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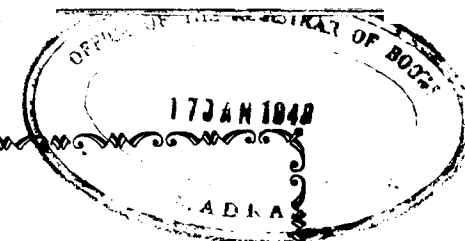
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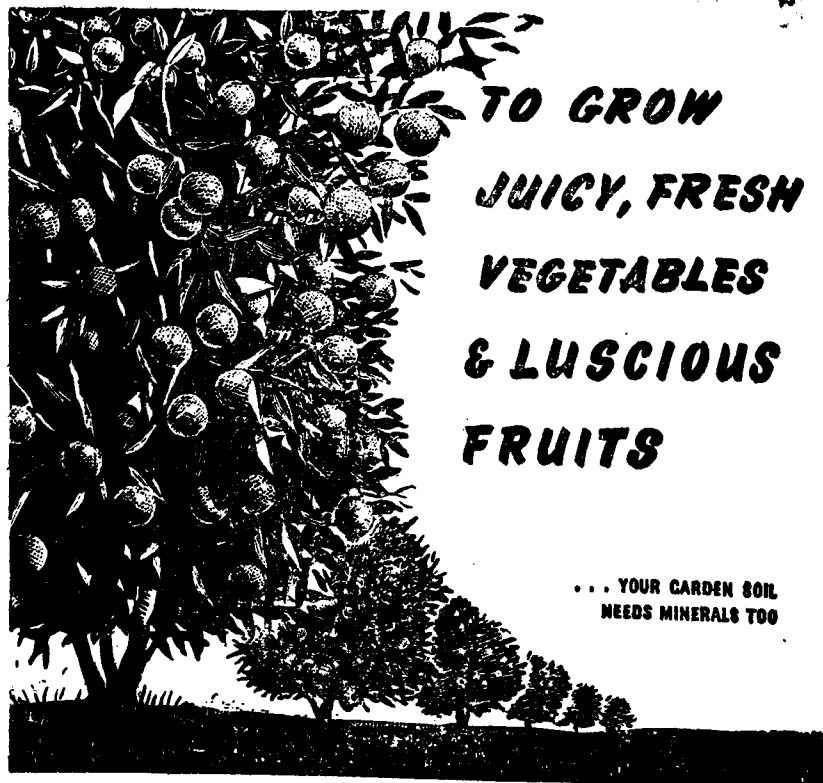
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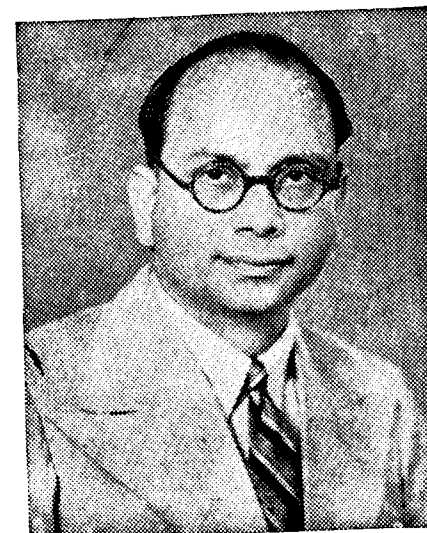
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Sri. M. S. SIVARAMAN, I. C. S.,
Director of Agriculture, Madras.

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EDITORIAL

New Director of Agriculture and Food Problem:

We have very great pleasure in welcoming Sri M. S. Sivaraman, I. C. S., our new Director at a time when the Province is threatened with a food problem of unprecedented magnitude. Sri M. S. Sivaraman is no stranger to us for he is well known for the very active interest he has been taking in the agricultural development and the many practical suggestions he has been making from time to time even before joining the Department.

The war and the consequent transformation of world trade and national economics have in no uncertain manner shown that agriculture is the most important industry and that no country can afford to rely on outside supplies for food, however small the supplies may be. The normal prewar annual deficit of this Province has only been in the order of 5 lakhs of tons of rice but the partial cessation of imports and the increase in population have caused a serious situation in the Province, which is now on the verge of starvation. Though our deficit in food supplies only represents a small fraction of the total production in the Province it has not been possible to fully bridge the gulf during the difficult years in spite of the various concessions that have been granted by the Government from time to time to encourage both extensive and intensive cultivation. It is here that the Agricultural Department can help considerably for achieving quick results. The new Director of Agriculture has already launched a vigorous propaganda and taken concrete steps to produce more seeds of improved strains of cereals and green manure and also planting of green leaf yielding trees and shrubs in all available wastelands. It has been established beyond doubt that the primary problem in tropical Agriculture is the maintenance of organic matter of the soil. Farm yard manure is available only in limited quantities and that too is not well conserved. Other organic wastes are generally allowed to go un-utilised and as such the requirements of organic matter of the soil can be met in full only

by growing green leaf yielding plants and utilising them. It has long been recognised that green leaf is the best and cheapest manure for paddy lands. With the slender resources of the Indian ryot and the narrow margin of profit obtaining in Agriculture it is of utmost importance that he should avail of the propaganda and the help rendered by the Department under the able guidance of the New Director. The yields of paddy, our principal food crop, can be further increased by the judicious application of phosphatic manures. Even in this direction the Director of Agriculture has been doing constructive work for a long time by advising the ryots to collect, calcine, and utilise all the available bones for enhancing paddy yields profitably. We have no doubt that by adopting such measures the small deficit in respect of food grains can be easily overcome in years to follow.

While the adoption of these methods is likely to ease the food problem in future years the present crisis which is apparently caused by difficulties in procurement has still to be faced. The Government has tried its best to induce the ryot to part with his grain by offering bonus to paddy and millets. It is upto the ryots and particularly the landed aristocracy to appreciate the difficulties of the Government and part with the grain even though the bonus granted may not be quite upto their expectations. It is hoped that the Indian agriculturist who has always been noted for his hospitality and generosity will rise to the occasion and immediately part with the last grain that he can conveniently spare so that the people of this Province are saved from the anticipated famine. It has been our singular good fortune to have gone through the difficult war and post war years without many serious difficulties and we are sure that the producers of food grains will not force the government to adopt an aggressive policy in their anxiety to maintain the same peaceful and contented atmosphere.



Note on the Value of Sea Weeds - as Manure†

By

K. CHIDAMBARAM & M. MUKUNDAN UNNY

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It is well known that sea-weeds are valuable as manure for agricultural crops besides the importance of certain varieties as food and as raw-materials for the extraction of agar agar. In Madras Presidency sea-weeds are washed ashore on the coasts of Palk-Strait and Gulf of Mannar during the period from May to October. The chief varieties of sea-weeds washed ashore are: *Gracillaria* spp., *Sargassum* spp., and *Turbinaria* sp. Though accurate statistics of the quantity of sea-weeds washed ashore are not available at present, it may be of interest here to point out that the quantity of sea-weeds washed in the jurisdiction* of the three Fish Curing Yards, Sethubhavachathram, Idinthakarai and Ovari, during the year (July, 1944 to June 1945) amounted to 120 tons. This will indicate a comparative idea of the abundance of sea-weeds washed ashore in the Coast line, from Pt. Calimere to Cape Comorin — a distance of about 250 miles.

