THE CULTIVATION OF THE MANGO IN THE DRY ZONE OF CEYLON (concluded)

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TOPWORKING UNDESIRABLE VARIETIES OF TREES.

UNDESIRABLE varieties of mango trees which are not very old may be topworked. This may be carried out by cleft-grafting, budding or bark-grafting on shoots produced as a result of heading back the branches within a foot or two of the main trunk. When the branches are pruned, it is desirable to have the cut sloping, so that water may not remain on the cut surface. All wounds should be painted with tar or any other suitable covering material. The strongest and the most vigorous of the shoots is selected for budding or cleft-grafting.

PACKING OF MANGO SCIONS FOR TRANSPORT.

For packing of scions to be sent by post within the Island the following procedure is adopted at the Jaffna Farm School. Selected scion twigs are cut to a length of 9 to 10 inches. The leaves are removed with a sharp knife leaving only the stumps of petioles. A rectangular cardboard of length a little more than that of a twig is cut and rolled into a cylinder. Usually about 12 or 16 twigs are sent and they are tied together by strings at both ends. The bundle of twigs is packed in sufficient green grass (blades of guinea grass cut to the required length or *Cyanodon dactylon* grass may be used), and put into the cylinder of cardboard. The cylinder is tied up tightly. It is then wrapped in brown paper and sent by post. Usually the cuttings are received in good condition.

PACKING OF PLANTS FOR TRANSPORT.

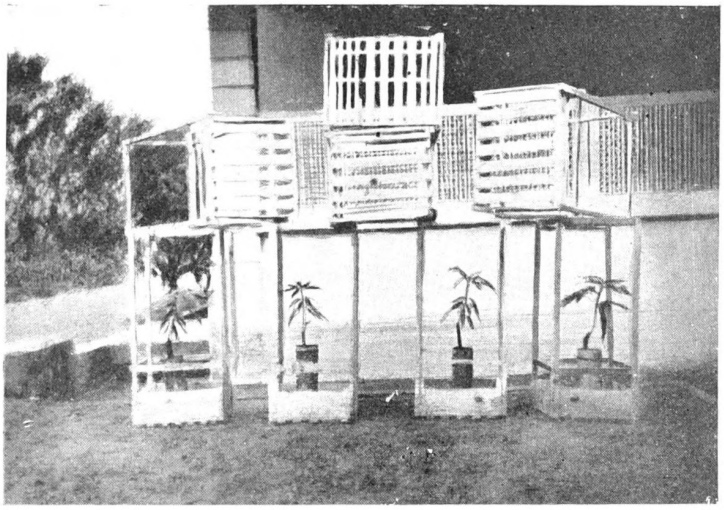
At the Farm School, Jaffna, mango bud-grafts potted in zinc sheet cylinders are packed in dealwood crates for transport. The crate usually consists of a box the bottom of which is about one foot and six inches square and the sides about six inches in width. The bottom is made of wooden bars nailed on to the side planks with an inch of space between them. Four bars are fixed at the four corners of the box as posts and they are fitted with a square frame on top. They may be strengthened by bars fixed at the sides. The height of the posts is about two feet and six inches. The crate would hold about 12 budded or cleft-grafted plants. The crates may be made to any size to hold a required number of plants. At the bottom a layer of plantain sheaths or straw may be put in. Then the plants are put inside with pieces of plantain sheaths between the cylinders. If the plants are to be sent a long distance, moist saw dust may be packed between the cylinders.

Plants are then watered, water being also sprinkled over the crate to keep the plants cool and moist. Coir strings are tied in the form of a network round the sides as well as the top of the crate. The network of coir strings prevents injury to the plants during transport. During last year 18 budded plants were sent by rail and steamboat from Jaffna to Nagpur in the Central Province of India, a distance of about 1,500 miles. It was reported that they were received in good condition. Thousands of plants were sent by rail within the Island and no reports were received regarding damages during transit. Even during the hottest months the plants could be sent in the crates. The cost of packing 12 plants is Rs. 2·50. Woodrow (13) writes " Grafted mango trees in pots bear transport over sea with very slight loss if firmly packed in a ' wardian case ' and in a case really similar the writer has despatched grafted mango plants from India to Florida and Queensland and found they arrived in safety. " Burns and Prayag (1) write " Ordinary deal wood packing cases have been used at the Ganeshkhind Botanical Gardens for despatch of plants to Washington (U. S. A.), Dongola and Cairo (Egypt). Twenty-seven out of twenty-eight plants arrived in good condition at Washington ; fifty plants were sent to Dongola and were acknowledged. No report of damage was made. Out of hundred sent to Cairo fifty-eight arrived. Those not in good condition on arrival were all dead from physiological causes but one case had been roughly handled and many plants broken. "

