

STUDIES IN PLUM PRODUCTION ON THE NILGIRIS

By

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Introduction: Both as a commercial fruit and as an important part of the home orchard, plums have come to be recognised as the leading fruit crop on the Nilgiris. With an estimated area of about 150 acres and a reputation for the highest yield among the deciduous fruits in this tract, combined with the tree hardiness and regularity of bearing, the plum has a much wider appeal to the growers on the higher altitudes of South India than any other fruit. The extension of plum production, however, has not been as rapid as its importance justifies, owing, mainly, to the perishable nature of the fruit, its poor transporting capacity, and above all the well-known prejudice in South India against the relatively greater acid blend of most varieties of the plum. There is reason to hope that, with the expected improvement in transport facilities in the near future and with increasing awareness of the public of the nutritive value of fruits in general, the increased production and consumption of plums will be stimulated progressively.

Ever since the Pomological Station, Coonoor was established in 1920, work on plums has figured prominently in its activities. As was natural, the introduction and trial of varieties formed the major item of work in the initial stages. When the work of the Station was reviewed in 1941, preparatory to launching more extended investigations, it was found possible to select a batch of varieties, that were the most dependable performers on the Nilgiris. With this information it was decided to undertake trials to determine the optimum propagation and improvement of orchard cultural practices. Work on both these aspects of plum production has now reached a stage when important findings of practical interest can be released to the public, thereby catering to the growing demand for reliable information from the plum producers in the region.

The following is an account of the work done to date, and results achieved in so far as the plum production on the Nilgiris is concerned.

A. Varietal Studies: Although prunes have often been considered as a distinct fruit from the plum, in reality, the only difference lies in the suitability of the prune for drying without the removal of the pit. All prunes belong to the species, *Prunus*

domestica, to which all the European plums also belong. The ability of the prune to dry or dehydrate successfully with the stone intact is because of its higher sugar content. The plums, on the other hand, have been found to decay when they are dried without the removal of the pit. Except for the above difference and subject to varietal peculiarities, the European plum and prunes are substantially identical.

At the Pomological Station, Coonoor, the varietal introductions made so far comprise of over 30 varieties of Japanese plums (*Prunus salicina* L) and the European plum (*Prunus domestica* syn. *P. Salicina* Tindl). The latter is believed to have originated somewhere in Southeastern Europe or Western Asia (Yearbook U. S. A., 1937), while the former were domesticated in Japan before they were introduced in other countries. The trees of the former species are more spreading in habit than the domesticas or damsons (*Prunus insititia*) and also differ from these two species in certain leaf and fruit characters, particularly in having more attractive fruits generally, with a yellow ground colour overlaid by various shades of red (Yearbook, U. S. A., 1937). In some varieties of Japanese plums the flesh colour is also different, being a striking red, while that of the domesticas and damsons is green or yellow. The damsons are not however found in the Coonoor collections, nor were they ever tried for their suitability to the tract. Work at Coonoor has proved that European plums do not generally take kindly to the Nilgiris and have therefore no future in the region. Among the Japanese plums, those that have proved their commercial qualities are listed below with their important varietal peculiarities.

(a) **Culinary varieties:** (1) *Rubio*: Fruit medium in size, rounded, purple in colour with blood red flesh, very juicy, rather sour, and second rate in eating quality; but its tartness makes it a favourite for culinary purposes. Blossoms in the last week of January and the fruit ripens in the last week of April. It is one of the earliest varieties on the Nilgiris. The tree is a vigorous semi-erect type and a prolific regular bearer. An excellent commercial type. Blossoms are self-fertile. Fruit thinning is recommended.

(2) *Satsuma seedling*: Resembles *Rubio* in all respects but the fruits are less sour when fully ripe.

(3) *Alu Bokhara*: Fruit medium to small in size, slightly elongate, yellow in colour with slight red splashes on the skin, juicy, fairly sweet when fully ripe, largely used as a

stowed fruit. Blossoms in the last week of January and the fruit ripens in the third week of May. The tree is vigorous and semi-erect in habit. Blossoms are self-fertile. Fruit may be thinned with advantage.

(b) **Dessert varieties:** (1) *Gaviola*: Fruit medium in size, round in shape, attractive, wine-coloured with yellow flesh, of good eating quality, fair in texture and of firm flesh. The fruit is covered with ashy bloom when mature. Blossoms in the second week of February and the fruit ripens in the last week of May. The trees are of medium vigour, giving fair and regular crops. Its blossoms are partially self-sterile. Pollenisers recommended are Hale, Czar or Combination.