Samples of *Gracillaria* spp., *Sargassum* spp. and *Turbinaria* sp. were collected from the shores of Krusadai Island, Gulf of Mannar in August, 1944 and they were sent to the Agricultural Chemist for testing their manurial value. The analysis shows that the three varieties of sea-weeds contain fairly large quantities of nitrogen and that *Sargassum* and *Turbinaria* are also rich in Potash. Of the three, *Gracillaria* is rich in nitrogen but very low in phosphoric acid and potash content. *Turbinaria* has a high potash content and low nitrogen content, and *Sargassum* is intermediate in potash and nitrogen content. The following table gives the result of the analysis:—

		Moisture in air dry sample	Loss on ignition	In- solubles	Solubles	Nitrogen	Potash	Phos- phoric acid
Gracillaria	...	10.71	71.59	2.41	15.29	1.48	0.66	0.069
Sargassum	...	11.72	61.63	0.17	26.48	1.02	5.99	0.21
Turbinaria	...	6.13	63.07	0.50	30.30	0.96	9.11	0.27

† With the kind permission of the Director of Industries and Commerce, Madras.

* The jurisdiction of each yard extends to 5 miles on either side of the yards, along the Coast.

The sea-weeds are applied as manure in the dried state in Ramnad District for the Cocoanut plantations in the following manner. A circular pit is dug round the palm at a distance of 3 — 4 ft. from it and to a depth of 2 ft. The dried sea-weeds are put into the pit and covered with earth. The yield of trees manured in this manner is comparatively very good.

Besides the application of sea-weeds as such for the plantations it was suggested that a compost can be prepared by mixing sea-weeds, fish-offal and shark-liver-sediment. A series of experiments is being conducted at Krusadai Biological Station and the results of the first two experiments are given below:—

Raw-materials: The raw-materials used are sea-weeds, fish-offal and shark-liver sediment. The sea-weeds belonging to the three above mentioned genera that are washed on the shores of Krusadai in plenty are gathered and air dried. Fish-offal is collected from important fishing centres like *Thangachimadam*, *Karsapad* etc., close by and from the Smoked-Fish Supply Centre at *Attankarai*. The sediment of liver, remaining after the extraction of shark liver oil, is procured from the adjacent oil-extraction centres.

Method of preparation of the Compost Manure: A pit 4' deep with sloping sides is dug and it measures $4\frac{1}{2}' \times 4\frac{1}{2}'$ at the top and $4' \times 4'$ at the bottom. Dried casurina needles and palmyra leaves were spread at the bottom and the sides to prevent the admixture of the sand with the compost. In the first experiment the sea-weeds, fish-offal and liver-sediment are mixed in the proportion of 15 : 3 : 4, i.e., 120 lbs of sea-weeds, 24 lbs. of fish-offal and 32 lbs. of liver-sediment were used. This is covered with palmyra leaf and over that with sand. The period given for the formation of the compost was from 30—11—1944 to 3—2—1945, i.e., a period of 3 months. A sample of this was analysed by the Agricultural Chemist, Coimbatore and the analysis shows that the nitrogen content is 2.66%, phosphoric acid 0.366% and potash 3.47%. This has been certified to be of a "quality much above the average".

The same system of compost preparation is followed in the second experiment except that the proportion is a little varied and the period given for the formation of the compost is reduced to $2\frac{1}{2}$ months. The proportion of sea-weeds to fish-offal and liver sediment is 20 : 4 : 3, i.e., 310 lbs. of sea-weeds, 64 lbs. of

fish-offal and 48 lbs. of liver-sediment. The analysis indicates that the nitrogen content and potash content are comparatively lower than in the 1st sample whereas the phosphoric acid content is higher. The following table gives the results of the analysis of the two samples:—

Compost Expt.	Moisture	Loss on Ignition	Ash	Insoluble	Nitrogen	Phosphoric acid	Potash
I	10.07%	44.53%	45.40%	3.07%	2.366%	0.66%	3.47%
II	5.87%	50.52%	43.64%	7.58%	1.24%	1.45%	2.00%

The second sample is of average quality.

Further experiments on variations in the manurial value of the compost by changing the proportions of the raw-materials, period of compost formation, in different seasons of the year and with different species of sea-weeds etc., are being conducted at Krusadai Biological Station. It is up to the officers of the Agricultural Department to suggest the proportion of the sea-weeds and compost for application as manure for different crops at different places in different seasons.

Resume: (1) Three sea-weeds, *Gracillaria*, *Sargassum* and *Turbinaria* sp. have been analysed for their manurial value.

(2) The sea-weeds, *Sargassum* and *Turbinaria* are fairly rich in potash.

(3) The three varieties of sea-weeds contain fair quantities of nitrogen.

(4) The result of the compost formed with sea-weeds, fish-offal and liver-sediment in the proportion of 15 : 3 : 4 in 3 months during the rainy season shows that the manure is of a superior quality.

(5) The compost prepared in the proportion of 20 : 4 : 3 in $2\frac{1}{2}$ months during the hot season is of average quality.

Acknowledgment: Our thanks are due to Mr. H. Shiva Rau, Agricultural Chemist, Coimbatore, for kindly analysing the samples.

Some Observations on Seed Germination in Mangosteen (*Garcinia Mangostana*)

By

K. FAZLULLAH KHAN,
Fruit Assistant, Mettupalayam.

Low germination in mangosteen seeds has been the experience of nurserymen in all lands. To improve this a series of studies has been undertaken at the Government Fruit Station, Kallar (Madras) during the past few years. Blossom, biological and pollination studies on that station have revealed that mangosteens can set and mature fruit without the aid of pollination i. e., parthenogenetically, which fact also explains the absence of any horticultural varieties of the fruit. This feature is mainly due to the fact that the flowers are all hermaphrodite with sterile male organs. The segments in the mature fruit do not also all contain seeds; and among those that have seeds, only a few possess well-developed and plump seeds. Because of the incidence of a physiological disease, called gambog, which is typified by the exudation of a yellowish liquid on the rind, pulp and seed of the fruit, it was thought that even the few plump seeds might have their germination capacity adversely affected by the gambog. The testing of these various classes of seeds in different media was one of the items of work taken up at Kallar with the object of improving the germination percentage and to secure the maximum number of healthy and robust seedlings. These have shown that the well-developed, plump, and healthy seeds when sown under normal nursery bed conditions in November 1942 gave a germination percentage of 30. In a separate trial, similar seeds free of gambog recorded a germination percentage of 40, while those with signs of gambog incidence on the arils gave only 32.5% germination. The ill-developed leathery seeds were found useless, as none produced a seedling.

