https://doi.org/10.29321/MAJ.10.A04746

These attack the leaves, the leaf-stalks and stems. Greyish or brownish black spots appear among the affected area and the leaves begin to fall away quickly. Once the disease is detected, it is wise to remove the affected portions from the plant and burn them. On the other hand if they are not removed the fungus will soon spread to other healthier parts of the plant.

The general and effective remedy in the case of fungus attack is spraying with Bordeaux mixture. This mixture is a notable fungicide. It is prepared with a pound each of copper sulphate and quick lime mixed up in ten gallons of water. Copper sulphate and lime are separately dissolved in water in mud pots and both mixed in a third pot and diluted to the aforesaid strength. This mixture should be used as soon as it is made. The local Agricultural Demonstrator will be able to render further help needed in the matter of preparation or application of this fungicide.

Culture of Oranges at Kodur.*

By MOHAN RAO, B. Sc. (Ag.),
Fruit Research Station, Kodur.

In popular parlance the word orange designates both the tight jacket or sweet oranges and the loose jacket or mandarines. The application of the name orange to both the sweet oranges and the loose jackets is very misleading and has been responsible for a lot of confusion with the fruit-nursery and growing industries. There is, however, some doubt whether our loose jacket orange is really a mandarine, as some authorities have put it to be identical with the famous *Ponkan* orange of China—*Citrus poonensis*, Tanaka, while the mandarine is botanically known as *Citrus tangerina*, Tanaka or *Citrus nobilis var. deliciosa*, Swingle. There is no such doubt, however, about the nomenclature of sweet oranges (*Citrus sinensis*, Osbeck) under which fall our Sathgudi, Batavian and Manilla oranges. For better precision and standardised nomenclature, it would be well if our sweet oranges only are designated under the orange group and the loose jackets are designated by a different name such as Santras as in Western and Central India, Coorg loose jackets or Kamalas.

It is now well known that the conditions suitable for the commercial cultivation of these two distinct groups of citrus differ markedly from each other. While the loose jackets flourish even on hill slopes of poor fertility and under the heaviest precipitation, the optimum growth in sweet oranges is found to be in tracts where soils are comparatively more fertile and relatively dry conditions prevail. Great care and intensive cultural practices are the key notes of success in the sweet orange farming, as against the almost primitive methods which seem to suffice for the production of the loose jackets. Medical science and popular fancies have put a greater premium on the quality of sweet orange, and this coupled with high cost of production of sweet orange has made this fruit more valuable and therefore

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

more expensive. In this paper an attempt is made to describe the sweet orange farming in Cuddapah district, in a tract reputed to produce the finest quality fruits in South India.

Sathgudi orange has been seen to come up best on well-drained red loamy soils. The water table in such soils at Kodur is at depths ranging from 20 to 30 feet.

Propagation. Seed propagation has been the rule. No particular care is taken in the selection of fruits for seed purposes. The fruits are cut when fresh and seeds extracted. Those that float on water are discarded and only the heavier ones which sink are utilised for sowing. The seeds are generally sown in the months of July and August, in seed beds at a distance of about 10 to 12 inches. Seeds take 25 to 35 days for germination. The seedlings are not transplanted to nursery beds for hardening but are directly lifted and planted out in the orchard when they are a year old. Since the public outside Kodur appear to have a great fancy for bigger size plants, most of the seedlings sold outside are about two to three years old.

Till about five years ago trade in such seedlings was carried on to the extent of over a lakh of plants per year, at an average of Re. 1 per seedling at the nursery. But after the establishment of the Fruit Research Station, the growers have come to recognise the value of vegetatively propagated plants. With the rapid popularisation of budded plants through the Fruit Research Station, Kodur and through several private nurseries started subsequently, there has however been a fast decline in the volume of trade and the price of the seedlings, so that, at present the supply of the budded plants from Kodur far outweighs that of seedlings, and the price of the latter is less than half of the former.

Lay out and planting. Two to three ploughings are given with the advent of the first rains of the North-East monsoon. Square system of planting is followed with a spacing of 9 yards either way. In November, pits 3′ × 3′ × 3′ are dug, and they are left to weather till the middle of December. They are then filled up with the excavated earth, taking care to remove any clods or stones. Trees are lifted from seed beds by digging all round, and planted in December.

Irrigation. The seed beds are pot watered twice daily in the morning and in the evening, till the seedlings are about five months old. In the orchard, basins are formed around the tree soon after planting and pot watering is done. Another watering is given the next day, and thenceforth every alternate day for three months. With the setting in of the South-West monsoon the basins are widened and channels are formed. Water requirements are judged from a superficial examination of the soil surface. Growers prefer to give a shallow watering at short intervals to soaking irrigation at longer intervals. On an average, in a bearing plantation, about five to eight irrigations are given per month, depending on the soil texture and climatic conditions. The basins are widened to keep pace with the "drip" of the

leaves. No arrangements like sloping of the basins away from the tree is done to keep off water from the trunk of the tree. In some cases the purpose is achieved by heaping the soil under the trunk either in a mass or in the form of a ring. In older plantations flood method of irrigation is practised.

