
Jasminum pubescens	Bud-borer (<i>Hendecasis duplifascialis</i>).	Flower buds	
Palms in pots	{ Fringed-bug (<i>Cerataphis lantaniae</i>).	Foliage	} Emulsion.
	{ Caterpillar (<i>Elymnias fraterna</i>).	"	
	{ Scale-bug (<i>Lecanium hemisphaericum</i>).	"	
Pergularia (Perennial climber)	Scale-bug (<i>Lecanium caudatum</i>).	"	} Emulsion.
Portlandia (Shrub)	Caterpillar (<i>Caprinia conchylalis</i>).	"		"Paris Green," or arsenate.
Roses	{ Scale-bug (<i>Aspidiotus aurantii</i>).	Stem	} Emulsion.
	{ .. (<i>Iccrya aegyptiaca</i>).	Stem and foliage	
	{ Rose-beetle, several species.	Flowers and young foliage		Hand-pick. Sprinkle Vaporite about bushes.
Salvia, Thunbergia and other <i>Acanthaceae</i> plants	Lantana-bug (<i>Orthozia insignis</i>).	Foliage and stems	Emulsion.

CHAPTER XXIX.

FUNGUS DISEASES OF PLANTS.

Fungi differ from plants possessing green leaves in not being able to obtain their food from the soil; they can only derive nourishment from the bodies of plants or animals, either living or dead. Those fungi that live on dead vegetable matter, as humus, decaying wood, roots, &c., are called *saprophytes*; these do not injure living plants unless they alter their mode of obtaining nutrition, as they sometimes do. Fungi which grow on living plants are known as *parasites*; the greater number of these are very minute, and are only visible to the naked eye when present in great numbers. Parasites all cause disease, important or not, according to the extent to which they occur and the harm they do to plants or crops.

Preventing the spread of diseases.—The methods available for combating fungus diseases are more or less regulated by the life history of the fungi, and may be grouped under the following heads: (1) destroying the plant tissues that contain the vegetative forms or the reproductive spores of the fungus; (2) spraying with a fungicide to prevent the germination of spores deposited on leaves, stems, or fruits; (3) avoiding conditions that are known to be favourable to the spread of the disease; (4) raising disease-resistant varieties; (5) avoiding the importation of new plants from localities that possess diseased areas.

Destroying plant tissues.—The most certain means of eradicating a disease is to burn the affected plants, or cut out and burn the diseased portions of these. When the latter course is adopted, the cut surfaces of the living plant should always be painted with tar or other substance that will prevent the germination of fresh spores which may fall on them. When burning is not practicable, as through excessive moisture, the diseased parts should be buried with lime. Lime not only hastens decay, but also prevents local souring of the soil by the addition of large quantities of decaying matter. Thus the burial, with lime, of all diseased cocoa pods, as well as the

husks of healthy pods, left after the beans have been extracted, has been found to have an important effect in preventing the spread of the pod-disease of Cocoa.

Conditions favourable to infection.—In damp, warm weather, and in shady situations, spores of fungi stand the best chance of germination. Conditions of the soil which are unfavourable to plants, as defective drainage, &c., are sometimes conducive to the rapid spread of a root disease. Crowding together plants of the same kind also favours the spread of disease, and an epidemic or extensive wave of disease can only occur where large numbers of the same kind of plant are growing in close proximity, as in the exclusive cultivation of single crops.

Wounds a cause of disease.—A large number of fungi can bring about infection of their host-plants only through wounds or breaks in the bark. Canker is generally caused by a wound parasite, and in order to avoid conditions likely to bring about infection by it, careful attention must be given to pruning, fruit-picking, etc., as well as to the tarring of all wounds.

Isolation of affected areas.—The spread of a root disease may sometimes be effectually arrested by means of cutting a trench round the affected area, the progress of the mycelium through the soil being thus confined to certain limits. This prevents healthy plants being attacked, and enables the affected areas to be cleared and treated with large quantities of lime.

Effects of rotation of crops.—A fungus disease may often be starved out by rotation of crops. This, however, is only possible in the case of annual or temporary crops, like root products, &c. In the case of permanent crops, as Cacao, Tea, Rubber, &c., when a tree has died from a root disease, the diseased roots should be carefully extracted from the ground and destroyed, the soil being opened up and treated with lime, and allowed to remain some time before the vacancy is supplied.

Disease-resisting varieties.—Some varieties or species of plants are more or less free from disease, while others, cultivated under the same conditions, are especially susceptible to it. Therefore varieties which are the least susceptible, consistent with other desirable qualities, should be selected for cultivation. The raising or selection of disease-resisting varieties is now recognised as a matter of considerable importance in horticulture and agriculture.

Good cultivation a preventive of disease.—The remarks applied in the case of insect pests, with regard to the importance of maintaining a vigorous condition of the plants or crops grown, are

equally applicable in the case of fungus disease, for plants in vigorous growth are often capable of combating the parasitic effects of a disease, while those of a weaker constitution succumb to it. Therefore good cultivation, as secured by proper draining, manuring, careful pruning, &c., should be considered an effective measure towards the suppression of a fungus disease.

Importation of plants from infected areas.—This has often resulted in the introduction of new diseases, and many countries have formulated laws to prevent such occurrence. The importation or transference of seeds or plants from countries or localities affected with fungus diseases should, therefore, be allowed only where measures of disinfection are adopted.

USEFUL FUNGICIDES.

Bordeaux Mixture.—This is one of the most useful and effective fungicides for application to plants attacked with mildew or other fungus disease. There are various formulas for making it, all of somewhat varying degrees of strength. The following proportions, however, represent a standard formula, which has been successfully used at Peradeniya: Copper sulphate (98 per cent.) 6 lb.; lime (freshly burnt) 4 lb.; water to make up to 45 gallons. Dissolve the copper sulphate in water, using a wooden tub for the purpose; slake the lime to a paste, mix it with the remaining water and pour into the copper solution. Treacle is sometimes added to render the mixture more adhesive. When being applied, the mixture should be kept thoroughly stirred.

Sulphur.—This is used for the destruction of mildews, whose mycelium is superficial and forms a whitish down on the surface of living leaves, fruit, &c. It is applied as a powder in the familiar form known as "flowers of sulphur," preferably when the affected leaves are damp. Various appliances are in use for blowing the powder on to the leaves, such as sulphur-sprayer, sulphur-bellows, &c. Quick-lime is sometimes added to the sulphur, but it should not exceed one-third of the whole. Occasionally sulphur is mixed with water, and thus syringed over the plants. In glass-houses, sulphur is sometimes put on the hot-water pipes to create sulphurous fumes.

Ammoniacal copper fungicide.—This is a useful fungicide, which has properties similar to those of Bordeaux Mixture. It is prepared as follows:—

Copper sulphate (98 per cent.) $1\frac{1}{2}$ oz. Ammonia solution (strongest) 12 fl. oz.
Carbonate of Soda (98 per cent.) $1\frac{3}{4}$ oz. Water to make 12 gallons.

Dissolve the copper sulphate and soda separately, each in half a gallon of water, pour the soda into the copper solution and stir well. When the precipitate has settled, pour off the clear liquid; give the precipitate a second washing, and when again settled, pour off the supernatant clear liquid. Then introduce sufficient liquid ammonia to the precipitated copper carbonate to dissolve it, care being taken not to use any unnecessary excess of ammonia. To this add water to make up 10 gallons, when the liquid is ready for use. This preparation is specially recommended for surface moulds, and for the Rose mildew.

Potassium sulphide.—This powerful and useful fungicide must be kept in well-corked bottles or air-tight vessels, as it rapidly decomposes when exposed to the air. Care must be taken to adjust the strength of the solution to the nature and hardness of the plants under treatment; a quarter of an ounce to 1 gallon of water will generally answer for slight attacks, and from 1 oz. to 10 oz. in 10 gallons of water is considered strong enough to suit all requirements.

Potassium permanganate. (Permanganate of potash).—A simple but effectual fungicide may be prepared by dissolving about 30 to 40 grains of permanganate of potash in a gallon of water. The solution resembles Condyl's Fluid, being of a pale rose colour, and may be used for herbaceous and bulbous plants with good effect.

Condyl's Fluid, Jeye's Fluid, &c.—These are useful fungicides, and are sometimes employed for sterilising soil, the latter being allowed to remain a week after treatment before anything is planted or sown. The proportions should be about 1 oz. of the fluid to 1 gallon of water.

Corrosive sublimate.—For disinfecting seed, preserving books, dried specimens of plants, &c., nothing is better than a solution of corrosive sublimate. This is a powerful poison, and kills bacteria, fungus spores and similar organisms by contact. It may be used in a water solution, at a strength of about 1 oz. to 7 gallons of water. For books, specimens, &c., the following proportions are recommended: corrosive sublimate 1 oz., carbolic acid 1 oz., methylated spirits 2 pints; apply with a soft brush.

SOME COMMON DISEASES OF PLANTS.

Club-root.—This disastrous fungus disease attacks the roots of all plants of the Cabbage family, and does a great deal of damage in up-country gardens, rendering them in many cases

unprofitable for cultivation. It produces large nodules on the roots, and, the leaves becoming yellowish, the plants suddenly die. The disease spreads readily by means of spores carried on implements or with plants transferred from an infected area, and once established it is impossible to eradicate it, except by giving up the cultivation of cruciferous plants for two or three years. Fresh unslaked lime, applied at the rate of 75 bushels to the acre, or about 15 lb. to 100 sq. ft., will, however, check the disease considerably for a time. Rotation of crops also minimises its effects.