Further observations on the growth and development of seedlings brought out certain contrasting features between the healthy and gamboged seeds. A month after germination it was clear that the later, produced contorted leaves and weak plants on 92.4 percent of the seedlings, while in the former only 6.3 percent of the seedlings suffered from similar defects. There was also a distinctly stunted appearance in the seedlings in the bed allotted to gamboged seeds. Within the second month, however, when the second pairs of leaves began to emerge out, the above stated disparity between the two lots disappeared appreciably, such that no difference between them could be noticed from a distance. These led to the inference that

gamboged seeds are not to be discarded as seed material, even though the seedlings therefrom may not look apparently healthy and sound in the first one or two months of germination. In both the cases, however, it is necessary for the nurserymen to endeavour to select only the plump and well-formed seeds for sowing purposes.

That the germination percentage is possible of marked improvement by selecting the proper media for sowing, is clear from the results of yet another trial. Peaty soil with its high organic matter content and high water-holding capacity has been found to be the best medium for mangosteen seeds at Kallar, giving as high as 80% germination with plump, well-developed seeds, as against the maximum of 50% recorded in soils of different types.

There is a wide-spread belief among the mangosteen growers that the slightest damage to the seed affects its germination capacity adversely. On that account, sowing the seeds with pulp in intact has been widely advocated as a desirable practice. Observations from the preliminary tests with pulpy and pulp-free seeds denote that the adhering pulp in the course of disintegration in the soil attracts insect pests, which in turn might inhibit or prevent germination. In the case of gamboged fruit, however, the pulp being astringent in taste, does not possibly get affected adversely to the same extent. The germination was also higher and quicker in pulp-free seeds than in those with pulp attached to seeds, the figures being 50% germination and 20 days for the first signs of germination in the former, and 17% and 31 days in the latter respectively.

In the course of the afore-said trials, it was found that mangosteen is slightly polyembryonic - a feature which does not seem to have been recorded in extant literature. In a lot of 120 seeds sown in August 1945 at Kallar, seven per cent of the seeds produced two seedlings per seed. There is some evidence to show that only the healthy or gambog-free seeds exhibit this polyembryonic phenomenon.

To summarise, it is found necessary to select only well-developed, plumpy seeds, free of gambog and sow them in a peaty soil medium after carefully removing all pulp. Such of these seedlings which arise at the rate of more than one per seed, can be easily separated out by splitting the seed into two exact halves, and planting each seedling out separately in a bed or pot.

Acknowledgment: The fore-going studies were undertaken under the guidance of Sri K. C. Naik, Fruit Specialist, Kodur, to whom the author's grateful thanks are due.

STUDIES IN PLUM PRODUCTION ON THE NILGIRIS

By

U. NARASINGA RAO,

Assistant, Pomological Station, Coonoor.

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

stewed 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) *Gaviota*: 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, 2½ 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, 2½ 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

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Studies in Plum Production on the Nilgiris

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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A Note on the Cultivation of Sweet Potato with Special Reference to Northern Circars

By

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Introduction: In sweet potato (*Ipomaea Batatas*) one finds an effective combination of high nutritive value and ease in production under varied conditions of soil and climate. Added to this its heavy yield makes its cultivation an attractive proposition. It is a dual purpose crop in that the tubers are used as food and vegetable and the green vine forms a palatable and nutritious fodder for cattle.

The crop is a native of West Indies and Central America and is known to thrive best in a tropical climate. It is widely cultivated in this country and in Madras, special mention has to be made of Northern circars, West Coast, Tinnevely, Coimbatore and Madura where its cultivation is well known. A Plea to increase its production and widen its use is warranted in view of the deficiency of food in our province. In what follows is embodied information on its cultivation and use as a food crop with special reference to its cultural methods in Northern Circars.

Botanical description: Sweet Potato (*Ipomaea Batatas*, Poir.) belongs to the family Convolvulaceæ. It is an annual rootcrop with a prostrate creeping stem which roots at the nodes. The adventitious roots produced at the nodes get modified into tubers. The leaves are alternate, cordate, glossy and dark green. Flowers are large, axillary solitary or cymose. Sepals are elliptic and glabrous. Corolla is about two inches long and purple in colour. Capsules are very rarely produced, four-celled and contain smooth velvety seeds. Seed production is extremely rare.

Soils and Climate: Sweet Potato is cosmopolitan in respect of its requirements of soil and climate. A tropical climate as that of our province is most favourable. The crop is adaptable to a wide range of soils but shows marked preference to sandy and clay loams of medium fertility and friable texture. In soils of high fertility the crop runs to leaf at the expense of tuber production. A poor well-drained soil enriched with organic manure viz., farm yard manure would yield best results.

Season and Crop rotation: The main season during which the crop is raised in Circars is September — October to January — February, though it is possible to raise a crop during summer (February — May) and also the rainy season from (June to September). But high cost of production of a crop during summer, and low tuber yields from a rainy season crop, discourage farmers from attempting its culture. The only season of its culture in the Circars is the *pyru* season (September — October to January — February). Sweet potato is known to be a heavy feeder and as such a wide rotation (once in 3 years) is ordinarily adopted to avert serious depletion of the nutrient reserve of the soil. In crop rotation on garden-land it follows gingelly, ganti, or maize and is succeeded by a vegetable crop like ribbed gourd and brinjals. In wet lands it takes the place of a *pyru* crop like gingelly, ragi or a pulse crop like black-gram or green-gram.

Preparatory cultivation: After the removal of the previous crop preparatory cultivation commences with a thorough ploughing of the land with country plough. The desirable tilth is secured with three to four ploughings. Farm yard manure is then uniformly spread and incorporated into the soil by another ploughing. The field is then thrown into beds of 5 ft. x 5 ft. Irrigation channels are formed between every set of two beds. Ridging of the land 3 ft. apart with a double mouldboard plough and planting the seed vines across the ridge at 12" distance, as is common in the Bombay Presidency is practically unknown in the Circars. But an introduction of this practice is desirable as it is likely to economise in irrigation and land preparation.

Manures and Manuring: Ten to fifteen cartloads of farmyard manure per acre is all that is given as manure to the crop. In soils where a previous crop is heavily manured the crop is raised without the addition of any manure.

Seed material and planting: Vegetative propagation being the rule, the semi-mature portions of previous crop serve the purpose of seed vines of the next crop. But if a long period is to intervene between the harvest of a crop and the planting of a new area, sufficient seed vine material should be propagated in a nursery set apart for the purpose. In localities where the crop is a new introduction and on certain occasions when the seed stock has to be improved, vines should be prepared by planting tubers. These have to be sown in a well-prepared and manured plot 3 to 4 months before planting. Vine cuttings of moderately mature portions of 9" to 12" length are used by

growers in the Circars as seed material. The apical portions of the vine are rejected. In Bombay also this practice is reported to be common. But Philippine agriculturists claim a quicker growth and a heavier yield by the use of tender apical cuttings of the vine. The advantages claimed in respect of this practice, however, remain to be tested. Cuttings taken out of a plot of 8 to 10 cents in area are ordinarily sufficient to plant an acre of the field. The leaves from the cuttings are removed before planting. The land is first irrigated and planting of the sets follow. Sets are planted at a distance of 1½ to 2 feet between rows and 9" within the row. Planting is commonly done by thrusting the middle of the set deep into the wet soil and covering it with mud-leaving the two ends outside. 20,000 sets are required to plant an acre. Planting the bottom most node into the ground leaving the two apical nodes outside is also widely practised in the locality.