(2) *Shiro*: Fruit large, slightly tapering at the distal end, attractive golden yellow in colour with covering of ashy bloom when mature; very juicy and of good eating quality. Blossoms in the third week of February and the fruit ripens in the first week of June. The tree is vigorous, spreading and open in habit. Inclined to be a shy bearer, as the blossoms are partially self-sterile. Hale, Czar or Combination are recommended for planting near it as pollenisers.

(3) *Abundance*: Identical to *Shiro* in all essential particulars except that the skin of the fruit is thinner in texture than that of *Shiro*.

(4) *Czar*: The fruit is large, elongate, very attractive, with a rich ashy bloom on it when mature, purplish crimson in colour, dark red flesh, of fine eating quality. Blossoms in the third week of February and the fruit ripens in the first week of June. The tree is a vigorous, compact and upright grower. Its blossoms are largely self-sterile. Hale, Combination or *Shiro* are recommended for pollenisers.

(5) *Kelsey*: Fruit large with a prominent beak at the distal end, amber colored when fully ripe, of good eating quality. Blossoms in the last week of February and the fruit ripens in the third week of June. The tree is vigorous and of semi-erect habit. It is irregular in bearing. Blossoms are largely self-sterile. Hale, *Shiro* or *Satsuma* are recommended for pollenisers.

(6) *Satsuma*: Fruit large with a cleavage line on one side, flattened at ends, dull red in colour, purplish red flesh, of good eating quality and of fine flavour. Blossoms in the last week of February and the fruit ripens in the third week of June. The tree is vigorous and spreading in habit. Blossoms are self-fertile and the tree yields regular crop of fruit.

(7) *Hale*: Fruit of medium size, rounded, dull red in colour with pale yellow flesh, juicy and sweet when ripe used both for dessert as well as for cooking. A peculiar feature of this variety is its production of blossoms in three or four waves during the flowering period which extends from the second week of February till the first week of March. Fruit ripens in the last week of May. The tree is a vigorous spreading type and a very prolific bearer. Commercially it is one of the best varieties to grow. Blossoms are self-fertile. Fruit thinning for larger size is recommended.

Among the prunes, the only variety that has thrived at Coonoor is Prune Splendour. Fruit small in size with a cleavage line on one side, dull reddish purple in colour, very sweet and rich in flavour with a rather tough skin. As the sugar content is high, the fruits can be dried and used. Blossoms in the third week of March and the fruit ripens in the last week of June; the tree makes only fair growth and bears moderate crops.

B. Studies in propagation: The plum is universally propagated for commercial orcharding by budding. A variety of rootstocks has been employed in the different parts of the world, all of which are yet to be investigated upon in this region. However, the common peach and the Pershore plum have been the extensively employed rootstocks so far on the Nilgiris, while recently *Prunus divericata*, and Early Jewel have also been tried as rootstocks on a limited scale. Observations show that under Coonoor conditions, the common peach is the best rootstock of those tried so far. This gives a compatible union with our promising cultivated varieties with the exception of Czar, which seems to prefer the Pershore stock. Being a hardy plant and very adaptable to different elevations and soil types, the common peach is not likely to be displaced easily. It, however, suffers from a defect, in that it is prone to plentiful rootsucker production. But with a careful grower, this need not be a serious impediment.

Among the several methods of budding that have been tried in different seasons, the usual 'shield' method without any wood attached to the bud-shield has been found to produce the highest 'take', when insertions were done from December to end of January. The optimum nursery practice determined at Coonoor consists of sowing the common peach seeds in beds in April, transplanting the seedlings to nursery beds in the following July, and budding in the ensuing winter. Plump buds from

well-ripened shoots of the previous season's growth form the best scion material, and these can be bound over after insertion either by raffia, banana or aloe fibre, when the stock stem is cut back to six inches over the point of insertion. A couple of months later the lopping of the stock stem is completed up to the bud-joint. A bulk of the budded plants upto an extent of 60 per cent become available for planting out in their permanent site in the following July, while the rest can be set out within the course of the next six months.