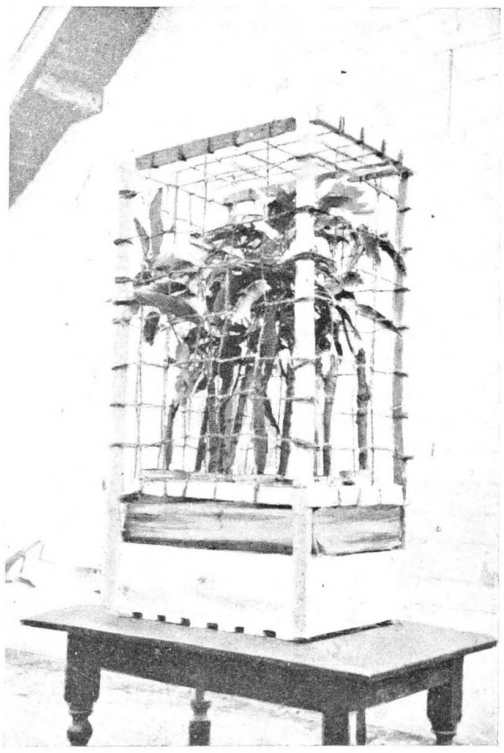
During the year 1937 the writer sent 16 budded plants in pots to the Under Secretary, Department of Agriculture and Stock, Brisbane, through the Curator, Royal Botanical Gardens, Peradeniya. No report of damage was received.

CARE OF THE ORCHARD.

During the early growth of the plants there should be no check. The plants should be regularly irrigated, twice a week during the first year, and then once in two weeks for two or three years afterwards when there is no rain. It is well known that root distribution may be affected by irrigation during the early growth of roots. By withholding water, or by irrigating at longer intervals, trees may be made to send their roots deeply into the soil ; light irrigation tends to encourage shallow rooting ; and irrigation to one side of the tree will confine the development of roots to that side. When once the root system is developed, later irrigation will have no influence on the extent of the distribution of the roots. It is desirable, in the case of the mango, to have a well-developed root system with laterals on all sides penetrating fairly deep into the soil. Young mango trees require irrigation for about two or three years according to the nature of the soil, water table and climate. On sandy soils the young trees should be irrigated fairly frequently and in small quantities. With the coming of warm weather, readily-available water is quickly used by trees and the supply should be replenished. During dry weather irrigation is very necessary for the uninterrupted growth of young trees. Mango trees are irrigated by the basin method which permits of the wetting of a large extent of the soil (about 100 to 150 square feet per tree to a uniform depth). The irrigation system consists of square or rectangular basins enclosing a tree. The water is let into a basin to the desired depth ; then turned into the next and the first



Crates for packing grafts.



A Crate packed with grafts.

basin is closed. Water requirements of the trees may be found by examination of the soil with an auger or an "alavangu", to the depth containing most of the roots. In the case of two-year-old trees most of the roots may be contained in the upper three or four feet of good soil. If this depth is wetted at each irrigation the interval between each irrigation need only be just sufficient to allow for penetration of the uppermost layers to about a foot or two.

Intercrops may be planted in a young mango orchard. The trees do not require all the space between the rows for about three years. Plantain suckers may be grown not closer than 6 feet from the rows of mango trees. In addition to being a catch crop they act as a wind break against the strong winds of the south-west monsoon in most of the dry zone areas. Tomatoes, chillies, dhal &c. may also be grown as intercrops. At the end of the third year mango trees may require all available space for themselves. They may give so much shade that the intercrops may not grow well. It should be the aim of an orchardist to keep the young trees growing vigorously. In the beginning the intercultivation of the catch crops would be sufficient for mango trees.