Sooty Mould.—Orange trees and other members of the Citrus family are peculiarly liable to this fungus disease, which forms a black crust on the foliage, sometimes covering the entire leaf, besides occasionally blackening the fruits also. It is however a superficial growth, and does not penetrate the tissues of the plant. Its presence is due to scale-insects, which must be got rid off in order to effectually dispose of the mould. Spraying with petroleum emulsion or a resin wash is the best remedy.

Gumming, or Gummosis.—This condition, which is sometimes common in Oranges and other fruit trees, is usually induced by badly drained soils or external injury, as through improper pruning. Experts are not, however, agreed upon the actual cause of the disease, which has been attributed to a fungus or a bacterium; but it is a common result of injury. The best way of preventing its occurrence consists in affording the trees proper cultivation, and preventing as far as possible any rupture of the bark. A remedy that sometimes proves effectual is cutting out the affected part, and covering the area with cow-dung and clay.

Damping-off disease.—The common malady known as "damping-off" is due to a fungus (*Pythium*), which affects young seedlings and small tender plants. It usually attacks the plants at a point just above the ground level, and the tissues becoming destroyed, the plants fall over from that point. Excessive dampness, absence of light or ventilation, and imperfect drainage are conditions which are conducive to the disease. Thick sowing also favours the spread of the fungus, the subsequent seedlings being especially predisposed to an attack.

TABULAR LIST OF COMMON FUNGUS DISEASES OF
PLANTS IN CEYLON,
ARRANGED ACCORDING TO CROPS ATTACKED.

Host plant.	Name of disease and fungus.	Part attacked.
Albizzia	Root-disease (<i>Ustilina zonata</i>).	Root
Beans, Broad, and French	Rust (<i>Uromyces fabae</i>).	Leaf
Breadfruit	<i>Phytophthora</i> sp.	Fruit
Cabbage	Club-root (<i>Plasmiodiophora brassicae</i>).	Root
	{ Canker (? <i>Nectria striatospora</i>).	Stem
	{ Brown Root-disease .	Root
Cacao	{ <i>Phytophthora</i> sp.	Pod
	{ <i>Diplodia cacaoicola</i> .	Stem
Camphor	{ Brown Root-disease .	Root
	{ <i>Rosellinia bottrina</i> .	Root
Castilloa	Collar-rot (<i>Fusarium</i> sp.)	Stem
Castor-oil Plant	Rust (<i>Melanophorella ricini</i>).	Leaf
	{ Scab (<i>Cladosporium</i> sp.).	Leaf and fruit
Citrus family	{ <i>Ustilina zonata</i>	Root
	{ Black Rust (<i>Meliola</i> sp.).	Leaf and fruit
	{ <i>Cephaleuros parasitica</i> (Algae).	Leaf
Cinnamon	{ Grey Blight (<i>Pestalozzia palmarum</i>).	"
	{ Witches' Broom (<i>Exobasidium cinnamomi</i>).	Stem
Clove	<i>Fomes substygius</i> .	Stem
	Red Spot (<i>Cephaleuros parasitica</i>).	Leaf
	Grey Blight (<i>Pestalozzia palmarum</i>).	Leaf
	Stem-bleeding disease (<i>Thielaviopsis paradoxa</i>).	Stem
Coconut	<i>Fomes lucidus</i> .	Root
	Bud-rot. (Bacterial).	Apex
Coffee	Coffee-leaf disease. (<i>Hemileia vastatrix</i>).	Leaf
Colocasia	<i>Sclerocystis coremioides</i> .	Stem
Cotton	Rust (<i>Uredo gossypii</i>).	Leaf
Crotalaria	Leaf-disease (<i>Parodiella perisporioides</i>).	"
	Pink-disease (<i>Corticium javanicum</i>).	Stem
Dioscorea	Rust (<i>Accidium dioscoreae</i>).	Leaf and stem
Guava	<i>Gloeosporium psidii</i> .	Fruit
	{ <i>Fomes semitostus</i> .	Root
	{ Brown Root-disease.	"
	{ <i>Sphaerostilbe repens</i> .	"
Hevea	{ Pink-disease (<i>Corticium javanicum</i>).	Stem
	{ Die-back (<i>Gloeosporium alborubrum</i>).	"
	{ <i>Botryodiplodia elasticae</i> .	"
	{ Canker.	"
	{ Leaf-spot (<i>Helminthosporium heveae</i>).	Leaf
Mango	{ Fruit-rot (<i>Gloeosporium mangae</i>).	Fruit
	{ Root-disease (<i>Fomes lucidus</i>).	"
Mulberry	Rust (<i>Uredo moricola</i>).	"
Nutmeg	Thread Blight (<i>Marasmius rotalis</i>).	Leaf and stem
Pea	Leaf-spot (<i>Ascochyta pisi</i>).	Leaf
Pepper	Wilt.	Root
Strawberry	Leaf-spot (<i>Sphaerella fragariae</i>).	Leaf



KNAPSACK AUTOMATIC SPRAYING MACHINE.



SULPHUR OR FINE LIQUID SPRAYER.

Host Plant.	Name of disease and fungus.	Part attacked.
Tea	Grey Blight (<i>Pestalozzia palmarum</i>).	Leaf
	Brown Blight (<i>Colletotrichum</i> <i>camelliae</i>).	"
	White-spot (<i>Cercospora theae</i>).	"
	Horse-hair Blight (<i>Marasmius rotalis</i>).	Stem and leaf
	<i>Massaria theicola</i> .	Stem
	Brown Root-disease. (<i>Hymenochaete</i> <i>noxia</i>).	Root
	Root-disease (<i>Ustilina zonata</i>).	"
	<i>Poria hypolateritia</i> .	"
	<i>Diplodia</i> sp.	"
	Pink-disease (<i>Corticium javanicum</i>).	Branches
Tobacco	<i>Rosellinia bothriina</i> .	Root
	Mildew (<i>Oidium</i> sp.)	Leaf
	Wilt. (<i>Fusarium</i> sp.)	Root
	Mosaic-disease.	Leaf
Tomato	Pimpley Rot (<i>Phytophthora</i> sp.)	Fruit
	Bacterial-wilt.	Stem
Vine	Mildew (<i>Oidium tuckeri</i>).	Leaf

SPRAYING.

The object of spraying is to distribute a poisonous fluid in a finely divided form over plants, either for the purpose of ridding them of injurious insects, or for checking the spread of fungus disease. It is carried out by means of hand-pump sprayers, knapsack sprayers, or with compressed air and spraying machines of various designs. Where only a limited number of plants are treated, a garden syringe will answer the purpose. In the case of fungus diseases it should be remembered that spraying is essentially a preventive, which to be successful should be applied at the first signs of the disease. Spraying operations are generally best carried out when the foliage is in a moist condition. Emulsions containing kerosine in any form should be used in cloudy weather only, or after sunset.

Dangers of spraying.—As all insecticides and fungicides are necessarily of a poisonous character, discretion must be used in applying them over fruit and vegetables that will be consumed for food. As the fruits ripen, the spray-fluid should be further diluted, withholding it altogether when it is judged to be desirable to do so. On quickly-maturing vegetables or salads, as Lettuce, etc., which are eaten in an uncooked state, it is obviously unsafe to apply any poisonous sprays. Fruit trees should not be sprayed when in blossom, as traces of the poison may become lodged in the ovary of the flowers and thus remain in the fruit.

CHAPTER XXX.

TRANSPORT OF PLANTS, SEEDS, FLOWERS, &c.

The conveyance of plants or seeds over long journeys, or from one country to another, is a question which not unfrequently confronts one in the tropics, and upon it often depends the successful development of a new planting industry. In cases where seeds are not procurable, or are of a particularly perishable nature, recourse must be had to plants for securing a supply. Unquestionably the best means so far invented for transmitting these over long journeys, especially by sea is in Wardian cases, by the aid of which the exchange of live plants between widely separated countries has been greatly facilitated. Thus the introduction of Rubber, Cacao and other useful plants from the Western to the Eastern tropics, and others *vice versa*, is due largely to the excellent Wardian cases (and equally perfect packing) which have been sent out from Kew Gardens, London. A Wardian case consists of a large box, with two sloping glazed sides which meet at the top to form a ridge, the two ends being carried up like a "V" inverted, thus Λ . The sides are movable, with the glass panes fitted in grooves with putty, and protected on the outside with narrow thin strips of wood about an inch apart. A small circular hole, covered by perforated zinc, is made in each end, and over this (inside) is nailed a small box to catch any sea spray, &c., that may get in. Therefore a Wardian case, when travelling, is nearly airtight, so that very little evaporation or change of air can take place within it. The bottom of the case is filled with soil, in which the plants to be conveyed are packed closely together and held in position by narrow strips of wood, which are firmly secured by being nailed down to the inside of the case. Wardian cases may be made of any size to suit large or small plants. They have been of the greatest service at Peradeniya in despatching Cacao, Rubber and other plants to different parts of the tropics, more especially when seeds are either not obtainable or are of too perishable a nature to withstand a long journey. When transporting Cacao and other

seedling plants in Wardian cases, the best way of establishing them so as to stand the journey is to sow the seed in the case, a sufficient depth of good light soil being placed in the bottom for this purpose, so that the seedlings may grow *en route*. When the seedlings are well above ground, thin bamboo twigs may be placed between them over the soil, these being held down by strips of wood, the ends of which are secured by a longitudinal strip nailed on to the inside of the case on either side. The case is then ready for despatch, a liberal watering being given to the contents before the sides are closed down.