Irrigation: The crop is usually raised in garden land commanded by a well and occasionally supplemented by flow irrigation from a channel. Pure rainfed crops are rare. Irrigation at frequent intervals, once in ten days is necessary in the early stages. Later the crop can be maintained with the rainfall received and in the absence of rain two more irrigations would bring the crop to maturity. On the whole during the crop period six irrigations are necessary. But crops raised during the summer period require as many as ten irrigations.

After care: The vine begins to take root in about a week to ten days after planting. One weeding after a week followed by a hand hoeing is sufficient as when the vines cover up the ground weeds will be very few and also hoeing becomes difficult. Another necessary operation is that of turning the vines so as to prevent rooting of the nodes through coming in contact with the soil. This has to be done one month after planting and repeated afterwards at an interval of two to three weeks. Neglect of this operation would seriously affect the size of tubers.

Harvest and yield: The crop comes to harvest in about 100 to 105 days from the date of planting. The maturity of the crop is indicated by some of the older leaves turning yellow and beginning to drop off. The ripeness of the crop is tested by breaking a few of the fresh tubers dug out from the field. If the milk on the broken end on exposure remains white it is ripe but if it turns dark, tuber is still immature. The harvest of the crop commences with the removal of the vines. An interval of a week

between the harvest of the vines and tubers is believed to improve the taste of the tubers, as a portion of the starch is converted to sugar. If the crop is left in the field for a longer time a yellowing of the tubers sets in imparting to them a bitter taste. The soil is dug out with hand hoes carefully to minimise damage to tubers and the crop gathered. Harvest with digging forks would both minimise the damage to tubers and quicken the operation.

The yield of the crop is varying and is conditioned by the season, the soil, and the care with which the crop is nurtured. Sweet potato being essentially a cold weather crop maximum yields are secured when it is raised during September-October to January-February. High cost of production and lower yields are weighty reasons with the growers against its cultivation during summer. During the rainy season the crop is not productive as excessive vine growth results in little or no tuber formation. Ten to twelve thousand pounds of tubers and five to six thousand pounds of the green vines per acre are reckoned to be normal yields although higher yields are not uncommon.

Varieties: There are two varieties under cultivation distinguished by the colour of tubers, the red and the white. The white is considered to be less sweet and more fibrous than the red one. The Department of Agriculture, Bombay, introduced into Bombay, a Ceylon variety which tends to form clustered tubers. Certain varieties in Java are reported to have attained the weight of 50 lbs. per tuber. *Ipomæa crysorrhiza*, a variety popular in New Zeland is known to give tubers of 9 to 10 lbs. each. A trial of such varieties in the province with a view to select the best among them is desirable.

Pests and Diseases: A widely distributed pest of this plant is the sweet potato weevil (*Cylas formicarius* F.) an ant-like insect in red and blue. The grub of the weevil tunnels through the vine and in bad cases number of them breed inside killing the vines. It also attacks the tubers when stored in godowns. The use of healthy cuttings for propagation, rotation with other crops and destruction of early infested vines are the chief measures in the field. In godowns cleanliness and prompt destruction of affected tubers keep the pest under control. In some countries outside India the crop is not grown for a fairly long period so as to starve out the pest. Among other pests affecting the crop are some leaf-eating beetles and caterpillars such as Tortoise beetles (*Aspidomorpha miliaria* F.)

the Sphinx moth (*Herse Convolvuli*) the hairy caterpillar (*Diacrisia obliqua*), but these seldom cause any appreciable damage and if and when they do so, arsenical dustings have to be resorted to.

Food and Fodder value: Dr. W. R. Aykroyd in Health Bulletin No. 23 published by the Government of India gives the percentage composition of the tubers as below. The difference between the red and white varieties is, however, not known.

Moisture	....	66.5	Carbohydrate	....	31.0
Protein	....	1.2	Calcium	....	0.02
Fat	....	0.3	Phosphorus	....	0.05
Mineral matter	....	1.0	Iron	....	0.8
Calorific value per 100 grams	....	132			
Vitamin A per 100 grams	....	10			
Vitamin C per 100 grams	....	24			
Calories per ounce	....	37			

The actual food value compares favourably with that of a crop of rice or millets obtained from the same area. It is eaten either raw, fried, roasted or boiled. That it is a delicious vegetable needs no special mention. Sun-dried slices of the tubers can be ground into flour. Such flour can be baked into cakes or used in a variety of ways. It is mixed with other kinds of flour in the preparation of bread and biscuits. It is reported that in Bombay the flour is taken on fast days. In America and Japan it is reckoned to be a good food. Sweet potato yields a fine quality starch possessing a high commercial value. In America a delicious syrup is prepared from the tubers. The vines or the haulms in the green state form a palatable and nourishing fodder for cattle. It is believed in the Circars that it increases milk yield when fed to milch animals. In the Madras Agricultural Journal, Volume 31, August, 1943 Subbiah Mudaliar V. T. reported the composition of the vines as below:—

Original moisture	....	86.42 per cent
Crude protein	....	2.58 "
Fat	....	0.32 "
Carbohydrate	....	4.65 "

Young succulent vines contain 2.58 per cent of proteins equivalent to 19.0 per cent on a dry basis. 20 lbs. of green vines a day would supply as much protein as one pound of groundnut cake or 3 lbs. of cotton seed. The vines have a tendency to

loosen the bowels of animals when fed in large quantities and cannot, therefore, replace concentrates entirely. Dairy animals at the Agricultural College, Coimbatore are fed with sweet potato vines up to 50 lbs. a day especially in summer when other green feeds are scarce, without any ill effects on the animals.

Economics of Cultivation: The cost of cultivation as detailed below comes to Rs. 152—8—0. Calculating the average yield of the crop at 10,000 lbs. of tubers per acre valued at Rs. 0—0—6 per lb. the gross income from an acre will be Rs. 312—8—0 and the net gain Rs. 160—0—0.

Cost of Cultivation for Acre - Details.

Preparatory cultivation	Rs. 25—0—0
15 cart load of farm yard manure and spreading the same	Rs. 30—0—0
Seed material 20,000 sets preparation of sets and planting	Rs. 30—0—0
Five irrigations	Rs. 25—0—0
After care weeding and hoeing lifting vines occasionally	Rs. 10—0—0
Harvesting and cleaning	Rs. 30—0—0
Assessment	Rs. 2—0—0
Total cost of cultivation	Rs. 152—8—0
10,000 lbs of tubers valued at Rs. 0—0—6 per lb.,	Rs. 312—8—0
Net gain per acre	Rs. 160—0—0

The cost of cultivation may occasion surprise but the growers hardly spend 30 per cent of the amount as cash expenditure. Further, individual holdings scarcely exceed an acre and are easily managed by the farmer and his family labour. To farmers with small holdings (50—60 cents) the entire gross income is regarded as profit, since the farmer and his family manage the cultivation of the crop till harvest.

