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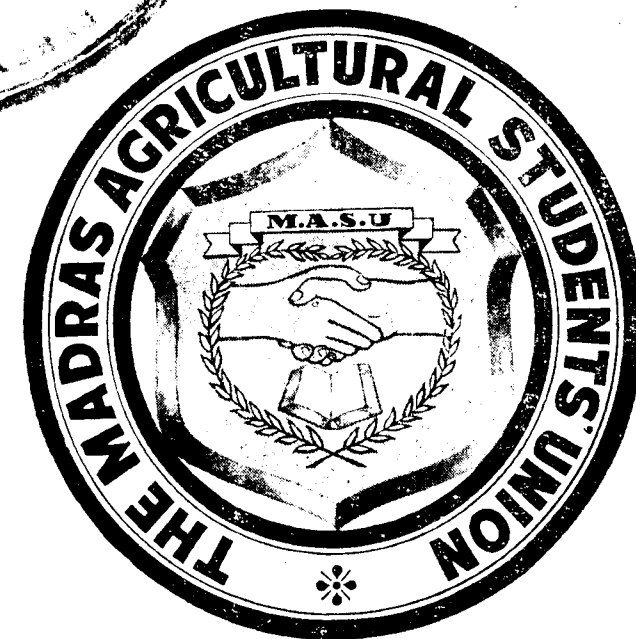
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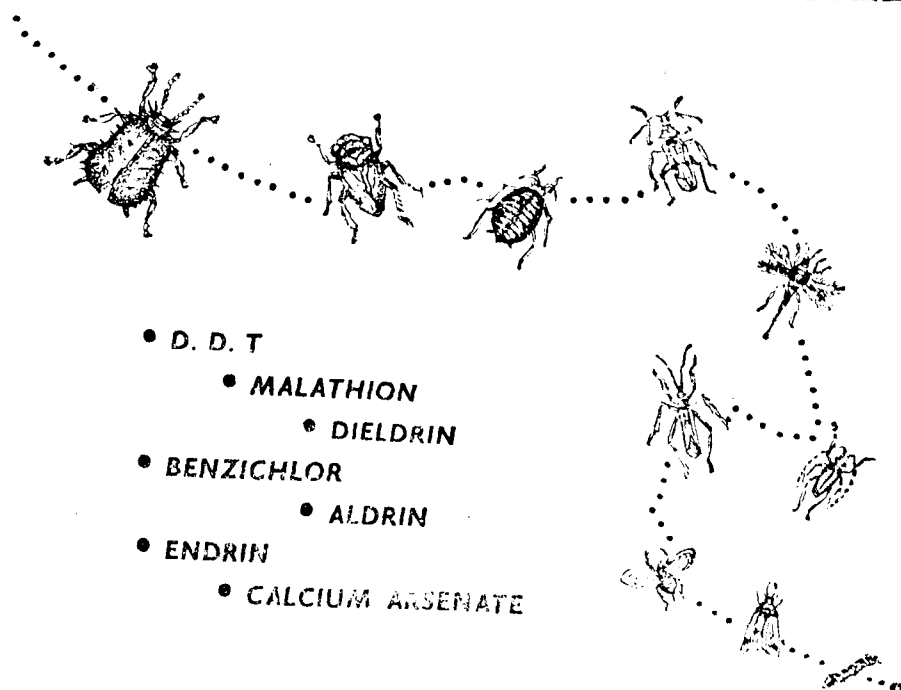
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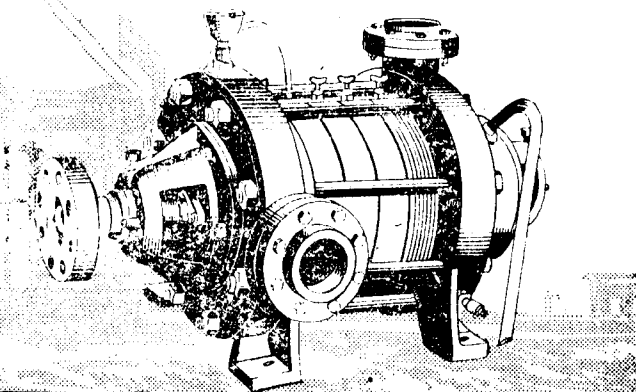
Editorial