Flute budding is a variation of the plum nursery practice which is popular in the north and north-west of India and has been tried extensively on the Nilgiris during the past three years. In this method, the bud is drawn out carefully from the scion shoot by first making a circular cut around it, half an inch above the selected bud. An inch below this cut another similar cut is given, and this is followed by the extraction of the fluted bud between the two cuts. The process of extraction of the flute bud is a simple operation, if performed in about February just when the sap flow is active. The bud is inserted on a stock of similar growth and is pushed down to ensure a close fit around the exposed stock stem, which is previously prepared by the peeling of the bark to the extent required for the passage of the flute bud. Bandaging of the bud is found unnecessary. Trials at Coonoor have shown that this method of budding is less certain of success than shield budding, giving an average success of 50 per cent only, as compared to over 90 per cent by shield. During heavy rains the union by flute budding has been found to be greatly impeded, whereas shield buds are found to resist such adverse climatic influences to some extent. When once the union is effected, the flute budded plants grow at a slower pace than shield-budded plants, becoming ready for planting after only about a year from bud-insertion. On these various grounds it is possible to recommend only shield budding of plum under Coonoor conditions.

C. Studies in Sterility: Varietal peculiarities in plums considerably influence the extent of success in plum growing, so much so that a large number of failures of plum orchards is directly attributable to the inadequate appreciation by the grower of this important factor. Of the several varieties selected at Coonoor as of commercial importance, it has been found that Czar and Kelsey can never be planted by themselves in solid blocks, since their blossoms are mainly self-sterile. To a lesser degree, Shiro, Abundance and Gaviota suffer from the same defect being partially self-sterile. It is therefore

incumbent on the grower to provide suitable varieties in the plantations of the above varieties to serve as pollenisers and thus promote optimum fruit-set and yield. Rubio, Satsuma Seedling, Alu Bokhara, Hale and Satsuma varieties being self-fertile do not require such a precautionary measure. The pollenisers to be effective should flower simultaneously with the varieties to be pollinated, and further they should be planted with a spacing and in numbers sufficient to disseminate the pollen effectively. It is here that the valuable role of bees can be exploited. Perhaps there is no other fruit in South India where the yield is so largely governed by the provision of beehives in the orchard. On the basis of the simultaneous blossom periods as recorded at Coonoor, recommendations of suitable pollenisers for each variety have already been made elsewhere in this paper. It is suggested that for an acre of plums two beehives should be maintained for ensuring adequate pollination.

D. Studies in Spacing and Planting: It is common to devote 12 to 20 feet spacing for plums on the Nilgiris. Since the plum varieties differ greatly in the shape and spread of trees, a common spacing of all varieties is not feasible. To an extent, spacing has to be varied according to the fertility and texture of soil. On general considerations based on tree growth and performance on the Nilgiris, the following spacing is recommended for the promising varieties — Gaviota — 12 feet; Shiro and Abundance — 20 feet; Czar — 15 feet; Kelsey — 18 feet; Satsuma — 20 feet; Hale — 20 feet; Rubio and Satsuma Seedling — 18 feet; Alu Bokhara — 18 feet and Prune Splendour — 15 feet.

The usual period of planting on the Nilgiris is from beginning of November to end of January. At this time the grafts in the nursery are dormant and are least injured when transplanting them to their permanent sites. But recent experience has shown that June—July is also a favourable time for this work, especially in view of the frequent rains received for two or three months after planting.

E. Studies in Training and Pruning: Unlike most other South Indian fruits, plums require to be trained and pruned regularly and systematically for securing efficient performance. The pruning in this fruit is influenced largely by varietal habits and peculiarities, a knowledge of which is therefore essential. From a study of all these factors, the following recommendations have been framed for adoption on the Nilgiris.

The method of training that appears most suitable is the 'open centre' in which the trees are headed low, the leader shoot is removed and four to six scaffold branches are allowed to develop equally for the first year. Later the centre of the tree is kept open exposing almost the entire fruiting area to sunlight. The advantages of this system are that, a low spreading habit is obtained and much of the fruit being exposed to the sun develops a fine colour and improves in quality. The disadvantages are, the mechanical weakness of the branches due to their originating very close to one another and the consequent danger of their breakage when laden with crop, and the sunscald injury to the limbs due to their continuous exposed condition.