Conclusion: The profitable nature of the cultivation of this root crop is widely known among the farmers in Circars. Its production at present meets with the local demand. An extensive demand coupled with the provision of storage facilities for the tuber would induce cultivators to increase its production.

Under an increasing awareness of the dangers of food deficiency verging on famine, the importance of this crop to supplement the staple food - rice can hardly be over-estimated. To give wide publicity of this important crop and to extend its use among the public in a variety of ways as in other countries are the objects of this note and if these objectives have been in any measure attained, the writer will feel amply compensated for the effort made.

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A Note on Malt Industry in Madras

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As a result of a series of investigations undertaken by the Department of Agriculture, Madras, in its well-equipped research laboratories at the Coimbatore Agricultural Research Institute, it was possible to undertake the production of Malt Extract and Malt food on large scale during the past three years. The Government Malt Factory at Coimbatore is now a big concern and the malted products which are manufactured under careful scientific control are being released for large scale distribution.

Malt Food: The factory consists of two sections, one for the production of Malt Food and the other for the manufacture of malt extract. The malt food section is rated to produce about 300 lb. of Malt food per day of 24 hours. The equipment consists of 6 polishers, 6 roasters, 6 grinders and six sieving machines. The food is packed in one lb. standard glass bottles and sealed in CO_2 gas. The bottles are despatched in standard cases containing 20 bottles each. The present price is Rs. 2—4—0 per bottle of 1 lb. f. o. r. destination in the Madras Province. Messrs. Best & Co. of Madras are the sole agents for its distribution.

Cholam is the basic raw material utilized for malting. Special refrigeration rooms have been constructed to "couch" or germinate the cholam at 65°F . After couching, the grains are sun-dried and taken through the various stages of malt food manufacture such as polishing roasting, grinding and sieving. The coarser powder which does not pass through the 100 mesh sieves is known as the "coarse malt" and is utilized for the preparation of malt extract. An yield of 20—25 per cent of malt food is obtained using good quality cholam having high germination capacity.

Malt Extract: The malt extract plant is a fairly big unit and is capable of maximum output of about 250 lb. of extract per day. The process is continuous and has to be carried through by working in three shifts night and day. The equipment essentially consists of a battery of six steam jacketed pans of 50 gallons capacity each, a set of six centrifuges, six vacuum filters and six vacuum pans of 50 gallons capacity each. There is additional equipment for mixing the extract with shark liver oil.

50 lb. of green malt and 50 lb. of coarse or roasted malt are mashed in each pan with about 40 gallons of water at 60°C for 3—4 hours to complete diastatic breakdown of starch. After drawing off the supernatant liquid, the thick liquid remaining in the mash tub is centrifuged and the centrifugal liquid drawn off from the top. The combined liquid is filtered under suction through about 10 lbs. of active carbon prepared from paddy husk, and the clear filtrate charged into the vacuum still. The vacuum is maintained in a series of four to five stills by means of a set of three vacuum pumps. The extract is concentrated at about $62\text{--}65^\circ$ and it takes nearly 16—20 hours for the extract to attain the proper consistency. The final extract should have a specific gravity of 1.40 to 1.45, a refractive index of 1.4950 to 1.5000 and should contain about 70—75 per cent of sugar as maltose. It is generally of a rich amber colour, highly viscous and palatable. The extract which is known as plain extract is mixed with high potency shark liver oil to give about 200 international units of vitamin A per gram and is bottled in one lb. amber or green coloured bottles. The present price is Rs. 4/- per bottle and 20 bottles are packed in a standard case. The Madras Provincial Co-operative Marketing Society are the sole agents for malt extract distribution in the Madras Province.

Using good cholam of high germination capacity, the yield of extract is about 25 to 30 per cent. The cost of buildings machinery and equipment for the plant is Rs. 1,50,000/-. The extract produced is of a high standard and has been supplied to hospitals and the Defence Forces in India. The Malt Factory at Coimbatore is the first of its kind in India. Most of the machinery and equipment was fabricated in India. Considerable experience has been gained in working it so that it is now possible to draw up definite plans and estimates for the expansion of the industry in the near future.

The malt industry in India is a recent one. Considering the vast amount of patent foods imported into the country, many of which contain malt products in their preparation, there is every scope for building up this industry, in India.

MANGOES IN CIRCARS, MADRAS.

By

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The mango is the most popular fruit in the Circars. Its luscious taste and agreeable flavour have won the appreciation of one and all. In the Circars its consumption is universal as no other fruit is so cheaply available as to be within the reach of the rich as well as the poor. The production and marketing of this fruit is mainly concentrated in the area comprising the districts of Vizagapatam and East Godavari. During the past decade there has been a considerable production of mangoes, as large areas of cultural waste land were brought under the cultivation of this fruit crop. The availability of these lands at attractively cheap rates besides being admirably suited for the purpose, formed an important economic asset.

Acerage and Production.

The presidency of Madras has an area of 2,50,000 acres under mangoes with an annual estimated production of 20,000,000 railway maunds. As much as a fourth of this production is from the districts of Vizagapatam and East Godavari of the Circars, where a total area of 65,200 acres is utilised for this crop and the two districts share the area almost equally. Largest areas are concentrated in the taluks of Vizianagaram, Anakapalli and Sarvasidhi of the Vizagapatam district and Pithapuram, Tuni and Rajahmundry of the East Godavari district.

Cultivation of the crop.

Soil: The mango is not exacting in its soil requirements and thrives in all well drained and high level soils. The fruit grown on the red sandy soils of the Vizagapatam district is considered generally more tasty than that from other soils. In heavy and rich soils the trees grow very vigorously with vegetative growth at the expense of fruit development.

Propagation: Trees raised from seed are as a rule not true to type. In recent years gardens are raised entirely with grafts obtained from reputed nurseries of the area. The most popular method of grafting in the area is 'Inarching'.

Season and planting: The best season for planting in the area is July, soon after the break of the South West monsoon. The land is thoroughly cleared of the vegetation and is ploughed with a country plough. About 4 to 6 ploughings are considered sufficient to bring the land to planting condition. Pits are then

dug out at suitable distances and kept exposed for a month before planting. At distances of 10, 12 and 15 yards, an acre takes in 48, 34 and 22 plants respectively. The grafts are taken out from pots without disturbing the ball of earth around the roots and these are planted in the pits. An important precaution is to avoid deep planting. Different varieties or groups of varieties known to bear at the same time are invariably planted in different blocks.