TRANSPORT OF RUBBER PLANTS IN WARDIAN CASES,
FROM CEYLON TO SOUTH AMERICA.

PLANT-CASES IN TRANSIT.

The success of any method of packing plants will largely depend on the position assigned to these on boardship. Obviously they must have access to light and air, but should not be placed on the lower main deck if on a long voyage, as they would thus be liable to be injured or killed by the sea spray or breakers. The best part of a ship for plants is the upper or boat-deck, but not too near the engines. Plants in an active state of growth will be benefited by an occasional watering, if this can be given by an intelligent hand.

Much also depends on the season. Tropical or hot-house plants can only be transported safely over long journeys during the summer months; while deciduous plants, or those of temperate countries, travel best when in a dormant state.

Wardian cases.—The following are brief instructions for the guidance of persons sending Wardian cases of plants from the tropics: The cases should be kept on *deck under awning*, away from the engines; direct exposure to the sun unless the cases are open will injure the plants. A Wardian case is easily opened by unscrewing one or both the glass sides. In tropical seas during fine weather, one of the glazed sides may with advantage be left partly or fully open during the day. The plants may be lightly watered or sprinkled with fresh *tepid water* at least once in three days. In cool latitudes less watering is required, and the cases should then be protected at night with some additional covering.

PACKING AND TRANSPORTING SEEDS.

In regard to imported seeds of annuals, culinary vegetables, &c., of temperate climates, it has been found that, provided the seed is properly dried, the best way of transporting them is in air-tight tins. Seedsmen who make a speciality of sending such seeds on long journeys pack them in hermetically sealed tins, in a dry atmosphere, so that the seeds are not affected by heat and sweat on the voyage. No packing material of a preservative kind is thus required. A similar method will suit certain tropical seeds; but these are often of a fleshy non-driable character, naturally unadapted to a dormant period, and require to be packed with a dry (or very slightly moist) absorbent material; the tins or boxes containing them should not be hermetically sealed, as otherwise fermentation will set in and destroy the seed. Thus, seeds of Para Rubber (*Hevea brasiliensis*) which are normally of short vitality, packed in ordinary biscuit tins, with a mixture of dry powdered charcoal and fine soil or coir-dust, have been transported over journeys of six to eight weeks, and at destination gave germinative results of seventy to eighty per cent. Seeds which are surrounded by a mucilaginous substance should have the latter washed off, then be rapidly dried in the sun, after which they should be packed with a dry preservative material as described above, and despatched without delay. To this class of seed belong Cacao, Castilloa-rubber, species of *Garcinia*, *Nephelium*, &c. The writer has found in the case of such as these that if the seeds, while moist and after being washed, are mixed with dry charcoal powder, the latter

upon drying forms an effective preservative coating around them. Dr. Van Hall, Director of Agriculture for the Dutch West Indies, states that he had success in sending Cacao pods in paraffin wax to Java, a voyage of over six weeks, and* describes his method thus: "The pods were first thoroughly washed with a tooth-brush and soapy water, then placed in 70 % alcohol for a minute, and afterwards in a 5 % solution of corrosive sublimate for a few minutes, so as to kill the germs on the surface. A piece of string being then attached to the stalk end of the pod, the latter was dipped in the liquid paraffin (70 %); it was taken out immediately and hung carefully by the string so as not to break the thin coating of wax. When cold, each pod was again dipped in the paraffin, making the coating more secure. The fruits were then packed in fine saw dust and despatched."

Seeds of a very perishable nature should be packed only in small quantities, and in such tin boxes as do not effectually prevent the escape of moisture. If transmitted by post, stout canvas should be used as an outside covering, or if sent as steamer freight they should be placed in wooden cases. Coir-dust when leached and intermixed with a proportion of powdered charcoal forms an excellent packing material for many short-lived seeds, such as those of Para Rubber. Burnt rice and dried sawdust are also used with good results. As a rule any such packing material should have only the slightest trace of moisture left in it. On the other hand, seeds of certain water plants, as *Victoria regia*, are best transported in small tubes or vials of water, which being made water-tight with wax may be easily packed with straw in a section of bamboo, and despatched by post.

Transport of bulbs or tubers.—These are always best transported when the plants are in a dormant or resting condition. In the tropics, however, this is not usually practicable, as the plants may be said to be seldom in that state. In this case the bulbs or tubers should be gradually dried until all the leaves have thoroughly withered, when they should be cut away. The bulbs may then be packed in dry sawdust or coir-dust for export. Small quantities may thus be placed in ordinary biscuit boxes, and sent by Parcels Post. If packed in a larger box for shipment, it is well to bore a few ventilation holes in the box.

SENDING FLOWERS BY POST, &c.

The flowers should preferably be cut with a sharp knife, and not broken off; cutting with scissors is apt to squeeze and close the

tubes of certain flower-stalks, thereby preventing the absorption of moisture when placed in water. Flowers should be cut in the early morning, when they are full of moisture. In packing, the box should be lined with moss or fresh leaves; no cotton-wool or other absorbent substance should be used as a packing, the best material for the purpose being fresh leaves or fern fronds. The flowers should be packed firmly, but not crushed in any way, and are best not tied in bunches, except in the case of small flowers, as Violets. Tin boxes with movable trays are the best receptacles for sending flowers long distances, either by rail or post.

STORING OF SEEDS.

Except for convenience, it is perhaps never advisable to keep seeds for a long time,* as most, if not all, seeds germinate best when fresh, provided they are perfectly matured. All seeds may be divided into dryable and non-dryable classes. To the latter belong a large proportion of seeds of tropical species, and these are best sown as soon as possible after they are ripe. Their vitality may, however, be usually prolonged for a limited period by placing them in a dry porous mixture, such as charcoal, burnt paddy husk, coir dust, sawdust, finely sifted dry soil, &c. Small dryable seeds, having been thoroughly dried, are best kept in stoppered bottles or air-tight tins, which afford protection from weevils and other destructive insects, as well as from the baneful effects of damp and mould. Imported seeds, especially those of annuals and vegetables, which are not sown immediately after arrival, should always be stored away in air-tight tins or stoppered jars, and kept in a cool place until required; otherwise they will soon become useless.

* In German and British East Africa seeds of Ceara Rubber are usually kept for two years before sowing, as they are considered to germinate best at that age.



CHAPTER XXXI.

RECIPES FOR MAKING JAMS, PRESERVES, &c., OF TROPICAL FRUITS.

JAMS :—

Billing jam.—Prick the fruit well over with a fork ; let it soak in a basin of water for a night. Then squeeze the fruit slightly to get rid of some of the acid juice, throw away the liquid, and boil the fruit with its weight of sugar until it is of the proper consistency.

Cape Gooseberry (or Tippari) jam.—Wash the fruit and put in a pan with sugar, allowing a cupful of sugar to every cupful of fruit ; add a teacupful of cold water, and boil till done.

Melon jam.—To every 18 lb. of fruit allow 12 lb. of sugar, six lemons, and $\frac{1}{4}$ lb. of bruised ginger tied in a muslin bag. Peel fruit over night, and cut into small blocks ; put into a large basin (after weighing), and sprinkle over a little of the sugar. Next morning put into the preserving-pan with the remainder of the sugar, and while it is boiling up pare the lemons and squeeze out the juice ; strain and add to the melon. Put the lemon rinds on to boil in plenty of water, and when they are soft cut them into strips with a sharp knife and add to above. Boil for four hours, and remove the ginger bag. The jam should be transparent, and of a golden brown colour.

Papaw jam.—Choose fruit three quarters ripe. Remove all skin and seeds ; chop up the fruit into small pieces. Weigh, add equal weight of sugar, also some green ginger (cut into small slices), 2 oz. of the latter being sufficient for six pounds of fruit. Cover the fruit and sugar up, and let them melt during the night. Boil them up next morning until done.

Passion-fruit jam.—Have two basins ready ; cut the fruit in halves, scoop out all the juice and seeds into one basin, put the shells in the other ; cover the latter with cold water and a very little salt, and leave in water for twelve hours ; then boil in the same water

for three-quarter of an hour, scoop out the inside of the shells, throwing away the outside skins and the water they were boiled in. Squeeze out the juice from the seeds. Put all together and boil for half an hour. Allow 1 lb. sugar to $1\frac{1}{2}$ lb. of fruit.

Peach jam.—Pare and stone the fruit, after which weigh it, allowing 10 lb. of sugar to every 12 lb. of fruit. Put the fruit in a preserving pan, and barely cover it with water. Allow it to cook slowly for $1\frac{1}{2}$ hours, at the end of which time add the sugar, and cook for an hour longer.

Pineapple jam.—Peel the pineapples and chop them up (not taking cores); weigh the fruit, and allow $1\frac{1}{2}$ lb. of sugar to 1 lb. of fruit; boil until of the desired consistency. A piece of cinnamon added will improve the flavour.

