

Fruit Nursery Practices.*

By V. VENKATADRI REDDY, B. Sc (Ag.)

and

R. SHANMUKASUNDARAM, B. Sc (Ag.)

Fruit Research Station, Kodur.

It is a well-established fact that the success of fruit-growing industry is mainly dependent upon the fruit nurseries. Nurserymen not only determine the fruit wealth and fruit quality of a region but also influence to a considerable extent the economic condition of fruit farming. A large class of the public naturally look upon the nurserymen for guidance on a variety of matters such as the selection of orchard sites, selection of kinds and varieties of fruits and the proper orchard cultural practices. This aspect of the nurserymen's duties are considered so important in some parts of the world that the issue of periodic publications replying to enquiries and organisation of demonstrations and exhibitions are being done through a permanent and important branch of each of the various leading horticultural nursery establishments. Many countries of the world proudly point out the research work carried out entirely by some of the reputed nursery firms, particularly in the sphere of originating new varieties either by breeding or through selection of bud sports, which form in some fruits a fertile source of improvement, for or through the proper selection of propagating material. Trading with spurious plants under wrong names and with fanciful claims is unfortunately not an unknown feature of the Indian fruit nursery trade. Selection of high-yielding and high-quality parents is done by only a few firms, and even these do not unfortunately enjoy any better patronage from the public than the unscrupulous nurserymen. The mal-practices in trade are given greater prominence than the solicitude for the welfare of the fruit industry. The ignorance of the fruit-growing class as a whole, or the indifference of most of the wealthier classes of growers, many of whom are absentee landlords, have naturally contributed to the present state of affairs. The progressive deterioration in the yield and quality from our commercial orchards is therefore almost entirely attributable to the unscrupulous tactics of some of our nurserymen who, with an eye on quick profits forget the welfare of the industry and the fair name of their own firms. We cannot ignore the fact that some of the reputed nursery firms have in some measure been responsible for the present development. In our own Province it was left to a private firm in Panyam to first popularise the planting of budded citrus trees. Although the present perplexing synonyms are due to the fanciful names given to varieties by nurserymen, it must also be admitted that the extension of orchards under some of the well-known commercial varieties of fruits has so far been largely undertaken by a few

* Paper read at the thirtieth College Day and Conference of the M. A. S. Union, July 1941.

of the well-known firms or at their instance, particularly in South Kanara, Kurnool, Rajahmundry and Salem. It is therefore necessary for the welfare of the fruit-growing industry and economic improvement of our commercial orcharding demands that our fruit nursery and trade practices should be organised on sound and up-to-date lines. Planting of inherently fruitful trees of high fruit quality and choice marketing value are the basis of success. Although fruit research and fruit industry have been undertaken by the Department of Agriculture rather late, the department realised in the early stage of the inauguration of fruit research that in the production and supply of reliable plants from parent trees of superior commercial value lay the keystone of success. The establishment of two Government nurseries, one at Kodur and the other at Taliparamba formed the evidence of the deep interest the Government took in this matter. These activities of the department formed supplementary to the work already on hand at Coonoor, Kallar and Burliar gardens and at Coimbatore under the scheme for banana improvement. That the nursery schemes initiated by the department have already appealed to the fruit-growing public as a necessary and welcome measure is patent from the large demands for plants from them. At Kodur alone, orders for the supply of over 10,000 plants have been booked in advance during the current year, and in some cases advance orders had to be booked about two years ahead of the expected date of supply. Although the Kodur nursery scheme was put into operation only towards the close of 1939, the financial statement of the scheme as worked out on the 15th January 1941, showed a net profit of 24% to the Government. This is a gratifying feature and has already come to the notice of the public who have started similar ventures of their own at different places in the Presidency adopting *in toto* the nursery practices recommended at Kodur, and employing almost entirely the hands trained at Kodur for propagational purposes. A large number of fruit growers also have themselves undertaken the methods of propagation evolved at Kodur for extending their own orchards. This unexpectedly rapid development within only about 2½ years of the commencement of nursery work at Kodur makes it clear that the public is realising the great havoc that some of the unscrupulous nurserymen have played in the past.

A brief idea of the nursery work that has been and is being carried out at Kodur will not, it is hoped, be without interest to the fruit-growing public and nurserymen. The following account is therefore presented, and it will be seen that it does not in any way indicate that the problem has been dealt with fully. In the farming of fruit crops, the selection of varieties and parents and the evolving of optimum nursery practices form but a few of the several very important items. That of determining the suitable variety for each tract and region and for each purpose, and above all, that of finding out the most suitable and economic rootstock for each variety of commercial fruit are subjects on which any nursery has yet to grope in the dark and has to await results of elaborate and prolonged research. The work of the Government nursery schemes are therefore now limited to only those items, on which

sufficient information is already available. Furthermore, the main purpose at present is to supply plants true to name, of varieties that have already proved their commercial value, propagated from trees which are known to be productive in normal years, and on rootstocks that appear to be suitable.

