Carob Tree. (*Ceratonia Siliqua*, L.)

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DCXVIII.—CAROB TREE.

(*Ceratonia Siliqua*, L.).

The Carob or Algaroba tree is a native of Southern Europe. It is a leguminous plant, usually from 15 to 25 feet high, with few branches and dark green pinnate leaves composed of two or three pairs of leaflets of a leathery texture. The flowers are polygamous or diœcious (*i.e.*, either self-fertilising or unisexual on different plants), arranged in small red racemes. The pods, known as Locust beans or St. John's Bread, are full of a sweet mucilaginous pulp, six to ten inches long, and contain numerous seeds. They are often eaten by the poorer people in the Levant, and serve as a useful food for cattle. The seeds are also said to be used in the preparation of mucilage. In Italy and Southern Spain the tree is cultivated in dry, stony localities, and yields valuable crops. The value of the carob pods exported from Cyprus has, in some years, reached £65,000.

There are several cultivated varieties, and as the tree is usually diœcious it is necessary to engraft seedling plants in order to ensure large crops. "In the case of [fully grown] male trees each branch is usually grafted from a female tree, reserving one ungrafted male branch to ensure fertilisation . . . if the tree is female, one branch must be grafted with a male branch for the same purpose."—(*Haldane*.) For cultivation in hot and dry districts, with stony soils, there is little doubt that the carob is a valuable tree, and deserves to be widely cultivated. It requires warmer conditions than the orange, *i.e.*, a mean yearly temperature of, say, 66° F. It is said to prefer a calcareous subsoil. It begins to bear at about eight years old. A single large tree may yield pods weighing in the aggregate about 2 cwts.

Carob trees are familiar objects in some parts of the Canary Islands, especially above Puerto Cruz, in Tenerife. There they are evidently seedlings, and produce only a scanty crop of pods. In the garden of Dr. Grabham, at Funchal, Madeira, there is a very handsome carob tree. The main stem has a circumference of 15 feet; at about 8 feet from the base it divides into numerous wide-spreading branches, and covers a considerable area. As it is the only tree in the neighbourhood and produces a fair crop, it is probably self-fertilised.

The carob tree was introduced to Jamaica in 1883, chiefly from seed gathered by the present Assistant-Director of Kew, from the Madeira tree above mentioned. The plants have grown well in the plains, but those that have hitherto flowered have produced male flowers only. Steps are now being taken to introduce grafted plants from Naples.

An interesting report on the carob tree has lately been presented to the Foreign Office by Mr. E. Neville-Rolfe, Her Majesty's Consul at Naples (F. O. Miscellaneous Series, 1897, No. 431). This is reproduced below. It contains valuable hints

respecting the propagation and cultural treatment of the tree in Italy :—

Report on the Cultivation of the Carob or Locust-bean Tree.

In the course of last spring a well-known gentleman from South Africa made inquiries at this Consulate concerning the cultivation of the carob or locust-bean tree and the possibilities of its introduction into the Cape Colony. The carob is a tree the fruit of which consists of a long pod, which not only forms excellent horse-food, but is very largely eaten by human beings, especially children, on account of its sweetness. The pods contain very hard beans, which are useful only for seed, as horses leave them in their mangers, and if by chance they swallow them, it is found that they do not digest them. The tree bears, moreover, thick dark ever-green foliage, which gives a cool and grateful shade. It grows in many places in the Mediterranean where nothing else will grow, notably on the arid hills of Malta, and it seems certain that in the endless varieties of soil and climate to be met with in the Cape Colony there must be many districts where it would grow freely. The successful result of such an experiment would be simply invaluable to the colony if merely as a supply for horse-food, for one of the greatest difficulties in travelling at the Cape is to feed one's horses, the price of forage in some districts being extremely high, and the supply often distressingly short. Forage, moreover, as it consists of oats with their straw, is not readily portable, but carobs enough for a pair of horses for a day can be carried in a small bag. The carob in Italy grows alongside the oranges and lemons, and there can be no reason why it should not grow with the magnificent orange trees of Wellington, and become as superior to the carob of Italy as the Cape orange tree is superior to its Italian prototype. In places like Graaf-Reinet, and Aliwal North, the success of the experiment seems absolutely certain, while, judging from the way the tree prospers on the dry stone of Malta, where it grows with apparently no soil to help it, there is good hope that it might take kindly to the "Kopjes" near Colesberg, the bush veldt of the Western coast, the lower slopes of the Drakenfelds, or among the trees of the Knysna forest. The writer being well acquainted with the Cape Colony, has had much pleasure in investigating the matter thoroughly, and, after lengthened consultation with practical arboriculturists, the following *modus operandi* has been decided upon. First, a sufficient quantity of seed will be sent out to grow a number of seedlings in different parts of the colony. These seeds will produce carobasters, which will not have a fruit worthy of the name till they are grafted. The strongest seedlings may be grafted in their third year, but it is of no use to graft until the plant is strong and well grown, which may not be till it is five or even seven years old.