CULTIVATION AND MANURING OF MANGO ORCHARDS.

Mango orchards do not require frequent cultivation. The usual practice is to hoe the basins once or twice just before the north-east monsoon during the end of August or early in September to aid the penetration of the first rains. During the rainy months tillage may be necessary to control weeds, but after the rains are over little tillage is necessary as only a few weed seeds would germinate when the surface soil has become dry. The chief reasons for cultivation around sufficiently old trees are to aid in the absorption of rain which might otherwise be lost by surface run off, to remove competition for water by weeds and to incorporate manure in the soil.

As mentioned earlier the mango flowers in the dry zone during the months of January to March according as they are early, seasonal or late bearers. The flowering is usually profuse in most of the varieties. During the time the trees are engaged in the production of fruit they usually make little or no growth. The trees are almost exhausted at the end of the fruiting season and they must be manured if they are to bear well in the next season. At the Jaffna Farm School the following mixture of manures is found to be suitable for each of the bearing trees :—3 pounds of Superphosphate, 3 pounds of Sulphate of Potash, 1 pound of Sulphate of Ammonia and 1 pound of lime. The mixture of manure is usually applied with ten baskets of farm yard manure to each basin at the end of the rains in the month of December or early in January. If some of the young trees are particularly slow their growth may be stimulated by the application of ammonium sulphate or powdered oil cake at the rate of 2 to 3 pounds per plant. Popenoe (12) writes "liberal application of potash manures encouraged the production of large number of fruits." Burns and Prayag recommend 20 pounds farm yard manure per tree for a one-year-old tree and an increase of 10 pounds per tree per annum up to 100 pounds per tree. Similarly bone meal may be applied at the rate of 5 pounds per tree for a one-year-old tree and the rate increased by one pound per annum up to 15 pounds per tree, ashes at 10 pounds per tree and increased by 2 pounds per annum up to 30 pounds per tree. The

manure should be well dug into the ground in a trench 2 feet broad and 6 inches deep and 1 foot away from the trunk in a one-year-old tree. Widen the trench 6 inches per annum and take its inner edge 6 inches further from the tree per annum. The best time to apply the manure is at the break of rains. If artificial manures are given they should be applied at the end of the rains. Woodrow (12) advises the use of salt to trees in the moist climate. He says " The mango growers . . . . applied 10 pounds of salt to each tree at the end of September.

This would arrest growth during October and November and encourage the formation of flower buds. In a moist climate, and the intervening ground occupied with irrigated crops, this system is highly commendable, but with a dry climate is unnecessary ". Burns and Prayag (1) write with regard to the application of salt as follows :—" It is a common practice in the konkan to apply salt as a manure to mango trees. The efficiency of this is doubtful . . . . Its use may, therefore, be disregarded until more conclusive evidence as to its value is forthcoming ".

YIELD.

Grafted mango trees are known to bear earlier than seedlings. At the Farm School, Jaffna, several budded mango trees are recorded to have borne at about the age of one year and six months from the time of planting. The budded plants are found to be very vigorous in their growth, and bear early in age. The number of fruits produced in the first bearing season varies from 10 to 25 in different varieties. It is observed that many mango trees bear heavily in one season and lightly in the next. Such trees improve to a certain extent when close attention is paid to proper manuring and cultivation. Burns and Prayag (1) say " As a rule the mango bears its crops in alternative years. The abundance of one year is generally succeeded by a small crop next year and though conditions that determine this are difficult of explanation, yet, from a commercial standpoint they influence greatly the mango trade ".

ROOT PRUNING TO INDUCE FRUITING.

Many imported varieties, which are usually inarched plants, do not bear even when they are sufficiently old. Several such trees are in existence at the Farm School, Jaffna. Preliminary trials on root pruning of some of those trees have not produced any definite results.

HARVESTING THE FRUIT.