Orange marmalade.—Ingredients: 1 lb. oranges, 3 pints water, 3 lb. sugar. Mode: Halve and quarter the oranges, take out core and seeds, then slice very thinly and let it stand in water for twenty-four hours; then boil in that water until it is as clear as amber. When it has boiled for twenty minutes, add the sugar and let boiling continue till it jellies.

JELLIES :—

Cape Gooseberry (or Tippari) jelly.—Boil and strain the fruit, put on the juice to simmer, and skim it; then add sugar in the proportion of three or four parts to one part juice (or to taste), and cook till it jellies.

Guava jelly.—After thoroughly washing the fruit, put it in an enamelled saucepan with sufficient water just to cover it; boil until all the fruit is broken, then strain; to one breakfast cupful of juice add the same of sugar and just a little over when it is all measured out: say if you have six cupfuls of juice, put six and a half of sugar, and boil very slowly. A little lime juice may be added to the juice after the sugar is put in.

Lovi-lovi jelly.—Boil the fruits thoroughly and take off the scum as it comes up. Then strain, and boil with refined sugar (two to one) till it forms a jelly.

Nutmeg jelly.—Take 3 lb. nutmeg skins and 4 lb. of sugar. Peel the skins and put them in water for twelve hours, then take them out and place in enough water just to cover them, and boil until quite mashed; strain off the juice, add the sugar, and boil slowly till it jellies.

Another recipe.—Put the rinds of ripe nutmegs into a preserving pan, with just enough water to cover them, boil

until the fruit is almost a pulp, or very soft ; then strain through a flannel jelly bag. To every pint of juice add one lb. of sugar, and boil until it jellies.

Rozelle jelly.—Place the rozelle sepals in a basin and barely cover them with water; let them soak all night, and in the morning slightly squeeze them; put the whole (sepals and water) into a preserving pan and boil until quite soft and pulpy. Then let the juice drip slowly through a jelly bag. Allow one lb. sugar to one pint juice ; boil all slowly for fifteen or twenty minutes, or until it jellies.

PRESERVES :—

Billing preserve.—Prick the fruits with a fork and put them in water for a few hours ; then squeeze out the fruits, wash them with hot water and dry with a clean towel. Sugar (in the proportion of $1\frac{1}{2}$ lb. to 1 lb. fruit) should be boiled separately and refined as for nelli preserve, and the fruits should be boiled till the sugar comes to a thick syrup.

Camaranga preserve.—Cut off the ends and sharp ridges of the fruit ; prick with a fork and soak in cold water for a few hours. Squeeze out and pass through hot water before putting the fruits in the sugar syrup, and boil as other preserves. Proportion of sugar, two to one.

Cashew-nut toffee.—Take 2 lb. sugar, 150 cashew-nuts (skin these like almonds, in hot water), and chop up with a knife or in a mincing machine. Make a syrup first of the sugar with two tumblers of water, then add nuts and cook till it crystalises ; put on to a buttered plate, and cut into square or diamond shapes.

Mango preserve.—Take fruits which are three-quarter ripe, peel off skin, cut into two and take out the seed. Prick the fruits with a silver fork, and soak in cold water for a few hours. Prepare sugar ($1\frac{1}{2}$ or 1 lb. to 1 lb. fruit) as for nelli, and boil till the fruit is cooked

Nelli preserve.—Prick fruits when half-ripe, wash and prick all over with a silver fork. Squeeze the juice out by hand, and soak in cold water for about twelve hours ; put the fruits in boiling water for a little while, and again squeeze out the juice. Add sugar in the proportion of 2 lb. to 1 lb. of fruits ; boil sugar separately, then add the fruits, and boil till the sugar becomes a thick syrup.

Pineapple preserve.—Slice the fruit, prick it or chop in pieces, but do not squeeze out the juice. Then boil with

refined sugar (one to one) as for nelli, with a bit of cinnamon and a few cloves added to flavour.

Pumpkin toffee.—This is made like cashew-nut toffee, allowing one lb. sugar for one lb. of pumpkin grated like coconut ; add $\frac{1}{2}$ lb. of flour and, when it is inclined to crystalise, a tablespoonful of butter. Cut into squares.

Mango chutney. Ingredients :—1 lb. unripe mangoes, 1 lb. Demerara sugar, $\frac{1}{2}$ lb. sultanas, 2 oz. almonds, 2 oz. garlic, 2 oz. dried ginger, 2 or 3 oz. dry chillies, and salt to taste. Peel the mango, slice from the seed, and cut into small pieces ; chop the sultanas, dates and almonds ; grind the garlic, ginger and chillies on a curry stone. Mix all with half bottle of malt vinegar, and boil for twenty minutes, stirring all the time.

Devilled Bananas.—Melt one tablespoonful of butter, add one teaspoonful of chopped red chillies, two teaspoonfuls chopped pickles, one teaspoonful Worcester-sauce, and quarter teaspoonful of salt. Add four bananas cut in four equal parts. Cook five minutes.

Banana sauce.—Ingredients : Half a pint of water, $\frac{1}{4}$ lb. of sugar, three banana pulps, three tablespoonfuls lemon juice, two eggs, and a pinch of salt. Boil sugar and water ten minutes. Mix remaining ingredients, and pour hot syrup on to them. Beat well, and serve hot.

Banana compote.—Ingredients : Sound ripe bananas, three-quarter pint of white syrup, half liqueur glassful of maraschino, chopped almonds, a few grapes. Peel the bananas, remove any of the white coarse threads, plunge the fruit into boiling water just for two seconds. Drain at once, and transfer the fruit into boiling syrup, kept ready for the purpose in a saucepan or basin. Cover with a plate, and leave to cool, then add the liqueur. Take out the bananas, dish up in a pyramid garnished with large grapes (which have been cut in halves and had the stones removed). Pour the syrup over and serve.

Fruit salad.—Peel and clean with a silver knife any fruit available, as pineapple, mangoes, plantains, oranges, papaws, etc. Slice the fruit and cut into neat squares, and place in a glass dish. Sprinkle well with castor sugar ; mix well, and if liked add one pint of hock or sherry. Fresh whipped cream, Fussell's tinned cream mixed with sugar and vanilla, or a good custard, should be served with this salad, which improves by being kept in a cool place. (" Hausfrau " in *Ceylon Observer*).

Vegetable curry.—Take three carrots, three turnips, three potatoes, one onion, two tablespoonfuls curry powder, one apple,

and some boiled rice. Scrape the carrots and cut in slices; peel the turnips, potatoes, onions, and apple, cut in slices, and fry in dripping until a nice brown; put all in a deep pie dish; mix the curry powder with quarter pint of stock, pour over the vegetables; cover the dish with a plate, and simmer in the oven for one hour.

SWEET-POTATO RECIPES :—

“Biscuit.”—Mash thoroughly four medium-sized cold boiled potatoes after removing the skin. Stir in four tablespoonfuls of flour, with a piece of butter the size of a small egg, and milk to make the consistency of biscuit dough. Roll, cut, place in a well-greased pan, and bake in an oven with moderate heat.

“Sugared.”—Steam potatoes, peel, and dry a little in the oven. When cold, cut in half length-wise, place round-side up in a well-buttered dripping pan, give a dash of salt and pepper, dot with bits of butter, sprinkle liberally with sugar, and bake thirty or forty minutes in a quick oven.

“Waffles.”—Add to two heaping tablespoonfuls of boiled potatoes rubbed through a cullender, a tablespoonful of melted butter, a tablespoonful of sugar, a pint of milk, four tablespoonfuls of flour, one egg well-beaten, a little salt, two teaspoonfuls of baking powder. Grease the irons thoroughly, fill, and bake brown. Serve with a sauce of half a teacupful of honey beaten with a teacupful of cream.

“Pudding.”—Remove the skins and mash finely six potatoes; beat with the yolks of four eggs a teacupful of white sugar and four level teaspoonfuls of butter. Beat the whites of two eggs as for icing, add grated rind and juice of a small lemon, a little salt, and two teacupfuls of cream; stir, then add to other mixture. Put into a buttered dish, and bake an hour and a half. Beat whites of eggs with three tablespoonfuls of sugar, pour over the top, and brown.

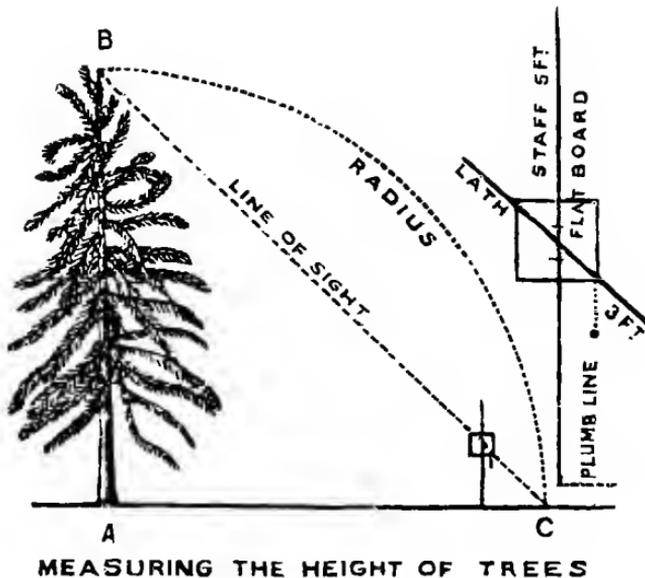
USEFUL REFERENCES.