A number of plants in pots will be grafted here next spring, repotted in larger pots with plenty of clay, and when the grafts have taken well the trees will be packed, the clay well soaked in water, and it is confidently hoped that they will bear the journey satisfactorily. They will be sent from here in the month of February, and will probably travel *viâ* England, which seems climatically preferable to the East Coast route, by German steamer

to Durban *via* Zanzibar. If the coincidence of the steamers can be secured, they may reach Cape Town within a month of their despatch from here, or even less, but if not, we have no doubt that the steamship company will see that the roots are kept carefully wetted while the trees are in bond at the port of origin. It is with the object of keeping the roots wet that they are now being repotted in stiff clay, a soil which is in itself favourable to the growth of the tree.

Having thus given a general sketch of the scheme, it is necessary for its success to enter into minute detail as to the method to be employed in the cultivation of the trees. We will first take the plants to be exported two years hence, because these are ultimately the most important part of the subject. If they should succeed, the acclimatisation of the tree at the Cape is assured; if they fail, the seedlings will be comparatively valueless for want of grafts. It is the fixed opinion of people here who have studied the subject closely that there would be no chance of grafts sent out arriving in a condition to be of any value whatever, so that it becomes absolutely necessary to send out the plants themselves; besides, when the plants at the Cape were ready to be grafted, our grafts would be out of season here. We have already secured some excellent plants, from each of which a large number of grafts should be available. It does not seem possible to secure plants already grafted, for the reason that they are not usually grafted in pots, the operation being performed after they are planted out and have got a good hold on the soil which is to be their permanent home. We cannot graft these plants till May, 1898, nor can we be sure of the success of the operation till May, 1899, when the plants will be sent out. The carob is a tree which cannot be transplanted on account of its tap-root, so that once planted it must remain where it is; it is therefore very essential to plant it in the right place to begin with. In the case of our plants it will be necessary to top them and to cut off every leaf in order that the sap may not be exhausted by the foliage when it begins to rise. We shall consequently export mere skeletons to the colony; and here again we have another difficulty to contend with, namely, the change of season. The plants will leave here at the end of our winter, and will arrive at Cape Town at the beginning of the South African winter. They will thus have a great strain put upon their nature, and great care will have to be taken of them to enable them to overcome it. This care they will certainly have at the hands of the managers of the Botanical Gardens in the colony, so that this is one of the least of our anxieties. The details in this report would therefore be unnecessary but for the fact that as the experiment will be tried on an important scale, and many of the plants will fall under the care of less capable hands, it is advisable to give very clear instructions. On arrival at their destination the plants must be carefully potted in garden mould, to which a little old farmyard manure should be added, and the pots must be moved from time to time to prevent the plants striking a tap-root through the hole at the bottom of the pot into the soil, in which case they will certainly perish. They will not require very much water, in fact the climate of South Africa so much resembles that of Naples that were it not for the clay which we must send with them the plants

scarcely require water at all in the Cape winter. If, however, this clay gets hardened it may kill the rootlets which by that time will have spread into it, and give the tree a worse chance, so that the clay must be kept moist. It may be desired to plant the trees out at once, but this should not be done in windy weather, and on the whole it will be safer to pot them, at all events for a few months till they can recover from their journey.