Citrus Nursery Practice. *Sothgudi* oranges and acid limes which are the most important commercial varieties of citrus grown in Kodur area are propagated by budding on *jamberi* or rough lemon rootstock. *Rough lemon* is believed to be well-suited as a rootstock for almost all commercial types of citrus. It gives a high percentage of germination and a large number of apogamic seedlings. The plant remains in sap-flowing condition for a considerable length of time and the bark peels off easily from the wood, the former feature being conducive to easy bud "take", and the latter feature facilitating budding operations. It is a fast grower, very hardy and gives a straight stem. The seedlings are able to withstand transplantation well. An elaborate trial on nine different rootstocks for *chinee* orange and three for acid limes has been laid out at the Fruit Research Station, Kodur. The data collected so far show that, *jamberi* and *gojanimma* are the most vigorous and produce the largest sized plants. *Jamberi*, however, is preferred in Kodur nurseries because of the aforesaid advantages, and its resistance to gummosis. The scion material is selected from trees of outstanding merit. Some of the leading orchards at Kodur have been surveyed and the trees possessing the desirable qualities have been marked out for taking budwoods.

Sound healthy tree-ripe, rough lemon fruits are selected and seeds extracted. Those that float on water are discarded and heavier ones are collected and sown immediately on raised seed beds of 6 ft. in length and 2 ft. breadth, in straight lines across the beds at a distance of 6 in. from row to row and about $1\frac{1}{2}$ to 2 in. from seed to seed. The seeds are then covered with about two inches of sand. A copious watering is immediately given with rose-cans; subsequently, watering is done daily. When the seedlings are about one month old, a weeding is given, and a month later the weaker and diseased seedlings are pulled out. The beds are daily examined for caterpillars of lemon butterfly from the time of germination of seeds. When the seedlings attain about 6 in. height, they are lifted and transplanted into nursery beds. Generally one irrigation is given to the seed beds a day or two prior to lifting of seedlings.

The nurseries are prepared by giving two or three ploughings and applying a basal dressing of 50 cartloads of well rotten farm yard manure. The beds are generally 30 ft. by 10 ft. in size. Holes are made for planting the seedlings with the nursery transplanters devised at the Fruit Research Station, Kodur. This tool turns out five times the work of a chisel hoe. The seedlings are planted 6 in. apart in rows and $1\frac{1}{2}$ ' between rows. Close planting is always resorted to get straight stems. The beds are irrigated immediately after transplanting and again four days later, and continued at regular intervals of 10 to 12 days. Stirring of the

soil between rows with junior and hand hoe and hand weeding in between plants are done occasionally. In order to induce the growth of straight, thick seedlings, the side shoots are nipped off as they emerge. Lemon caterpillars, if any, are regularly hand-picked and destroyed. When seedlings have attained pencil thickness which they do in about a year in nursery beds, they are fit for budding.

Small trials are in progress to study the influence of vigour and kind of seedlings on the future performance of scion. So far no significant differences are observed between the treatments, and therefore, the selection of earlier germinated or vigorous seedlings from seed and nursery beds with the hope of obtaining the best orchard performance, appears futile. Buds are chosen from round, plump wood taken from two-year-old scion shoots which have attained almost the same thickness as that of the rootstock, and which have grey streaks. This wood should be straight and free from angularities. The bud is cut with a very thin slice of wood attached to it. Recent investigations at Kodur have shown that inserting the bud with a thin slice of wood attached to it gives a higher 'take'. An inverted "T" cut is made on the rootstock stem at a height of 6 in. to 9 in. and the bud is inserted carefully with the growing point upwards. Raffia fibre is then tied firmly round the rootstock stem and around the point of bud-insertion, leaving the bud open. From trials with various kinds of wrapping material, raffia fibre is found most suitable as it possesses just the right amount of elasticity to permit the radial growth in rootstocks and bud-sprouts, thus leaving no unseemly constrictions near the bud-joint. When the sprout has made 2 to 2½ in. of growth, the rootstock stem 3 to 4 in. above the bud is lopped off. Observations have shown that although the lopping off of the rootstock stem at the time of budding induces an earlier bud break, it considerably retards the growth of the sprout. Care is taken to remove all rootstock sprouts as they appear. When the bud-sprouts have made a growth of about 4 to 6 in. the rootstock stem is lopped off just above the bud-joint. The optimum season for budding at Kodur has been found to be from July to January. When the bud-sprout has made over 12 in. of new growth, the plant is dug out with a ball of earth of about 6 in. diameter and about 9 in. depth, and then packed in *arika* (*Paspalum scrobiculatum*) straw.