[S.—SINHALESE].

How to make Charcoal.—Cut the wood in lengths of two to three feet, and split the stout pieces two or three inches in thickness. Heap these into a wide pit, commencing by making a square chimney in the centre with sticks about fifteen inches long laid across each other; pile the wood around this, one piece upon another, laid as closely as possible. Cover the whole with turf or adhesive earth, except the top of the chimney; start the fire in the

chimney at the base with dry kindling. Carefully stop all outbursts of smoke with soil, and close or open the draught holes (left at the base) according as the fire burns. When the fire is completely extinguished allow the mass to gradually cool.

Woods for making Charcoal.—The following are some of the best charcoal-making woods in Ceylon:—*Acronychia laurifolia* ("Ankenda," S.), *Adenauthera pavonina* ("Madatiya," S.), *Artocarpus nobilis* ("Del," S.), *Bassia longifolia* ("Me," S.), *Caryota urens* ("Kitul," S.), *Croton lacciferum* ("Keppitiya," S.), *Doona Zeylanica* ("Dun," S.), *Trema orientalis* ("Gedumba," S., or "Charcoal-tree," *Wendlandia notoniana* ("Rawan-idella," S.).



Measuring the Height of Trees.—Take a staff six feet long, pointed for pressing into the ground. To the centre of the staff fix with screws a piece of board twelve inches wide and exactly square. Fix to this a diagonal strip of straight lath. A plumb line is attached to the board of staff to enable the perpendicular being obtained, this being indispensable. In measuring a tree the staff is placed at a distance from it so that with the plumb exactly perpendicular the diagonal lath points to the top of the tree, the person taking the "sight" resting on one knee or reclining to bring the eye to the lower end of the lath. The sight line is then extended to the ground by means of a string. From the point where

this touches the ground (C in the figure) to the centre of the trunk will represent the actual height of the tree: that is, the horizontal line A C is equal to the vertical A B. If the tree were blown or cut down, its top would follow the course shown by the curved line and rest at C.

Another method.—Make two lines on the ground exactly three feet apart. On one of the lines drive a stake in the ground so that the top of the stake will be exactly three feet from the ground; when the shadow of the stake will have reached the other line, the shadow cast by the tree will be precisely the length of the height of the tree, and by measuring the length of the shadow at that moment you will obtain the exact height of the tree. The measurements should be taken on level ground. If the tree is leaning, incline the stake at as nearly the same angle as possible at which the tree inclines.

Measuring land.—The following lengths multiplied by the corresponding breadths equal an acre:—

988 yds. long and	5 yds. wide.	110 yds. long and	44 yds. wide
484	10	88	55
220	22	69½	70
121	40		

A yard is a good long stride, and few men step a yard in their natural stride.

To estimate Grain crops per Acre.—Frame together four light sticks, measuring exactly a foot square inside, and with this in one hand walk into the field and select a spot of fair average yield; lower the square frame over as many heads as it will enclose, shell out carefully the heads thus enclosed, and weigh the grain. To make the result more reliable, make ten or twenty similar calculations, and estimate by the mean of the whole number of results.

To measure Timber.—Take the girth in inches in the middle, divide it by 4, and square the result, which gives the mean sectional area of the trunk; multiply the product by the length of the tree in feet, divide by 144 and the quotient is the contents in cubic feet. Where there is bark, an allowance must be made for this, the usual allowance varying from ½ inch to 1½ inch to every foot of quarter girth; thus, the total quarter girth being 24 inches, and the bark being thick, a deduction of 5 inches or 3 inches would be necessary, the quarter girth been taken at 21 or 22 inches. The height of standing trees may be judged by using a 20-foot rod, and the girth by using a girth strap 12 feet in length and about ¾ inch wide, on

which every fourth inch is numbered from one to thirty-six. Thus a tree having a circumference of 120 inches would read 30 inches on the strap.

Weight and Measurement of Straw or hay Stacks.—To measure an oblong stack, multiply the length in feet by the width below the eaves, and the product by the height from the ground to the eaves. For the top, multiply the length in feet by the width at the eaves, and the product by half the length to the ridge. A cubic foot of hay approximately weighs from 7 lb. to 9 lb. For general purposes the weight of a stack may be ascertained by actually measuring the cubic contents of the truss, and from this calculating the weight of a cubic foot. Stacks of straw are estimated at from 18 to 20 cubic yards to a ton.

Rainfall.—The depth of rainfall in inches multiplied by 3,630 equals number of cubic feet per square acre; multiplied by 22,623, equals number of gallons per square acre.

Thus:—

Inches.	Cubic feet per acre.	Gallons per acre.	Tons per acre.
1 =	3,630 =	22,635 =	101.1 =
2 =	7,260 =	42,270 =	202.2 =
3 =	10,890 =	67,905 =	303.3 =
5 =	18,150 =	113,174 =	505.5 =

Material for (and cost of) cart-wheels.—The most generally used woods in Ceylon for making cart wheels are “Hal-milla” (*Berrya ammonilla*), and “Suriya” (*Thespesia populnea*). The usual quantity and cost of two ordinary wheels of 4½ ft. diameter are : twelve pieces for rims @ 50 cents each ; twenty-four spokes @ 18 cents, two hubs @ Rs. 3, total for two wheels Rs. 16.32. Iron tyres and bushes, about Rs. 10 extra. To this must be added the cost of labour (carpentry), viz., about Rs. 14, in all say Rs. 40.

To revive Flowers.—Rinse the stalks in fresh water and put them into warm salt-water, to which has been added a few drops of sulphate of ammonia. As each flower is ready to be placed in the vase of fresh water, snip off a small portion of the stalk with a sharp pair of scissors. To keep a spray of arranged flowers fresh, place them on damp cotton-wool under a basin. This keeps the air away, and preserves their freshness. It is especially recommended for maiden-hair fern.

To prepare Skeleton leaves.—Mix about one drachm chloride of lime with one pint water, adding sufficient acetic acid to liberate the chlorine. Steep the leaves in this until they are whitened (about 10 minutes should suffice), taking care not to let them stay

in too long. Put them into clean water and float them out on pieces of paper. Lastly remove them from the paper before they are quite dry, and place them in a book or press. They look best when mounted on black velvet or paper.

To drive away Sparrows from Bungalows, &c.—Smear a few thin twigs with any sticky substance, as seccotine or the resinous gum from jak-fruit; place these at intervals where the sparrows collect, and the latter will soon disappear.

A simple fly-trap.—Pour some water into a finger bowl or other wide-mouthed vessel till the surface of the liquid is about an inch from the brim. Add a small quantity of oil (coconut or castor) to make a superficial film. In the centre of a piece of card-board, sufficiently large to cover the vessel, cut a small hole about a quarter inch in diameter. Smear some condensed milk or honey on one side of the card-board round the central aperture, and place the card over the vessel so that the smeared side is below. The flies will creep into the enclosed space and meet with an oily grave. A tap on the card will at once precipitate all those resting on its under surface. The oil-film is necessary, as flies are not easily wetted by water alone, from which they often succeed in saving themselves.

Book preservative.—I have found the following an excellent preservative for books, as well as a preventive against insects and moulds, which are so destructive to books in the tropics: Dissolve Canada balsam in turpentine, say 2 oz. of the former to 4 oz. of the latter, so as to make a weak solution; paint this over the covers or bindings of the books, and let them stand a few hours to dry.

Another recipe.—Paint the books lightly over both outside and inside the cover (and especially along the backs, where paste has been used), with the following mixture, using a soft brush for the purpose: 1 oz. corrosive sublimate; 1 oz. carbolic acid; 2 pints methylated spirit. No harm will be done to the books, and after the mixture has dried they may be handled with perfect safety.

CHAPTER XXXII.

CALENDARS FOR CEYLON.

FOR JAFFNA AND NORTHERN PROVINCE :—

By S. CHELLIAH, AGRICULTURAL INSTRUCTOR, JAFFNA.

January.—Average rainfall 2'15 in. Gather in the crop of different kinds of yams. Plant tobacco seedlings, also chillies and brinjals. Plantains are generally planted out this month, also betel creepers. The latter is the staple cultivation in the west of Jaffna.

February.—Average rainfall 1'31 in. Gather in paddy crops. Sow dry grains, such as gingelly, kurrakan, peas, kollu, &c., soon after the main crops are gathered. Lift Palmyra kilangu (*i.e.*, germinated seedlings). Water tobacco gardens and “sucker” the plants.

March.—Average rainfall '93 in. Gather paddy crops and plough vacant paddy fields. The season for extracting juice from Palmyra palms is from now to the end of May. This cultivation forms an important industry among the lower classes of the people. Manioc (cassava) roots are now lifted and dried to be used as food stuff.

April.—Average rainfall 2'35 in. Brinjals and chillies are now planted. This is the time for planting out coconut plants. Gather dry grains sown in February. Gather and cure tobacco crops all over the North. Gathering and drying of chillies must be done now; also ploughing and manuring paddy fields. Planting of betel creepers is also done this month.