Manuring: At present proper manuring of the gardens is the most neglected part of grove culture. During the first 3 or 4 years a few baskets of well rotten farm yard manure or green leaves are sometimes spread all round the trees and incorporated into the soil. Manuring of the young plants or at the time of planting is not an accepted practice.

After care: This consists in the first place affording adequate protection to plants from cattle or goats. Secondly they are watered carefully at necessary intervals during dry and hot weather, for the first three years. During the first three or four years, low crops such as horse-gram and groundnut are cultivated as inter crops. Application of green manure at the commencement of the rains during the period is however not uncommon. An essential part of orchard management thereafter consists in clean cultivation of the interspaces by one or two ploughings a year.

Profits: A graft mango garden commences its bearing from its fifth year of planting and remains in good economic bearing for 10 to 12 years under good management. The cost of raising a graft mango garden in the area (pre war) will be Rs. 5 to 6 per tree upto the bearing stage. Thereafter an average income of Rs. 3 per tree may be taken to be a very modest estimate. The main contributing factors for low incomes are the large uneconomic and unmanageable holdings, neglected part of orchard management, varying capacities of trees arising from planting of unreliable grafts and incidence of unfavourable climatic and weather conditions leading to heavy fruit fall or poor bearing of the orchards.

Utilisation and demand.

A remarkable feature of the mango production in the area is that it is confined to a few standard commercial varieties reputed to be productive and fairly good and regular in bearing. Of the total production nearly 35% finds export outside the province and about 20% is utilised to meet the requirements within the province. The rest answers the local demand within

the production zone. Of the fruit that finds export outside the province the variety '*Suvarnarekha*' distinguishes itself by its attractive appearance and inviting flavour and as such commands a universal demand. Though '*Banganapalli*' is much favoured in the Godavari district it stands next to '*Suvarnarekha*' in the markets of Northern India and Vizagapatam district.

Season and Varieties.

The marketing season for mangoes commences with the first week of April and ordinarily extends up to the middle of June and rarely to the end of July. The supply is at its peak for a period of five or six weeks during May-June. In respect of varieties, the market opens with early juicy varieties '*Rajamanu*' and a few other non-descript fruit of the country seedling types towards the end of March. Among juicy varieties the various types of '*Rasalu*' of the Circars deserve special mention. The '*Suvarnarekha*' an early variety comes for sale by the end of April and remains for a period of six to eight weeks. The '*Banganapalli*' and '*Banglora*' are late season varieties and these get into the market by the second week of May and last till the end of June. The '*Nilam*' a very late season variety comes to the market in the month of July and towards the end of this month the mango season of the area comes to a close. The fruit of certain choice fruiting varieties like the '*Himavuddin*' and '*Jehangir*' are very limited and are sparsely seen in the local markets of the area. Within the short producing season of 2 to 2½ months all the varieties finish their sales with a certain degree of overlapping of the varietal production.

Assembling and Distribution.

Of the important stations from which large quantities of fruit are annually exported Vizianagaram, Kottavalasa, Alamanda, Anakapalli, Tuni, Samalkot and Rajahmundry deserve special mention. Each of these stations constitutes an important export centre for the fruit that gets collected from the gardens in its neighbourhood. The consumer is generally separated from the producer by three agencies. One is the garden contractor who assembles the fruit from the gardens at the nearest marketing centre. The second is the broker who transacts business with the local retailer or distributor who directly deals with the consumer or at times through another middleman. The garden owners in the first place lease out their gardens to garden contractors on a contract long before the season in January. Usually the terms of the contract stipulate the payment of ⅓ of the amount at the time of agreement, another ⅓ before the fruit is picked and the rest towards the middle

of the harvest season. In most cases they do not pay the garden owners in full as per contract but withhold large sums (30 to 35%) of the money on the pretext that they have incurred heavy losses owing to poor bearing, heavy fruit fall and low market prices. The contract system is thus weak in its constitution and invariably bring the owner and the contractor into dispute.

Transport and Produce Movements.

The fruits are usually picked soon after they attain maturity. As a rule all the varieties intended for export are harvested a week before they are known to become soft for purposes of consumption. The garden contractors within the reach of the market (5 to 6 miles) send the fruit harvested on the previous evening, to the market on the next day and woman coolies usually bring the fruit in baskets. Fruits from gardens situated beyond six miles are brought in double bullock cart which holds 2,000 to 2,500 fruits. The fruit intended for export is packed with paddy straw in bamboo baskets holding about 60 fruits each. For export to markets within the province they are sent by goods train and to all places beyond the province they are booked by passenger train and parcel express. Under the existing defective methods of harvesting, packing and handling at various stages as much as 15 to 20% of the fruit suffers damage. The fruit from the area is known to move as far as Peshawar and Delhi. A very large percentage of the fruit finds ready sale in Calcutta. The recent railway line connecting Raipur and Vizagapatam has facilitated the export of the fruit to Raipur and its surroundings.

Grading.

At no stage in the entire trade, grading of the fruit is either attempted or allowed. In fact the sale of the mixed fruit of different sizes is an accepted condition of the transaction between the contractor and the buyer. While exporting out of the 50 to 60 fruits usually packed in a single basket, one can pick out only 10 to 12 well sized fruits, which are usually placed at the top, the rest being immature and of varying size. However in retail sale at the local market the vendors classify each variety into two or three groups according to the size. This is only practised with a view to meet the varied purchasing capacities of the rich and the poor but not on any scientific basis in true realisation of the economic value of the process. The packing of ungraded fruit at present markedly reduces the value of the high class fruit of the varieties '*Suvarnarekha*' and '*Banganapalli*'. Further it leads to suspicion and seldom fetches the price it actually deserves.

The Marketing section of the Department of Agriculture, Madras, during the past three years made attempts to impress on the traders and exporters the value of the grading process under the 'AGMARK' scheme. The writer's enquiry on the possibilities of grading revealed the existence of certain difficulties. In the first place the producer (garden owner) after leasing out his garden ceases to function in all important phases of the marketing and thus his interest does not go beyond trying to secure as much of the contract amount as possible. The interest of the middleman and other traders is limited to the securing their respective margin of profits to the maximum. The consumer is not particular to buy only graded fruit. As long as buyers do not insist on the purchase of the graded fruit and the producer maintains absolute indifference in the marketing of the fruit, the middlemen and the brokers rule the market and continue their old and unhealthy practices to the disadvantage of the both the producer and consumer.

Organisation Needed.

The interest of the orchardists of the area ceases with the production of the fruit and till today there has hardly been any satisfactory attempt on their part for organised marketing of the fruit. At present there is a wide disparity between the price received by the grower and the price paid by the ultimate consumer. This is due to the uneconomical system prevailing at present which countenances the existence of a post of middlemen between them. The middleman of the trade absorbs a major part of the inflated price, which the consumer pays, the share left to the grower is anything but satisfactory. The improvement of the present system of marketing with a view to enhance the producer's share of the profit calls for organised marketing and direct participation of the grower in the disposal of the fruit without the interference of the middleman. This can best be accomplished by the producers organising themselves into Co-operative Export Society for each centre of trade which in turn may all be affiliated to a central organisation. This ensures concerted action on their part in all vital matters and prevent unhealthy competition among themselves. Such direct interest of the producers not only renders grading an easy job but enables the elimination of the middleman — the cancer of the marketing problem.