As compared to the period of three years reported to be essential in the Punjab for producing budded orange plants from the date of sowing the seeds, it is found possible to raise similar plants at Kodur within a period of only two years on *jamberi* rootstock. By artificially stimulating the growth of seedling rootstocks in seed and nursery beds, it is possible to further reduce this total period of two years by about three months. It seems clear that soil and climatic conditions influence the length of the pre-orchard life to a considerable extent, and this, specially the absence of a prolonged dormant season associated with severe winter conditions is possibly the explanation for the very great advantage that Kodur enjoys

over some other important citrus tracts in India as the Punjab. This feature has been emphasised by other workers also who have pointed out that in some parts of the tropics the pre-orchard period of citrus budded plants from the time of budding to that of planting out in the grove is only about eight months as compared to 12 to 24 months under semi-arid conditions as in South Africa and California. Experience at Kodur has, however, shown that a well-formed tree can be grown in nursery in about five months from budding, if the operation is done in proper season and on a suitable rootstock.

Mango Nursery Practices. Since seedlings of most of our mangoes do not breed true to type, vegetative methods of propagation have to be resorted to, to continue the desired parental characters. Inarching has been the commonest method of mango propagation in India. There are some varieties of mangoes which give rise to more than one seedling per seed, only one of which is sexually produced while the others are apogamic. The value of employing these apogamic seedlings as rootstocks with *boneshan* and *neelum* as scion varieties is in progress at the Fruit Research Station, Kodur.

Stones for propagation of rootstock seedlings are chosen from productive and vigorous seedling trees. They are sown soon after extraction, in beds at a depth of about 2 in. and with a spacing of 6 in. from seed to seed and 3 ft. from row to row. Sowing with the plumule up has been found to produce straight tap root and stem, both of which characters facilitate inarching operation. Shelled stones produce seedlings with straighter tap root and stem than unshelled ones, but the practice is not followed at Kodur as it is expensive and the percentage of germination low. Grading of fruits or stones is not considered a necessary operation in mango nursery practice, as neither plant vigour nor germination is found to be dependent on these.

When the plants are one-year old, they are lifted with a ball of earth and potted. Heavy defoliation 7 to 9 days prior to lifting from seed beds has been found to be advantageous. The tap root is pruned while potting the seedlings. The pots are watered soon after potting. Placing the potted seedlings close together in a trench and letting in irrigation water thereafter at an interval of 4—5 days is shown to be a more economic practice than the prevalent system of hand-watering the pots daily. The rootstock seedlings get ready for grafting within 12 to 15 months, when they attain the thickness of a pencil. Inarching on seedlings of even 4½ months of age is found possible, but this is not being done as the demand for such small plants does not exist in this Presidency. An experiment to determine, if older rootstocks are to be preferred to younger ones for securing the best tree performance, is under way at Kodur. So far within a period of three years no significant difference in growth between the younger and older rootstocks is found. Scion shoots of the required variety are taken from trees possessing such qualities as heavy bearing tendencies and good fruit

quality. The trees should not be too old or weak or diseased. The method of inarching is too well-known to be described in this paper in any detail.

The separation of the graft from the parent tree by lopping off the rootstock portion above the graft-joint is done in stages. The optimum period from the date of inarching to that of separation from scion parent is found to be about three months but some varieties like *rumoni* demand a longer period. The optimum season for grafting under Kódur conditions has been found to be July to September. A number of trials have also shown the commercial possibility of raising mangoes by side-grafting and budding. It is possible to plant out the grafts immediately after separation from scion parent if favourable weather conditions prevail. However, in order to avoid casualties, the grafts are kept in shade for about a month before being despatched or planted out.

Propagation of other Fruits. Propagation of some of the best varieties of guavas, sapotas, pomegranates and grapevines available at the station has also been undertaken. The first two are propagated by layering and the last two by cutting. These methods are also sufficiently known to need any elaborate description. Grafting of sapotas is proposed to be undertaken shortly.

General Remarks on Nursery Trade. One of the greatest set backs to fruit industry received from unscrupulous nursery practices is in the matter of wide-spread supply of inherently unfruitful trees and plants of varieties unsuited for commercial cultivation. Some kind of control on the private nursery trade to prevent the supply of such uneconomic plants shall have to be devised if the fruit industry has to be placed on a sound economic footing. A system of registration of private nurseries on a voluntary basis, or the introduction of suitable legislative measures may have to be brought into being to achieve the desired change. From the point of view of the public also, there is a widespread and legitimate grievance that a very large number of plants purchased by them suffer serious damages in transit, sometimes leading to a high number of casualties. This is a matter on which the nurseries cannot be legitimately blamed, as the safety of plants consigned to the care of transportation authorities is beyond the control of the consigners. At the same time, it would not be fair to expect the public to bear the cost of such dead or damaged plants for no fault of theirs. The only possible remedy lies in the railway authorities undertaking to cover such risks, particularly in so far as the damage due to rough handling and undue exposure to adverse weather conditions are concerned. A system of undertaking the delivery of plants to consignees immediately on arrival at the consignees' railway stations would also go a long way to minimise the loss.