Co-ordinated Agricultural Experimentation in India: In recent years the formulation of Agricultural Experiments in the several States in India on a co-ordinated basis has become common. The Indian Council of Agricultural Research and other commodity committees are initiate such co-ordinated trials. The co-ordinated Model Agronomic Experiments and the Simple fertiliser trials on cultivators fields sponsored by the Indian Council of Agricultural Research are being conducted in most of the States on the co-ordinated basis. The lay out of the trials, the staffing pattern and financing are all similar in all States. In some experiments even the treatments have been kept common for all the States. It is quite necessary to carry out co-ordinated trials as such experimentation has certain advantages. It will be possible to compare the results obtained in the different States on an All-India basis and group the data according to well defined Agro-climatic regions. The experiments will be laid out on approved lay outs with practically little scope for adoption of faulty technique. The staff and finance can be more economically utilised. As against these advantages, experimentation becomes stereo-typed leaving no scope for development of initiative in formulating research schemes by States. There will be less interest exhibited by the personnel in charge of these experiments. There is delay in carrying out the trials due to delay in finalisation of details. Data of the experiment are not analysed and made available to the States in time as they are to be compiled, collated and analysed on an All-India basis. The most important disability is the choice of treatments. While there is certain amount of freedom in deciding the treatments to be adopted in the different States, certain treatments are to kept similar in order to interpret the results on an All-India basis. This restriction itself may not render the results fully useful to the States. Co-ordination seems necessary to avoid duplication of efforts of the different States. But co-ordinated experimentation in applied research in States with varying soil, climate and agronomic patterns, not to mention the



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stage of development of research attained by the States, requires rethinking to make the experiments really useful to the States carrying out the experiments. It is very desirable to leave the States to develop their own initiative in solving their local problems, while guidance may be given in the matter of suitable experimental techniques and results of past research may be also made available on an All-India basis by the co-ordinating agencies. Above all, the more advanced States should be helped to proceed forward instead of being held back for the sake of co-ordinated experimentation. Co-ordination should be restricted to integrating the research in progress in the different States without attempting at uniformity which may result in leveling down the progress in certain States.

The Japanese Peppermint — *Mentha arvensis* L Possibilities of cultivation in South India

by

T. V. SUBRAMANIAM, B. A.,
Madras Agricultural Service (Retired).

99

Peppermint oil, and menthol crystals prepared from it, are very extensively used in medicine and are said to be excellent carminative, gastric stimulant, antiseptic and preservative. These find great use in the preparation of dental creams, mouth washes, tooth pastes and chewing gums, and as flavouring material in confectionery. All essential oils, like peppermint oil, are aromatic oils prepared from vegetable sources, and are capable of volatilisation without decomposition, and are practically insoluble in water but soluble in most organic solvents.

Peppermint oil is got by distillation from two species of plants — *Mentha piperita* and *Mentha arvensis*. *M. piperita* is grown in England, U. S. A., Canada, Germany and France, while *M. arvensis* is grown in Japan and China from where it has been introduced into other countries like U. S. A. and Brazil, and very recently to India. In England there are two varieties of *M. piperita* known as the black and white varieties; the black variety is said to be coarser and yields more oil though the oil is of a less delicate aroma. Peppermint oil can generally be kept for years without deterioration; in fact, the oil improves in smell as it gets older though it becomes darker and more viscid. The peppermint oil is colourless, yellowish or greenish in colour. It has an agreeable, refreshing odour and a cooling persistent taste.

There are nearly 250 species of *Mentha* growing wild or cultivated in different parts of the world; but very few yield any appreciable quantity of oil of economic value except the two species mentioned above. The total annual output of peppermint oil in the world is estimated to be somewhere near four million pounds, and China and Japan produce the largest quantity, nearly 70% of the world's production. The Japanese species of *Mentha* is *M. arvensis* L. — subspecies *haplocaly* Var. *piperascens*.

Guenther in his book on "Essential Oils", gives the chief differences between *M. arvensis* and *M. piperita* as follows; — "*M. arvensis* is a perennial herb spreading by rootstocks which creep along the ground or just under the surface and root at the nodes. The erect stem is 1–3 ft. high, usually branched, bearing clusters of flowers at the axils of the leaves. *M. piperita*, on the other hand, bears flowers in more or less interrupted, terminal, usually leafless, spikelike panicles. *M. arvensis* is covered all over with soft white hairs, while *M. piperita* is glabrous throughout and the hairs, if present, are sparse and are mostly near the

nodes at the lower part of the stem. The leaves of *M. arvensis* are lanceolate or oblanceolate with triangular blunt teeth, acuminate at the base of the petiole, while *M. piperita* leaves have sharper acuminate teeth and the base may be acuminate or acute with the petiole scarcely marginate. *M. piperita* rarely, ever produces seeds while *M. arvensis* produces seeds freely.