May.—Average rainfall 2'01 in. This is the time for sowing dry grain called “Thinai” in gardens after the harvest of tobacco, also for planting manioc (cassava) cuttings and different kinds of yams.

June.—Average rainfall '79 in. Watering dry-grain plants in gardens will now be necessary, this being generally the dry season. This is the fruit season in Jaffna. Plucking areca nuts will be

continued to the end of December. This is the time the land owners make arrangements to have their garden lands cultivated with tobacco on lease.

July.—Average rainfall '87 in. Reaping of dry grains sown in May will now proceed, also planting of betel creepers, onions, &c. Palmyra fruit season begins, and continues to the end of September, during which time this forms a great relief to the poor as an article of food.

August.—Average rainfall 1'44 in. Sowing of paddy in fields, also sowing and transplanting of kurakkan in gardens may be done this month.

September.—Average rainfall 2'80 in. This is generally a slack month and very little is done, except the sowing of dry grains, as varaku' and Karuasamy in palmyra gardens. Palmyra nuts are put in for kilangu.

October.—Average rainfall 6'66 in. Weeding of paddy fields, also transplanting and filling vacancies in paddy fields, should now be seen to. Paddy seedlings are bought at Rs. 2 to Rs. 3 a hundred bundles. Some people sow paddy thickly for the purpose of selling thinned out seedlings at this time. Tilling and manuring gardens for tobacco cultivation. Tobacco seeds are sown in nurseries. Fruit trees may be planted at this season. Planting of areca nuts may now be done. This is systematically planted in gardens surrounding the wells.

November.—Average rainfall 13'38 in. Generally a busy month for collecting green-manure, &c., for tobacco gardens.

December.—Average rainfall 11'34 in. Planting tobacco all over the North should now commence. Onions are put in this month.

CALENDAR FOR COLOMBO DISTRICT.

Average annual rainfall 88 inches.

Mean annual temperature 80 deg. Fah.

By C. DRIEBERG, Secretary, Ceylon Agricultural Society, and Superintendent, School Gardens.

January.—Average rainfall for the month 3'54 in. A fairly dry and cool month, during which little planting is done. A good season for vegetable produce, the result of previous October and November planting. Yams and gourds plentiful. Annual flowers in bloom.

February.—Average rainfall 2'08 in. A particularly dry month, when no planting can be done. Seeds should be gathered

and the soil worked up as crops go out. Where plants are growing the surface should be stirred to prevent loss of moisture, and beds copiously watered, and, when necessary, shaded.

March.—Average rainfall 4'80 in. This is the month for cleaning, digging, and manuring the soil. Occasional showers may be expected. Nurseries, where necessary, should be started.

April.—Average rainfall 11'03 in. Planting begins with this month, when the rainfall is usually plentiful. All varieties of vegetables and flowers may be planted with good prospects of favourable growing weather.

May.—Average rainfall 12'04 in. South-west monsoon rains begin towards end of month, when planting may be continued. Fruits (such as mangoes, oranges, pineapples, mangosteens, &c.) begin to come in. May flowering trees in blossom.

June.—Average rainfall 8'27 in. This is the last month of the S.W. monsoon for planting generally. Weather fairly wet and hot. Fruits well in season.

July.—Average rainfall 4'61 in. Fruits begin to go out of season; vegetables of April to May planting begin to come in.

August.—Average rainfall 3'67 in. Slack month; weather hot and dry. Vegetables fairly plentiful. Fruits go out of season.

September.—Average rainfall 5'03 in. Weather still dry. All crops fall off. Seeds should be collected, and land worked up for planting again. Nurseries should be started.

October.—Average rainfall 14'67 in. Second planting season begins with the N.E. monsoon rains, which are more or less general throughout the Island. All kinds of crops may be now started, and fruit trees also planted.

November.—Average rainfall 12'38 in. Planting may be continued. The best month for planting tomatoes and gourds in the low-country.

December.—Average rainfall 6'03 in. Vegetable produce begins to come in, also annual flowers. Weather generally cool.

CALENDAR FOR UP-COUNTRY

TAKING HAKGALA GARDENS AS A STANDARD.

(Elevation 5,500 feet; average rainfall 90'86 inches on 203 days).

By the late J. K. NOCK, * Curator, Hakgala Gardens.

January.—Weather wet, with foggy mornings; latter half of the month often fine. Average rainfall 8'22 inches on sixteen days.

* See preface.

Mean temperature 58 deg. Fah. The month during which the finishing touches should be given to a garden. Drives and paths, &c., should be attended to. All general planting should be finished early in the month. Fork up frequently the surface of the ground around all young plants; afford mulching with leaf-mould or well-rotted cattle manure; a top-dressing of artificial manures mixed with fine soil should be given when possible. Liquid manure may be applied to pot-plants once a week, especially to flowering kinds. Phloxes, Verbenas, Petunias, &c., need pegging down as their growth advances. Remove superfluous buds from roses if fine blooms are required. Afford protection to tender plants against frost (as stated for December) during the nights of this and the next two months. Vegetable seeds of all kinds may be sown for keeping up a succession.

February.—Weather dry, with cold nights and mornings, and hot bright days. Average rainfall 3'05 in. on nine days. Mean temp., 60 deg. Fah. Much watering is usually necessary. Liquid manure may with benefit be applied to bed and border plants. Supply vacancies where necessary. Weed and point over beds and borders frequently. Stake plants needing supports, *e.g.*, Carnations, Antirrhinums, &c. Collect cattle dung for potting work, and cut and stack turf-clods; the latter should be placed grass-side down, with manure between each layer. Pot on flowering plants. Remove fruit capsules from rose bushes. Place clean straw underneath the Strawberries before they begin ripening. Vegetables of all kinds, especially those of the cabbage tribe, may now be sown.

March.—Weather dry. Average rainfall 4'54 on nine days. Mean temperature 62 deg. This should be the brightest month in the flower garden up-country. Routine work as last month,—collect seeds as they ripen. If a lawn is to be made, prepare the ground early in the month for sowing in April, or for turfing in May or later.

April.—Weather showery. Average rainfall 7'62 in. on sixteen days. Mean temp. 64 deg. Sow seeds collected last month, and continue collecting. Cut away dead stems, leaves, &c., from annuals, and pull out unsightly plants that have finished flowering. Keep drains and culverts clean in case of heavy plumps of rain. This is the best month for sowing lawn grass seed. Owing to the approaching monsoon rains it is not advisable to put down such vegetables as potatoes, peas, beans, and onions until at least the end of July.

May.—Weather showery, also windy after the arrival of the S.W. monsoon about end of month. Average rainfall 6'99 in. on 15 days. Mean temp. 65 deg. At the commencement of the month stake all tall plants in exposed positions. Continue to collect and sow seeds. Where annuals have finished flowering, the ground should be dug up, manured lightly and prepared for planting out with seedlings in June or July. Advantage should be taken of the wet weather for planting pockets in banks, rockeries, &c. Repair turf of lawns where necessary. Except potatoes, onions, and peas, a few vegetables may be put down, although they are liable to be damaged by the strong winds and rain. These remarks also apply to June and July.

June.—Weather generally wet, and always windy. Average rainfall 8'13 inches on nineteen days. Mean temp. 62 deg. Plant up vacant corners and banks. Insert cuttings of all kinds, especially such as Verbenas and Petunias which have finished flowering. Stack manure; where necessary lay down turf and repair verges. Prune shrubs and shape trees during this or the next month. Order foreign seeds so as to arrive by the end of August.

July.—Weather moderately wet, but still very windy. Average rainfall 6'02 inches on nineteen days. Mean temp. 61 deg. The most difficult month in which to keep a garden tidy, owing to the prevailing strong winds. Clean up all rubbish, and place the leaves in pits to rot and form leaf-mould. Continue planting banks, rockeries, &c. Divide and re-plant double-violets in sheds. Prune fruit-trees generally. Prick out seedlings, and plant out when large enough. Plant-shed roofs should be made rain-proof. Most pot-plants will now require re-potting or top-dressing. When the weather is too wet for outdoor work, all pots, pans, boxes, &c., should be thoroughly washed *inside* and *out*, and be put away to dry and be ready for the seeds which are due to arrive at the end of next month. Collect good soil, and store away leaf-mould and dried cattle dung. Cuttings of all kinds do well if put in this month. This is one of the best flowering months for Amaryllids and Liliaceous plants.

August.—Weather fairly dry and pleasant though often windy. Average rainfall 4'43 in. on seventeen days. Mean temp. 62 deg. The foreign seeds ordered in June should now have arrived, but must not be opened until everything is ready for sowing them, as most kinds rapidly deteriorate when exposed to the air. Whether pots, boxes, or sheds are used, the soil for sowing in must be fine, light and rich; a sprinkling of sand should be added

to render it porous; dung should be rubbed fine before mixing with the soil. Sow such seeds as Begonias, Campanulas, Carnations, Cyclamens, Gloxinias, Golden Feather, Petunias, Salpiglossis, Stocks, Sweet-Peas, &c. Sow small quantities at intervals rather than all at once, keeping the balance in air-tight tins or bottles. Sweet-Peas and Nasturtiums may be sown at once where they are intended to remain. Cuttings of Verbenas, Petunias, &c., should be put in early in the month to be ready for December planting. Supply vacancies in beds and borders. Prune shrubs and trees where necessary. Fork up the soil among shrubberies, burying any decayed refuse. Top-dress or re-pot orchids. Vegetables of all kinds, except potatoes, may be put in early in the month.