With regard to the seedlings, they should be sown in pots with proper drainage, and in garden mould, with a slight sprinkling of old, short, farmyard manure. The greatest care must be taken to move the pots often enough to prevent a tap-root being struck through the pot into the ground beneath. Experiments may safely be made by sowing seeds in the spots where they are intended to remain, and grafting them when the plants come to maturity, but this should be done in enclosed gardens or places where the plants can be guaranteed from being choked by weeds, nibbled by sheep or game, or otherwise harassed in their early years. The carob grows freely in dry soils, but, economically speaking, it has been found preferable to raise them in pots. The seeds will be sent out in the pods, as this has proved to be the best method for their preservation. It is desirable to remove the beans from the pods, and soak the beans for four days before sowing them; the seed thus gets softened, and germinates more rapidly. At Naples the seeds are sown in February and March, but they are apt to sprout very unequally. The majority grow freely and well, but some come up as late as October, and then generally develop weak plants. The strongest seedlings may be potted at the end of the first year, or even as early as November; the weaker ones at the close of the second. They must be kept in pots till they are finally planted, as they will not bear transplanting, and windy weather should be avoided for these operations. The experiments conducted here show that it takes a minimum of four years and a maximum of seven to produce a plant. A strong plant may be planted out in safety in five years, but much depends on the skilful care of the seedlings in the nursery. Each plant brought to maturity in this country is calculated to cost 8*d.*, and it has been found by experiments that it is cheaper in the long run to grow the plants in the nursery than to sow them in the open ground. They are not particular as to soil, and grow freely in clay, if not too wet, in sandy soils, and in the clefts of rocks, where, of course, holes of about a cubic yard must be dug for them and filled up with soil, drainage being provided in the ordinary way. It is usually necessary to build a rampart of stones in the shape of a crescent on the lower side of the hole to prevent the soil from being washed away. On "Kopjes" and hill sides the trees must be planted on such spots as offer a position, unless the hill has soil enough to be terraced, but on open arable land they should be planted in rows from 12 to 15 yards apart. The intervening ground can be used for garden crops, but these must not be grown within four feet of the young trees, although the ground round the trees may advantageously be dug over when the rest is prepared for cropping. Exhausting crops, such as corn and mealies, must not be grown, but cabbages and garden produce generally will do no harm.

It is better to let the plants obtain a strong growth before

attempting to graft them, the third year being about as early as it is prudent to do it. If a plant is very full of leaf it is desirable to leave it alone and not to graft it at all, for a reason which will appear below, and also because being leafy it may be taken to be a good variety. The season for grafting here is from the middle of May to the end of June, the grafter being careful to see that the bark opens easily. The best plan is to graft on the boughs and not on the stem, leaving the smaller boughs to utilise the winter deposit of sap, which may otherwise prove injurious to the grafts. These boughs can be cut off in the following year. The carob can also be satisfactorily budded, or grafted by sawing off the trunk and cleaving it. In windy situations it will be necessary to bind canes to the grafted boughs to stiffen them, and to prevent the grafts from moving. The best two varieties of carob are both called here the "Honey bag": one bears a long narrow pod, the other a short wide one.

The object of leaving a fair sprinkling (say 25 per cent.) of ungrafted trees in a grove is the following. The grafted tree produces almost exclusively female flowers, the ungrafted tree males. Unless these flowers are in due proportion there can be no crop; and in fact this was the primary cause of the failure of a carob grove in Sicily, a cause which was discovered and remedied by Professor Bianca. In planting these trees on ordinary arable land great inequality will often be found in the plants, which arises from the fact that the carob cannot support water. Hence, where water accumulates in the subsoil the tree will not grow, whereas, where the water drains away, it will grow freely, and for this reason a hill side is the best situation for a grove.