Peppermint oil industry is a very old one, the plants having been known in England as early as 1750 and much earlier in China and Japan; it was introduced from China into Japan about 1700 years ago. It has been known to grow wild in China very much earlier, as early as 984, and used for cooling beverages and as an eye-wash. The first organised cultivation was started in China only in 1913 and began to develop during the years 1931—1935. In China it is grown as a yearly crop with two harvests, yielding 1—2% of oil and 45% of menthol. Propagation in China is usually by means of runners. It is also done by vegetative cuttings from the herbaceous portions of the plant which are rooted in sand and then transferred to pots or planted directly in the field. Though the peppermint plant was introduced into Japan as early as 1700 years ago, it was only by about 1870 that large scale cultivation was done and the first lot of menthol was exported in 1883. The industry flourished well and by 1914 the output of oil and menthol amounted to half of the world's total production. Somewhere about 1923, Japanese mint was introduced into Brazil where it flourished for sometime and reached its highest development by 1845, but unfortunately by 1947 the acreage declined considerably. In Brazil it is grown as a mixed crop with rice, maize, cotton and peanuts, and not as a single crop.

Menthol Cultivation in India: There are three indigenous varieties of *Mentha* in India, viz., *M. arvensis* and *M. sylvestris* growing in Kashmir, and *M. viridis*, growing in South India, all the three known locally as "Pudina" and generally used for culinary purposes when green, and said to be useful in setting right stomach troubles. None of these, however, yield peppermint oil of quality or quantity and practically no menthol. India's annual requirement of peppermint oil and menthol is said to be of the value of 50 lacs of rupees and the entire quantity has to be imported from abroad, China, Japan and U. S. A. sharing the supply. During the period 1956—57 India imported oil worth Rs. 6,01,527, in 1957 menthol worth Rs. 61,31,212 and oil worth Rs. 4,47,350 and in 1958 the import was Rs. 41,33,946 worth of menthol and Rs. 3,87,190 worth of oil. This foreign supply was greatly handicapped since the last World War owing to import restrictions and consequent prohibitive cost; the price of menthol has gone up to Rs. 50 60 a pound from Rs. 6-10 a pound during pre-war days.

In the latter part of the nineteenth century attempts were made to grow the European mint, *M. piperita* in places like the Nilgiris, Mysore

and Dehra Dun; but the experiment was given up as the oil and menthol from the crops did not come up to the official standard. Even in Europe it is said that the standard does not satisfy the British and the U. S. A. pharmacopea. The indigenous variety of *M. arvensis* in Kashmir does not yield sufficient oil with good menthol content; but the Japanese variety, *M. arvensis*, sub-species *haplocaly*, var. *piperescens*, is found to yield about 30—60 pounds of oil per acre and give 1—3%, with a menthol content ranging from 65—80%. So the Japanese mint has been introduced into Kashmir and cultivated there by the Regional Research Laboratory, is reported to be thriving well, and yields oil with menthol content comparing very favourably with the figures in Japan and Brazil.

Japanese Mint in South India: Peppermint oil and menthol are very much in demand in the preparation of scented betel nuts and the difficulty of obtaining these easily, and at convenient prices seems to affect the industry. Mr. M. K. Krishna Chetty, the proprietor of the famous "Asoka" betelnut factory at Coimbatore, visited the last "India Exhibition, 1958" and saw a demonstration by the Regional Research Laboratory, Jammu and Kashmir of the cultivation of the Japanese mint and the preparation of peppermint oil and menthol and on his return to Coimbatore, we had a discussion as to whether we could try the cultivation in South India and we decided to make a trial. The Regional Research Laboratory was contacted and on receipt of detailed information on the subject it was found that Coimbatore might afford favourable conditions for trying the crop and a small plot of ground was got ready as per instructions from Kashmir Laboratory and three dozen rooted suckers were got down and planted in March 1959. On account of the warm dry weather prevailing at the time, the growth of the plants was not very good; but with the receipt of a few showers in April, the crop picked up and gave us hopes and we decided to get a further consignment of 400 suckers. This lot was planted in an adjoining plot in the factory compound and all the plants came up. The two lots are flourishing well. The March crop came to harvest by the end of August and the second crop (planted in June) by October and the two together yielded about 67 lbs. of leaves which were used for the distillation of the oil, which gave 2.5%, very well comparable to 1.6—2.4% obtained in Kashmir and other places. Sri Nabhar, Special Officer, Medicinal Plants Organisation of the I. C. A. R. and Sri Rhandhawa, Vice-Chairman, I. C. A. R., who visited the plots, remarked that the performance of the crop compared very well with the condition of the crop in Kashmir. Trials in other places round about Coimbatore with root suckers from our crop are equally encouraging. The crop has been seen to thrive in other places in South India, such as Bangalore, Mysore, Ramnad, Trichinopoly and Tanjore districts and is also coming up well. Observations of plants attempted at various elevations in the Nilgiris indicate that the higher elevations are not so well suited for the growth of the crop as the lower ones; the