Manures and manuring. About five to six months after the seeds germinate, margosa cake at 1½ lb. per cent. of land is applied to the seed beds in powder form. Besides serving as manure, the cake acts as a deterrent to pests. Double this dose is sometimes given when the plants are about a year old. No basal dressing of manure is given to the orchard before planting nor is any manure applied to the pits at the time of planting. Six to eight months after planting 1 lb. of margosa cake and ½ a basket of well rotten farm yard manure per plant is applied. After that, till the third year after planting only farm yard manure is used, at the rate of 1 to 2 baskets per tree. From the fourth year onwards a mixture of 12 lb. of groundnut cake and 60 to 75 lb. of farm yard manure is given till the tree comes to bearing. Subsequently the following mixture is applied per tree.

12 lb. of groundnut cake,
9 lb. of fish manure,
3 lb. of bone-meal and
60 to 75 lb. of farm yard manure.

No green manure crops are grown. Manuring of bearing trees is done in the months of June-July or December-January, within the tree spread. The above practices are not followed by all the growers, but represent those adopted in some of the well-kept orchards.

Pruning. Six to eight months after planting out in the orchard, a light pruning of the low hanging and the intersecting branches is given. Subsequent pruning is limited to the removal of dead branches only. The branches are chopped off with scythes, without badly mutilating them and making the tree unsightly and pre-disposed to diseases.

Intercropping. Intercrops like turmeric, groundnut, ragi, *jonna, korra* and *arika* are grown till the sixth year after the trees are planted. The cultivation of tall intercrops like *jonna* has injurious effects on tree growth. Although leguminous crops may now and then find a place, these are being raised along with other intercrops without any adequate idea of the influence of such crops on the soil and the trees.

Blossoming. Seedling trees come into bearing from the seventh to the tenth year, while in the case of budded trees first flowering has been noticed on two to three-year-old plants. There are two flowering seasons in the year, one in February-March and the other in October-November. Some of the trees bear exclusively in one season. Most of them, however, flower in both the seasons. Some trees produce a third crop as well, in the period intervening between these two seasons. Subsequent to the tree coming into bearing, the time of manurial application is generally adjusted after studying the flowering habit of the trees.

Root pruning is one of the practices which is done in conjunction with the application of manure with a view to force flowering. Irrigation is gradually stopped until the trees just begin to show signs of wilting. The basins are then dug up 9" to 10" and manure is applied and covered. A copious irrigation is given soon after.

Fruiting and harvesting. Fruits mature in seven to eight months after flowering. Those of the October-November crop of flowers take a shorter time to mature, presumably because of the summer heat. Fruits are harvested when the colour changes from dark green to light green. Usually in order to reduce the expenditure on watching the orchard, the fruits are harvested in one lot irrespective of whether they have fully matured or not. Some growers defer harvest till the fruits turn yellow especially in the case of main crop, while others keep them on the tree for longer periods, sometimes even up to four to six months after maturity, with the hope of securing better prices. Such fruits are usually below standard, and in several cases, drop off prematurely causing great loss to the growers. Incidentally, it is believed that delayed harvest inhibits the setting of a better crop in the following seasons.

Improvements suggested. Although the seedlings are popularly believed to be more vigorous, hardier and more prolific bearers and more resistant to adverse environmental factors than vegetatively propagated plants, the fruit quality in them is generally so variable that it is impossible to secure anything like a standard crop. In seedling plantations very few trees are seen to bear good quality fruits, while a greater bulk of the crop is a mixture of fruits of varying shapes and sizes, and of variable quality. In budded plantations, however, the crop remains true to parent in respect of fruit quality; and therefore from the consumer's or economic point of view, the product will be of greater value. On a consideration of all these factors vegetatively propagated plants are to be preferred. Such plants may be either purchased from reliable nurseries or raised by the grower himself.