In the first year, when the plant is set out in the orchard, it is planted in the form of an unbranched whip with a single clean stem, $2\frac{1}{2}$ feet to 4 feet in height. The height of head varies with the habit. For spreading types such as Shiro, Abundance, Hale and Satsuma, four feet; for semi-erect types such as Rubio, Satsuma Seedling, Alu Bokhara, Kelsey, three feet; and for erect types such as Gaviota and Czar, $2\frac{1}{2}$ feet are suitable. In the second year's pruning the selection of the main scaffold branches is made. The optimum number for the Nilgiris is from four to six. These should be well placed on the trunk and should emanate from different sides. The rest of the shoots are removed. The limbs retained are headed back to about three-fourths of their natural size. In the third year, the tree should have a number of shoots from each of the primary scaffold limbs. Two on each, which are well-spaced and pointing outwards or inwards according as the variety is erect or spreading in habit, are retained and the rest removed. These in their turn are headed back just as the shoots on which they are borne were pruned in the previous season. For the next two years and until the trees come to bearing, a similar pruning as mentioned above is adopted, care being taken to see that a proper balance is maintained and the tree is directed to the desired shape. The shoots which are crowding or those which form a weak crotch are thinned out completely without leaving a stub.

During these years of shaping the frame-work of the tree, fruit spurs are seen to develop on the limbs along their entire length; and their growth is encouraged in every possible way. Young bearing trees require very little pruning on the Nilgiris, which should at this stage comprise only of the removal of cross limbs and diseased or deadwood. Unfortunately, however, there

is a popular misconception in this region that the plum requires a severe heading back of all shoots year after year. As a result the trees become stunted and the large number of vegetative shoots that are produced yearly at the cut ends starve out the spurs on the lower portion of the tree, leading eventually to the premature death of the latter. The fruit producing area of the tree is thus seriously reduced. Orchards on the Nilgiris where such excessive pruning has been in vogue, bear testimony to the evil effects of the treatment, by exhibiting rampant growth at the top and long many-jointed barren poles below.

As the Japanese plum bears its fruits mainly on spurs and sprigs, which in a reasonably well-kept orchard on the Nilgiris, live up to about six years, these fruiting shoots require pruning rarely, and that too, only when they are dead or broken or are excessive in number, as in variety Hale. Since it is at the terminal end of the sprig or spur that the vegetative bud is located, heading them back results in irreparable damage, due to loss of that portion of their wood which alone could extend them for future crops.

In some of the varieties a portion of the harvest is borne directly on laterals of one year's growth. This feature is prominent in varieties Rubio, Satsuma Seedling and Alu Bokhara, where it is estimated that from 15 to 20 per cent of the annual crop is carried by them. In two other varieties viz., Shiro and Abundance, though the production of laterals is abundant little fruit is produced on them directly. In the rest of the varieties viz., Gaviota, Kelsey, Satsuma, Hale and Prune Splendour, the output of laterals is very sparse unless stimulated by a severe heading back of older shoots, whether they bear fruits directly on them or not, are important, since they are the limbs on which fresh spurs or sprigs are produced eventually. A close study of the laterals is therefore necessary before their pruning is commenced or decided upon. If they are excessive, thinning to reduce their number is of benefit to the tree. If few, they are best left alone. In either case, heading them back to leave a stub is definitely harmful excepting once in 4 or 5 years or when the trees are declining in yields. This occasional pruning promotes new growth, on which fresh spurs and sprigs are formed to replace the dead and worn out ones below.

F. Studies in Fruit Thinning: Though the range in fruit size of the plum varieties is not wide, thinning the fruit is often important in plum culture. It is done primarily to procure a larger fruit which naturally commands a better price. In

varieties which have a tendency to overproduce, thinning lessens the danger of breaking of sprigs and branches when laden with crop. It also helps in uniform ripening of the crop and reduces losses by natural fruit drop. Finally, by limiting the size of the crop and conserving the energies of the tree, it is assisted to behave as a regular bearer of dependable crops. Experiments over three years at the Pomological Station, Coonoor with a prolific variety like the Rubio have confirmed most of the afore-stated points. It was also found that thinning to leave one inch and two inches between fruits increased the size of fruit by 50 to 76 per cent over the average. The irregularity in cropping was seen to gradually narrow down to a dependable annual average, and the harvests which usually extend over a fortnight in this variety were completed in the course of a week on thinned trees.

G. Conclusion: In this paper an attempt is made to set out some of the experimental findings of the past three years at the Pomological Station, Coonoor and the facts relating to the importance of the plum, promising varieties, propagation, sterility, spacing and planting, training and pruning and fruit thinning in relation to existing conditions and practices on the Nilgiris. The presentation has been purposely generalised in order to meet the existing demand for facts of a practical nature.

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