September.—Weather mild and pleasant. Average rainfall 5'78 inches on eighteen days. Mean temp. 62 deg. Mulch annuals which have been planted out in June and July, especially those in un-manured beds. Continue supplying vacancies where they occur. Prick out seedlings as they become large enough to handle into boxes or beds under cover. Where the sowings in sheds have been too thick the seedlings must be thinned out or all the plants will become weak and useless. More sowings should now be made of such seeds as Pansies, Phlox, Dianthus, Nemesia, &c. Keep an eye on young Cinerarias and Stocks for a green caterpillar generally found on the underside of the leaves and for green-fly; hand-pick the former, and smoke or syringe with soapy water for the latter. Dahlias should be taken up and stored in a dry place, for a six weeks' rest before being replanted in November. Stock manure. Sow vegetables of all kinds, except potatoes, which would suffer from the rains that may be expected during the next few months.

October.—Weather usually wet in the afternoons with the advent of the N.E. monsoon. Average rainfall 11'95 inches on twenty-three days. Mean temp. 62 deg. One of the most suitable months for general planting. Plant up pockets in banks. Re-pot any plants that need it. Prune back Geraniums, Pelargoniums, &c.; water sparingly until new growth has commenced, then re-pot. Insert cuttings of all kinds. Put into small-sized pots tuberous-rooted Begonias, Cinerarias, Gloxinias, &c., increasing the size of the pot each time of potting. Where annuals are wanted to be in bloom during the "season" (middle of January to end of May), these should be sown in succession from the middle of November to middle of February. Rose bushes here take two months to

come into bloom from the time of pruning, so the latter operation should be carried out according to one's requirements. Sow vegetables as last month.

November.—Weather wet and dull, often with heavy plumps of rain. Average rainfall 11'29 inches on twenty-one days. Mean temp. 60 deg. Watch for pests, especially black-grub; the early morning is the best time to catch these. Slugs and insect pests are liable to be troublesome this month. Unslaked lime will destroy them. Green-caterpillars are liable to attack Cinerarias and Stocks. The General planting up of beds and borders should be commenced as soon as the seedlings are large enough. Plant out roses, pruning them two or three weeks later. The weather during this and next month is generally suitable for budding and grafting. Put down vegetables of all kinds from now onwards.

December.—Weather often excessively wet and misty. Average rainfall 12'84 inches on twenty-one days. Mean temp. 58 deg. Weather conditions are generally against plant-growth, the days being sunless and misty, with an almost continual drizzle and heavy plumps at intervals. "Damping off" and pests are prevalent. Constant attention must be directed to the destruction of pests and the supplying of vacancies. Weeds are apt to become troublesome this month. The surface of the soil should be frequently pointed over, as the continuous rain tends to cake it. Attend to potting of plants generally: this should be about the last shift for flowering plants for the season. Re-plant strawberries. Cadjans or some similar material should be obtained for covering all plants that are susceptible to frost, which is now liable to occur at night at the higher elevations. Sow vegetables of all kinds.

CALENDAR FOR THE MOIST LOW-COUNTRY.

BY THE AUTHOR.

The following general remarks may need modification according to weather, local circumstances and elevation. For average rainfall in principal towns in Ceylon see page 5.

January.—Weather generally dry, with N.E. winds. Planting operations in the open should now cease. Collect fallen leaves on lawns, &c., and place in a deep trench to form leaf-mould. Order plants of roses, &c., from Europe, so as to receive them in April or May. Cloves are now in season. These should

be collected before the buds open, and spread out on mats to dry in the sun. Tamarinds, pineapples, and Cochin-goraka are fruits in season.

February.—Usually the driest month of the year. The surface soil should be stirred up frequently so as to check the evaporation of moisture. Much watering will be necessary for pot-plants, shrubberies, beds and borders. Overhaul pots and seed-pans, and order new stock if required; these cannot be made so well in rainy weather as now. Syringe pot-plants frequently, at least twice a day in hot dry weather. Repair drives and paths. Mulch surface soil among crops of all kinds. Where practicable, all plants with delicate leaves should be afforded partial shade. Do not water bulbous plants which may now be in a resting state. Flower seeds may be ordered from Europe. Star-apple, pineapple, and lovi-lovi in season. *Bombax*, *Bignonia venusta*, and *Tabebuia* in flower.

March.—Weather dry and hot, and most trees, crops and tender plants suffer from drought. Towards end of month plant out yams, sweet-potatoes and similar root-crops. Watering, shading and mulching should be the order of the day. Loosen the surface soil frequently where artificial watering is carried on. Syringe pot-plants morning and evening with clear water. Repotting of pot-plants should be carried out now. Fruits in season:—Pineapple, pomegranate, cannonball-tree, velvet-apple and Madagascar-clove. In flower:—*Jacaranda*, *Gliricidia*, *Spathodea campanulata*, *Bignonia venusta*, *Saraca declinata*, *Amberstia nobilis*, &c.

April.—Weather hot and muggy, often with thunderstorms. Keep drains, water-channels and culverts clear of leaves and rubbish, and provide means of escape for excessive rainwater. Plant out yams and native vegetables of all sorts. Overhaul banana clumps, cutting out barren stems and dried leaves, burying these round the plants. Oranges, jak-fruit, star-apple and bullock's-heart in season. *Cassia grandis*, *Schizolobium*, *Bignonia unguis*, *Jacaranda*, *Poinciana*, (Flamboyant), *Gliricidia*, *Sterculia colorata*, *Hippcastrums* in flower.

May.—The hottest month of the year. Prepare ground for all kinds of vegetable seeds. Procure sticks for supporting peas, beans, &c. Collect potting soil, and store away as much manure and leaf-mould as possible before the S.W. monsoon rains commence. Replanting of flower beds and borders should be put in hand, the ground being first well trenched and manured. Fertilise

vanilla flowers, which are now in season. Mangoes, cashewnut, pine-apples in season. *Dendrobium MacArthiae* ("wesak-mal"), *Michelia Champaca* (Sapu), *Lagerstroemia Flos-regina*, *Cananga odorata* (Ilang-ilang) in flower.

June.—If not already arrived, the S.W. monsoon is due early in the month. As soon as rainy weather begins sow English vegetable and flower seeds of all kinds. Mow lawns and dig out white-ants' nests. Renovate rockeries and ferneries, applying fresh soil if necessary. Principal fruits in season:—Mango, kamara, jambu, breadfruit, cashew-nut, Java-almond, nam-nam, sandoricum, soursop. Flowers in season:—*Lagerstroemia flos-reginae*, *Cassia nodosa*, *Peltophorum ferrugineum*, *Kleinhovia hospita*.

July.—Weather usually cool, with moderate rainfall. Plant out fruit, shade, and other useful or showy trees, also general ornamental plants. Attend to propagating work of all kind. Keep down weeds. Earth up root-crops, and stake peas, beans, &c. Mow and roll lawns. Budding and grafting work may now be undertaken. Prune roses which are finished flowering. Flower seeds may be ordered from Europe for sowing in September. Fruits in season:—Mammee-apple, durian, Cochingoraka. Flowers in season:—*Pometia eximiea*, *Porana volubilis*, *Fragroea fragrans*, *Ipomoea Briggsii*, &c.

August.—Weather moderately dry. Gardens in the low country should be at their best during this month. Attend to general weeding of vegetable and flower-garden, also mowing of lawns. Fork up surface soil between crops, also of beds and borders generally. Attend to the lopping of shade trees which have exceeded their proper limit. Principal fruits in season:—avocado-pear, durian, sapodilla, guava, coco-plum, goraka, also Hevea or Para-rubber. In flower:—*Cassia Fistula*, *Solanum macranthum*, Teak, &c.

September.—Usually a fairly dry month. Renovate flower-beds and borders, affording mulch to the surface; tie up tender stems or heavy flowers to neat supports. Fresh sowing of English vegetables and annuals should now be made. Repair drives and paths. Fruits in season:—Ceylon-gooseberry, nelli, lovi-lovi, soursop. In flower:—*Cassia multijuga*, *Spathodea campanulata*, *Gloxinia maculata*, &c.

October.—Usually the wettest month of the year. See to the planting of shade, fruit, and wind-belt trees; also of ornamental plants generally. This is a good month for transplanting work. Prune shrubberies, fruit trees, &c. Attend to propagating work of

all kinds, also to the re-potting of ornamental plants. Principal fruits in season:—Voa-vanga, soursop, custard-apple, bullock's heart, papaw, and nutmeg (second crop). Principal flowers:—*Vanda spathulata*, *Spathodea*.