Water requirements of the soil are to be judged by examining the surface nine inches of soil and not by a superficial examination. The practice of giving shallow irrigation results in the matting of fibrous roots on the surface and these get cut during ploughing or digging. The constant destruction of fibrous roots is deleterious to the health of the trees and consequently to its growth and bearing. Soaking irrigations should be given so as to encourage root growth in the lower layers of soil and not to confine their activity to the surface layers which are subject to frequent disturbance by orchard soil culture. Irrigation basins in non-bearing plantations should be widened so as to give full scope for root development. In normal soils such basins should extend at least three to four feet away from the drip of the leaves. Investigations at the Fruit Research Station, Kodur, have shown that a budded orange plant on *gajanimma* after about 46 months of budding and with a top spread of only four and a

half feet had a horizontal root spread of about 39 feet. This fact indicates that tree spread is not a reliable index of the feeding area of roots, which though depending on the type of soils, root stocks, etc., nevertheless covers a very much larger orchard space than that actually encompassed by the top growth. The practice of provision of basins of 2 to 3 feet wide around the tree trunk for application of water and fertilisers is, therefore, hardly sufficient to give full benefits of these treatments, apart from leaving a greater part of the root zone unfed and unirrigated. Flood irrigation overcomes this defect, but this system encourages excessive weed growth and consequently leads to an increase in cultural expenses. The furrow method of irrigation usually resorted to in American orchards seems to be the ideal, and deserves a trial in our plantations as well.

The relative merits of application of manure in a single dose in the year or in a number of doses, are yet to be studied in all their bearings. But it can be safely stated that the application of bulky organic manures usually involves some root disturbance, which if done a number of times during the year or during an active growing period is bound to adversely affect the tree performance. Therefore, till we have the results of well-layed-out experiments the application of manures once a year, before the production of the main crop of flower may be safely advocated.

All manures should be applied in a manner to become readily available to the trees. The practice of spreading them too close to the trunk of the tree is wasteful and may cause serious injury to the trees. Many foreign fruit-growers prefer the furrow method of applying manure to applying them in basins, and the efficacy of this method in our orchards is to be tested.

Root pruning of citrus is definitely a weakening process. While its value in the regulation of crops cannot be denied under certain conditions, it has to be admitted that repeated annual pruning of roots may reduce the longevity of trees by progressively impairing their growth. In heavy soils, root pruning may produce some benefit by providing better soil aeration, but such a result is not likely to be of any importance in open soils. It is therefore advisable to find out how the effects of root pruning can be brought about by other and less severe orchard operations. At any rate, it appears necessary to suggest that root pruning may be resorted to only infrequently, once in two or three years in normal but shy-bearing groves. Annual root pruning cannot be advocated even in the case of very vigorous-growing and shy-bearing trees.

The importance of clean culture in the control of insect pests and diseases should not be overlooked. But experience in other parts of the world has clearly shown that clean culture can be overdone. As a matter of fact, there is now a distinct swing from clean culture to the minimum of soil disturbance, particularly in America and South Africa. At the present state of our knowledge, while the practice of leaving orchards to rank weed growth deserves to be condemned, we should guard against going to the

other extreme, and thus bring about results not only contrary to our expectations but also highly injurious to tree growth and soil conservation.

There is no doubt that with the progress of research, the orange cultural practices at Kodur or elsewhere are bound to undergo rapid changes. During the past five years alone as the result of the work done at the Fruit Research Station, Kodur, a number of changes is evident in some of the plantations. The popularity of budded plants has taken such a strong hold among the public that new seedling plantations appear to be very few and far between. This shows conclusively that fruit-growers as a class are generally very responsive to scientific advice and guidance, perhaps in a much better degree than the general class of agriculturists. In the present paper it has been possible to refer to only a few of the more important items on which improvements are necessary and possible.

The Artisan's Share in Agricultural Production.

By M. BALAKRISHNAN NAYAR, B. Sc. (Ag.),

University Research Student, Paddy Section, Coimbatore.

Introduction. The self-sufficiency of Indian villages has, in fact, disappeared, and it exists now only in the vision of the future. Although the old harmony is absent and there is no well-defined functioning of the various social groups for the welfare of the entire village, the inter-dependence of classes is readily apparent even at the present time. In no other occupation is such mutual dependence so frequently felt as in the agricultural pursuits which still dominate life in the country side. The farmers cultivate the land with cattle and human labour while they are continually helped by many others like carpenters, smiths and basket-makers who supply ploughs, spades, baskets and similar articles of deadstock which are essential in farming. These artisans function mainly as suppliers of agricultural implements and their services are constantly needed in agricultural production.

For a general appreciation of the place of implements in the agricultural economy, it is necessary to know the organisation and set-up of the farm. An analysis has to be made of the capital investment on holdings under such items as land, livestock, building and implements and see how much of each is used up in production. It will enable one to obtain a quantitative estimate of the different items which are indispensable in themselves, but are required in varying proportions. And if information is gathered as regards the individual items and the particular social groups responsible for the same, it will be helpful in apportioning the share of each in agriculture.

Tract surveyed. A survey was made in 1939—40 of 54 agricultural holdings in the Palghat taluk. Paddy is the main crop of the locality and its cultivation is the mainstay of the people. This one taluk accounts for nearly a fourth of the district acreage under rice cultivation, and had