In home gardens the mango fruit is usually picked when it is fully mature and stored in a room for ripening on straw or on margosa leaves. Very often owing to the damage caused by squirrels, bats, crows and other birds, immature fruit is gathered, causing shrivelling when kept for ripening. Fully matured fruit is gathered with a waxy bloom in most of the varieties, the fruits of which when tapped with a finger emit a deep dull sound. Matured fruit is hard, and the sap which oozes out of the apex at the time of picking is thick and easily dries up. In varieties like Ambalavi a slight development of yellow colour near the apex indicates the maturity of the fruit. An experienced nurseryman would easily differentiate a mature fruit from an immature one by sight. ' In the Jaffna Peninsula, fruit is usually gathered by means of a long-handled picker known in Tamil as ' Kokkathadi '. The picker consists of a long pole 12 to 15 feet in length,

a small curved knife fixed to the end of the pole and a palmyrah leaf basket 9 to 12 inches in diameter and 9 inches deep attached just below the curved knife. In place of the curved knife a small stick may also be tied to the end of the pole so as to make an acute angle with it. The curved knife or the stick is usually slipped across the stalk of the fruit and pulled with a slight twist. The severed fruit falls gently into the basket. In picking great care must be taken not to bruise the fruit as the bruised fruits soon decay. In Jaffna the fruit is not picked with the stalk. Higgins (2) writes " For home use it is generally preferred in Hawaii to gather the fruit from the tree when it is perfectly ripe. In India it is preferred to gather the fruit while still hard and store in the dark for ripening. Sometimes it is even buried in the soil. For marketing purposes it is necessary to gather the fruit while yet firm, and if fully grown its excellent flavour will be retained. The fruit should be picked with great care to avoid the slightest bruising, which though it may not be apparent at first will soon disfigure the fruit and cause decay. The stem should be left about an eighth of an inch long ".

STORING AND MARKETING.

A number of trials was made at the Jaffna Farm School to ascertain the relative keeping quality of a few varieties. A few varieties such as " Dilpassand ", " Gundu ", " Malgoa ", " Pandi " &c., kept in good condition after picking for a period varying from 13 to 15 days at ordinary room temperatures. A few others like " Chembattan ", " Vellai Columban ", " Willard ", " Kalahatti " and others lasted only for a period varying from 6 to 7 days. A number of fruits of " Ambalavi " and " Willard " varieties was sent to Colombo to be placed in cold storage. Equal numbers were stored at 50°, 45° and 40°F. The history of those held at 50°F was unsatisfactory. All broke down in less than one month. Those held at 45°F decayed after 6 weeks storage although some were good at 8 weeks. Of those held at 40°F all survived 8 weeks and many were in good condition on February 5, 1938 (stored on December 18, 1937) and ripened into edible state one day after removal from cold storage. A number of fruits of the " Ambalavi " variety, which is of good appearance, remained inedible until decay set in. The fruit was stringy and very poor in taste. The " Willard " retained their flavour and appearance upto 7 weeks at 40°F; after that time the surface became spotted and unsightly. Regarding cold storage of mangoes Pope (8) writes " Two crates of 50 mangoes each were placed in cold storage at a temperature of 48°F. The fruit in one crate showed a little change after 15 days. Specimens which were ripe when placed in cold storage retained their flavour; those were still hard when stored ripened in several days after they were removed to warmer temperatures. The fruit in the other crate was unsatisfactory when held for 31 days at a temperature of 48°F. The ripe fruit had lost its flavour. The result with certain varieties indicate that the fruit can be successfully shipped long distances and marketed ".

A trial was also made by dipping a variety of mango fruits in a fungicide to reduce the incidence of common fruit rot and to increase their keeping quality at ordinary room temperature. The treatment appears to have

had no appreciable effect on the fruit rot infection. Treated and untreated fruits were alike spotted on the 8th day. The rot in almost all cases was due to stalk infection.

The fruits are usually disposed of by the growers themselves direct to the consumers. In cases where there are a larger number of trees in a garden the fruits are sold to the highest bidder when they are sufficiently mature. Usually the crop is sold to the fruit merchants who sell fruits in the markets.

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