REVIEW

Sugarcane cultivation - by K. M. Gururaja Rao, The Bangalore Printing and Publishing Co. Ltd. Rs. 4-8-0.

The Author of this booklet has contrived to give within the brief compass of 127 pages all the essential points needed for growing sugarcane successfully.

Part I which deals with the principles of cultivation, starts with an outline of the history of this crop, and then describes the botanical and physiological aspects and the main varieties of cane. The next three chapters deal with soils, manure and irrigation and yield estimates of sugarcane, with a concluding chapter on insect pests and diseases of sugarcane.

Part II gives some practical suggestions for sugarcane plantations, viz. on selection of site, surveying and levelling, growing greenmanure crops and goes on to a detailed account of preliminary cultivation, planting, after cultivation, determining the maturity of the crop and ratooning, concluding with a summary of recommendations for the cultivation of sugarcane.

The book is written in clear and simple language and should prove to be quite helpful for those interested in sugarcane growing.

RESEARCH NOTE

(Results of manurial trials on paddy with tobacco seed oil cake)

Last year, the Government sanctioned a scheme for conducting trials with Tobacco seed oil cake on a field scale in Kistna district. The scheme was intended to find out whether Tobacco seed oil cake when applied to paddy crop could give better yields, in as much as the Tobacco seed oil cake contains nitrogen equivalent in value to that of castor cake.

2. The trial was conducted on 36 one-acre plots at the rate of 4 plots in each of the 9 taluks of Kistna district. Tobacco seed oil cake was applied at 560 lbs. for each acre as against the application of groundnut cake at 328 lbs. (or 2 bags) per acre on control plots to supply 25 lbs. of N. (A statement showing the results of the trial is appended). The results indicate that Tobacco Seed cake in some cases has given higher yield than groundnut cake while the latter cake has given higher yield in other cases. Statistically the difference between the two kinds of manures is not significant and we may therefore conclude that Tobacco seed oil cake is quite as good as groundnut oil cake. On the whole, Tobacco Seed cake when applied on an equal N. basis is as good as groundnut cake that has become so popular a manure for paddy with the growers.

TOBACCO SEED OIL CAKE - TRIALS ON PADDY - KISTNA DISTRICT, 1946-47.

Area of the plot: 1 Acre: Each trial and control plot.

Serial Number 1	Taluk 2	Trial plot		Control plot		Increase in yield of trial plot over control lb. of grain 7	Decrease in yield of trial plot 8
		Dose of tobacco seed cake 3	Grain yield lb. per acre 4	Dose of groundnut cake 5	Grain yield in lb. per acre 6		
1	Gudivada ...	560 lb.	2490	2 bags or 328 lb.	2153	332	...
2	...	"	3320	"	2988	332	...
3	...	"	2324	"	1992	332	...
4	...	"	2324	"	1992	332	...
5	Bezwada ...	"	2324	"	2490	...	166
6	...	"	2905	"	2905	...	...
7	...	"	1494	"	1660	...	166
8	...	"	2656	"	2822	...	166
9	Nandigama ...	"	2158	"	2324	166	...
10	...	"	2656	"	2822	...	166
11	...	"	1494	"	1660	...	166
12	...	"	2656	"	2822	...	166
13	Masulipatam ...	"	1722	"	1704	18	...
14	...	"	1328	"	1308	20	...
15	...	"	1324	"	1245	79	...
16	...	"	1992	"	1909	83	...
17	Avanigadda ...	"	2158	"	1992	166	...
18	...	"	1743	"	1660	83	...
19	...	"	2324	"	2324	...	...
20	...	"	2656	"	2490	166	...
21	Kaikalur ...	"	3200	"	2500	100	...
22	...	"	1700	"	1700	...	...
23	...	"	1992	"	1900	92	...
24	...	"	2185	"	1992	193	...
25	Vuyyur ...	"	1992	"	1993	...	1
26	...	"	2073	"	1993	90	...
27	...	"	2052	"	1979	73	...
28	...	"	2075	"	2100	...	25
29	Nuzvid ...	"	1100	"	1162	...	62
30	...	"	830	"	996	...	166
31	...	"	1080	"	1160	...	80
32	...	"	900	"	1100	...	200
33	Tiruvur ...	"	1070	"	1140	...	70
34	...	"	1000	"	1160	...	160
35	...	"	960	"	1100	...	140
36	...	"	830	"	996	...	166

College and Estate Notes

*

Students' Corner: The inaugural address of the Students' Club was delivered by F. W. A. Morris, Esq., I. C. S., District Collector, Coimbatore on the 1st day of August, with S. K. Basu Esq., I. F. S., Principal, Forest College in the chair. The lecturer spoke on the problems of "Village Administration". He praised the working of the village group committees and stressed the need for the students to help in the uplift and improvement of the villagers.

Independence Day Celebration: This unique day was celebrated with fitting pomp and great enthusiasm by the members of the Student's Club and Hostel. The Students' Club and pavilion were gaily illuminated, posters being displayed in the Hostel and Club premises which were tastefully decorated with coloured paper and ornamental plants. Invitations were distributed to all the estate residents and some of the prominent citizens outside the estate. The stroke of 12 on the 14th night was announced by the joyous peals of the hostel bell and Estate siren. The students went in a body and burnt the effigy of John Bull. Fire works were let off. The running commentary, and speeches relayed on the Radio from the constituent assembly were listened to by one and all. Soon after the speeches were over a light tea was arranged for the students were taken by surprise by the arrival of the "merry ducking party" who went round from room to room with tom toms, ducking each and every student with tricoloured water as a symbol of washing away the slavery.

The glorious sun rise of the 15th morning saw all the students dressed in white robes and tricoloured badges standing ready to up the day's happy proceedings. At 6-30 A. M. a procession of the students went round the estate carrying the national flag and shouting slogans. After the procession the students and the guests assembled on the college maidan, where the national flag was hoisted by Sri P. Venkataramiah, Principal, Agricultural College, after which he took a march past and salute of the student volunteers. Dr. S. Kasinath, Senior Dy. Warden read out the message of the Independence Day. National songs were sung and sweets were distributed among the children of the Elementary School and farm labourers

school and flowers and pan supari to the guests present. Soon after this there were games and sports of which the donkey race was a special feature.

At 8 P. M. in the night there was an open air dinner under the gaily decorated and illuminated premises of the hostel. The dinner followed by a dramatic entertainment by the students. Just before the commencement of the entertainment, prizes were distributed by Mrs. W. L. Venkataramiah to the winners of the various items of the sports and games of the day. On this day a special number of the 'Hostel Tatler' was published. The day's celebration came to a glorious termination with a vote of thanks proposed by the Secretary of the Student's Club.