November.—Weather usually wet and fairly cool. All general planting work should be completed this month. Pruning or thinning out of shrubs, trees, &c., should now be attended to. Sow peas, beans, beet, and other vegetables. Yams are now ripe and should be lifted and stored in sand, in a cool shed. Prune roses that have finished flowering. See to drainage and soil requirements of pot-plants. Principal fruits in season:—Bullock's-heart, pineapples, soursop. Flowers:—*Aristolochia* (several spp.), *Palicourea*, *Acalypha sandarina*, &c

December.—Generally a moderately moist month, with fairly strong wind. Support all tender plants and young trees in exposed situations, fixing a stout stick in the ground close to the plant, and tying the latter to it. Afford shade to such plants as require it. Collect seeds of flowering plants, annuals, &c., and store when dry in stoppered jars. Collect fallen leaves, and place them in a pit or trench to form leaf-mould. Principal fruits in season:—Custard-apple, wood-apple, *Dillenia indica*, and *Elacocarpus edulis*. Flowers:—*Wagatea spicata*, *Naravelia zeylanica*, *Pachira insignis*, *Wormia Burbidgei*, *Humboldtia laurifolia*, *Alstonia macrophylla*, &c.

THE END.

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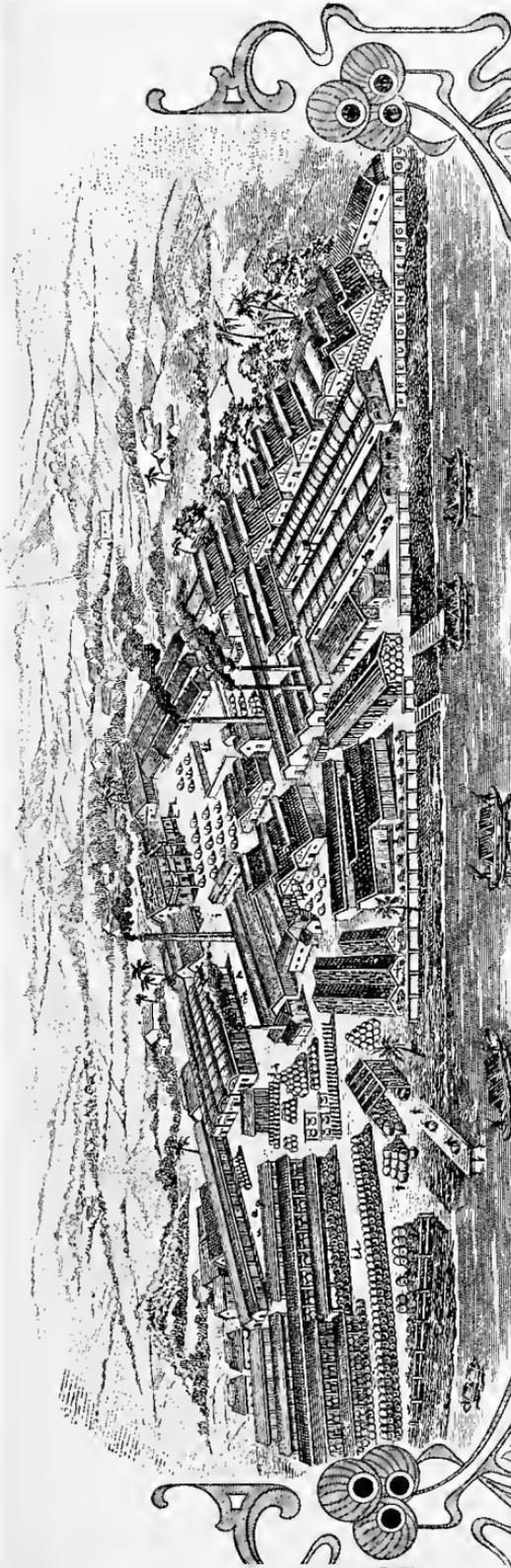
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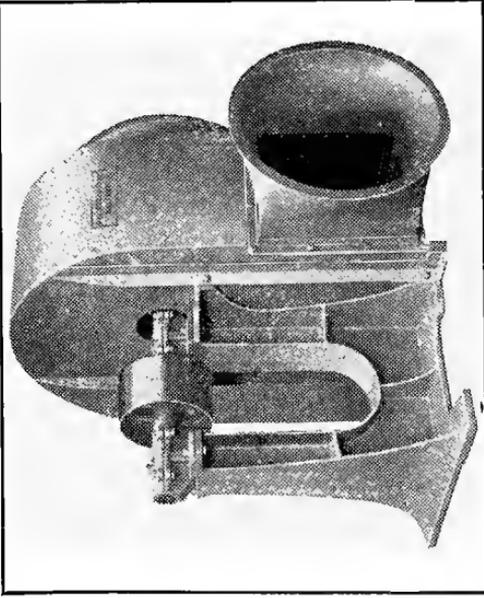
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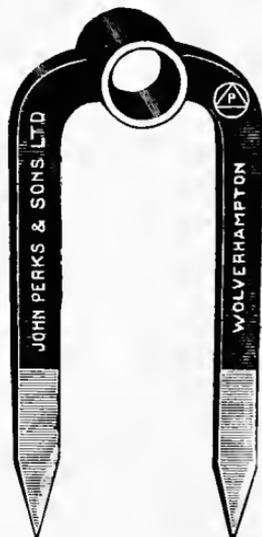
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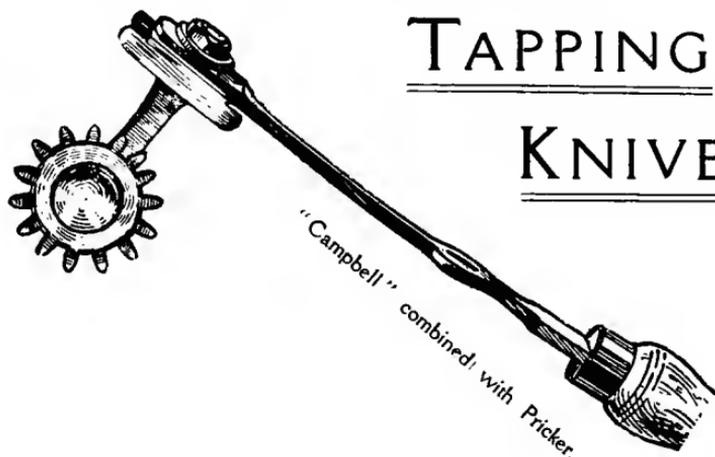
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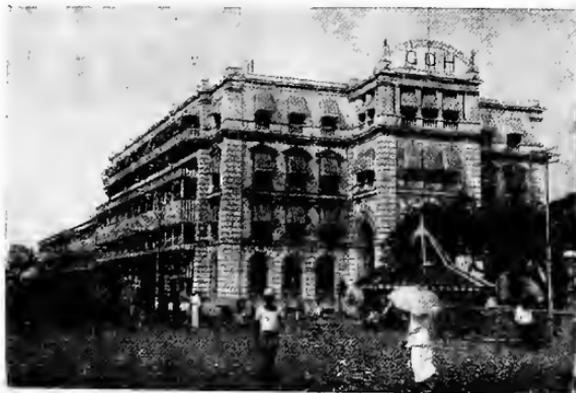
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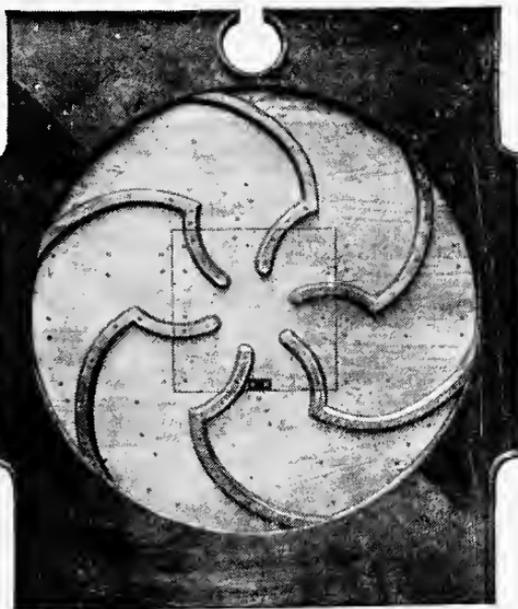
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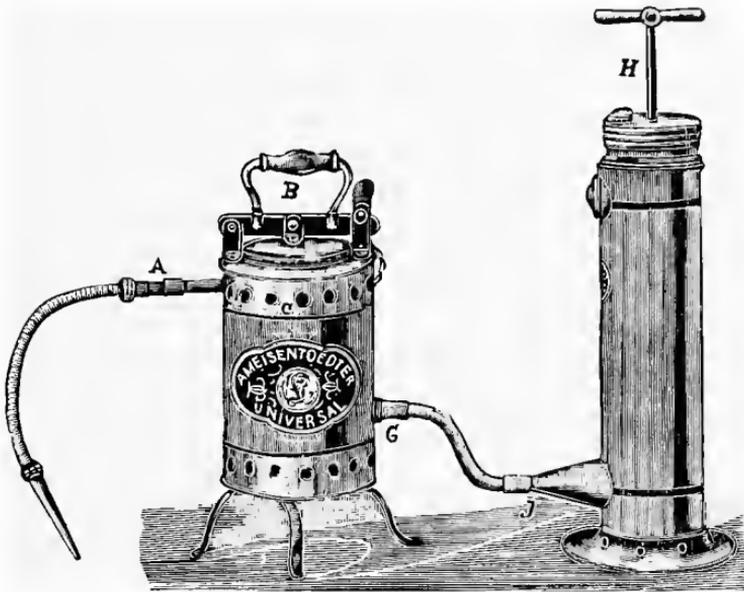
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