Some years ago the Italian Alpine Club agreed that it would be greatly to the advantage of South Italy, and would add materially to the attractions of the mountain scenery, if the Apennines, which are now for the most part quite bare, could be made to grow trees such as there is every reason to believe that they did in more ancient times. They determined to consult Signor Savastano, the professor of arboriculture in the school of agriculture at Portici, near Naples, who gave it as his opinion that the mountains where the lentisk and the myrtle grow freely enough could be utilised to produce the more remunerative carob. To the obvious advantage of reafforesting the mountains, and thus adding to the rainfall, would be added the production of a valuable crop where nothing saleable had grown before.

The great carob-growing districts of South Italy are in the Bari region, on the Adriatic coast, and quantities are exported annually to Russia and Central Europe from Brindisi and the other ports along the coast. Though the tree may be seen in almost any garden here, and is not uncommonly found on the mountains, the only person who has made a hobby of its cultivation is the Prince of Belmonte, who has large properties in the province of Salerno, not far from the ruins of Paestum. Besides planting several trees in his shrubbery, the Prince has a long avenue of them leading up to his house, which is particularly interesting, and is, we believe, the only avenue of its kind. The trees are planted 7 metres apart, and the largest of them has a trunk of 85 centimetres (about 2 feet 9 inches) in circumference. This tree is 18 years old, and its top is from 6 to 7 metres in diameter, and

4 or 5 in height. In common with the other trees of the avenue, the fruit is of the best description, and each tree may be taken to yield annually 50 kilos, or say 120 lbs. of fruit, worth here about 6 shillings. This may be spoken of as the ornamental part of the work, while the plantations of *Licosa* and *Tresina* are more on the scale of a commercial enterprise. They are both germane to our present purpose, as they show in what different circumstances the carob will grow and flourish. The *Licosa* grove is in a plain by the seaside, and the difference of the trees is very remarkable, some of them growing with great vigour, others not flourishing at all. The reason of this must be the existence of land-springs beneath the surface with which the weaker trees come into contact, and by which their growth is checked. There is no other apparent reason, and as the grove consists of about 1,500 trees there is scope for observation. The site is very much exposed to the wind, and in the first attempts at forming the grove as many as 70 per cent. of the plants were lost. There were other causes too which led up to this heavy loss. First, the whole thing being an experiment, they did not know at what period and in what way it was best to graft the trees, and also the grafters had not anything like the skill which they have since acquired.

The grove at *Tresina* is planted in altogether different conditions. Here we have a hilly country fully 1,000 feet above the sea, and here the outside loss of plants has been 20 per cent., which is not more than occurs in the planting of ordinary forest trees. The plantation consisted originally of 7,000 trees, but has been largely increased year by year, and the Prince expresses every confidence that in a few years' time he will clothe the barren slopes with a mantle of luxuriant green. Professor Savastano asks very pertinently why, if these results can be obtained at *Tresina*, they should not be obtained elsewhere, and thousands of barren acres of Italian mountains be made useful and productive. And, in fact, since he wrote upon the matter, the spread of this cultivation has been steady and continuous. We have shown pretty plainly that Prince Belmonte has attained success only by patient experiments extending over a considerable number of years. Commercially speaking he is abundantly satisfied with the results obtained, but he does not relax his efforts. He rears some 8,000 seedlings every year, and has a skilled staff to conduct all the necessary operations, with the result that he grows a valuable crop on ground which before was absolutely unproductive; and if the landed proprietors of South Africa profit by his experience, and are equally persevering, and the tree, as is anticipated, proceeds to grow like a weed, its introduction should form a mine of wealth to our industrious colonists. There is one important advantage that the carob has over other beans, namely, that it does not require threshing. In feeding horses it is usual to break the pod into two or three pieces and to put it in the nosebag or manger mixed with bran.

E. NEVILLE-ROLFE.