Obituary: True to the saying of 'claim after storm' the students were plunged in grief after their peak of pleasure on the 15th August by the sad news received on 16th about the death of Mr. Vadivelu, a student of the II year class. A condolence meeting was held on the same day and a message was sent to the bereaved family expressing the deep regret of the students.

Under the auspices of the Students Club a meeting was held on 22nd August 1947 when Mr. Mohan Kumaramangalam addressed the students on the 'Attainment of Freedom and the future of India'. Sri K. C. Ramakrishnan Lecturer in Agricultural Economics presided over the meeting.

Games: The following members were elected to officiate as captains in the various games for the year 1946—47.

Somanna	....	Games Secretary.
Appaih	....	Hockey.
Padmanabha Rao	....	Cricket.
Rama Rao	....	Tennis.
Joseph	....	Foot Ball.

The year was started with several practice games with a view to select new talents in the I year. Except for one or two there were no good additions.

Cricket: Several matches were played against out-side teams. Through out we maintained a high standard in batting by always scoring above 100 runs. But our offence has still got to be improved. Santanam of the 1st year is a valuable asset to the team and has shaped well with the bat. We hope to improve during next term and come out successful in the inter-collegiate matches.

Hockey: In the Catholic tournament although we lost against P. N. P. in the first round, our game was of a good standard. Venkataraman of the 1st year is an addition to our defence. For want of a proper playing field, practice matches could not be arranged.

Foot Ball: Several matches were played with success, but our defence has got to be improved considerably. We have good additions from freshmen in Messrs. Sahasranaman and Narayanan Kutty to our team.

As regards indoor games there are very many enthusiasts. We are confident of building up a strong team in Volley Ball and Basket Ball. Mention may be made here of an exhibition match at Ping Pong staged at the Freeman Hall. Sivaraman and Chandarana, the renowned All-India players participated. It was indeed a grand exhibition of the game.

College: The First terminal examinations for all the classes commenced in the first week and ended by the beginning of the third week of September. The College closed for the Michaelmas vacation on the 17th September and most of the students have left for their homes.

Madras Agricultural Students' Union: At a meeting of the Editorial Board of the Union held on 11th September, Sri C. Balasubramaniam and Dr. N. Krishnaswami were elected as Manager and a member of the Board respectively.

Officers Club: The members of the club under the presidency of Sri K. M. Thomas, Government Mycologist, conducted the Independence day celebrations on a grand scale, decorating the club and its premises with hand made flags, plantain trees etc. The president hoisted the flag at 9-5 A. M. and after taking salute and oath, Sri Bhashyam and I. V. Parthasarathy sang national songs. Several items of sports, in-door and out-door games were conducted and the function came to a close with distribution of prizes to winners in the several events.



K. KUNHI KRISHNAN NAMBIAR

OBITUARY

We record with deep regret the death, on 3rd September 1947, of one of our valued members, Sri K. Kunhikrishnan Nambiar, Assistant in Millets at the comparatively early age of forty two. Sri Nambiar entered the Agricultural College in 1925 and soon after taking his degree in 1928, in which he won the Robertson Medal for the highest aggregate marks he was taken as a research assistant in the Millets Section where he continued till his death. After an apprentice period of three years in sorghum, under the *exacting* supervision of Sri G. N. Rangaswami Ayyangar he was entrusted for the next twelve years, i.e. from 1931 till 1943, with genetic studies on pulses chiefly lablab and cowpea. The results obtained in the course of his studies were published as four articles in the Proceedings of the Indian Academy of Sciences. The quality of this work may be judged from the fact that any one else of a more ambitious turn of mind could have secured a doctorate for it and

a high paid job as well, but Sri Nambiar's self-effacing modesty prevented both. However there do exist as monuments of his ability, eleven outstanding varieties of field and garden beans and two varieties in cowpeas. When a separate Pulses Section was opened in 1943 all this material was handed over to the new section.

As a member of the Madras Agricultural Students' Union, Sri Nambiar was, right from his student days, a very able and enthusiastic worker, versatile, conscientious and sincere to the last degree in anything that he undertook to do, though here again very few were privileged to know his abilities, owing to his intense dislike of anything approaching fuss or show. Nearly twenty batches of students must have passed through his hands and got transformed from raw recruits, into shining stars in the College-Day Dramas; as a member of the Officer's Club, he was an automatic choice year after year as the chief of the Decoration committee and in the Editorial Board of the journal, to him would always fall the thankless task of correcting the printers devils and shaping the articles into a printable form.

A man of great talents and lovable nature, a craftsman of the highest order in anything he put his hand to, be it photography or furniture making, it can truly be said of him as Johnson said of Goldsmith that he touched nothing that he didn't adorn. It is a loss to our Department that his abilities did not get better recognition.

We extend our heartfelt sympathy and condolences to his family, brother and nephew.



The Madras Agricultural Students' Union.

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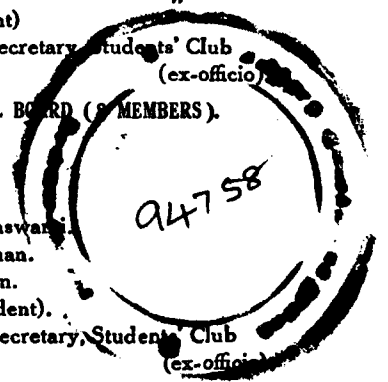
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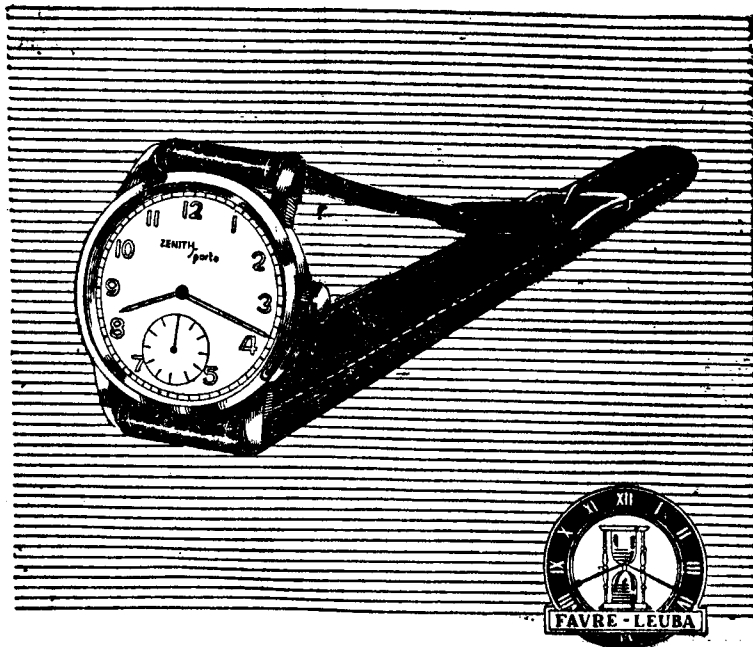
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