trials are being continued. It is proposed to try the crop on a bigger scale in a few place with suitable conditions of soil, climate, rainfall, etc., to work out the economic aspect before launching on a commercial scale. It is a satisfaction to see that the crop will thrive well in South India with good yield of oil and menthol.

The following information about the cultivation of menthol plant, gathered from our own experience and available literature on the subject, will, it is hoped, be useful to those who are interested in the venture.

Soil: Peppermint is a water-loving plant and the growth of the crop and the yield of the oil and menthol are greatly influenced by the nature of the soil and climatic conditions. A good light, sandy or loamy, well-drained soil, rich in humus, with little rain during the harvesting season is ideal for the crop. Virgin forest lands on mountain slopes with an altitude of 250-400 ft. is said to offer very good conditions. Liberal irrigation after planting and after each harvest enables healthy growth. A place with good sunshine in summer produces high menthol content. The presence of weeds has a harmful effect on the quality of the oil.

Cultivation: After the plot has been well ploughed and well manured, rooted fleshy suckers taken from old and healthy plants and cut into pieces 3-4 in. long. are planted, end to end, in rows 2-3 ft. apart and covered with a thin layer of soil. The crop responds to organic manures well and farmyard manure or compost at the rate of 12-15 tons per acre may be applied before planting. Subsequent dressings of inorganic fertilisers like ammonium sulphate, superphosphate or potassium sulphate at the rate of 200 lbs. per acre may be advantageous. Though the plants are slow in establishing at first, taking sometimes two or three weeks, with proper irrigation and care, the growth later on is very rapid and the crop generally comes to flower in 3 or 4 months when it is ready for harvest. In another three or four months later a second harvest can be had and a third one in another 3 or 4 months, and generally it is possible to take three harvests in a year if the crop is in good condition. A crop can be kept for three years at a stretch and then replantation is necessary. If the same field is to be used again, a rotation with some leguminous crop may be given before planting mint again. In the second year the crop grows vigorously, the rows disappear and the field looks even and is then known as meadow mint as distinguished from the ridge mint as it is known in the early stages. For aerating the soil then intercultivation by a cultivator may be necessary.

Harvesting: This is generally done when the crop is in full bloom, or, better, when the buds are still tight but ready to blossom, on a bright sunny day, after the dew has disappeared. It has to be done carefully so that the quality of the oil may not be affected. The cut plants are bundled and hung up in open air or in shade for drying until they weigh

about 1/3 or 1/4 of the original green weight; they should not be completely crisp nor should they be allowed to ferment. The leaves may be separated from the stems which constitute nearly half the quantity as the latter contain only traces of oil.

Distillation: An ordinary still, generally used for the distillation of other essential oils like Eucalyptus oil is used. The still is charged with the dry herb and heat is applied directly or by steam; steam distillation is preferable as it prevents the charring of the material. The whole process takes about 2-2 1/2 hours for one charge. The oil contains at first a lot suspended impurities which have to be filtered away. The golden yellow oil, with the characteristic peppermint smell and slightly bitter taste, contains 79-80% of menthol which can be separated in crystal form on cooling the oil to low temperature by repeated chilling and freezing. Nearly 40-50% of the menthol can thus be separated in trays and dried at ordinary temperature and traces of the adhering oil removed. The remaining oil that is known as dementholised oil can be used for the same purposes as peppermint oil.

From the excellent performance of the mint crop we have seen so far, it is hoped that when grown with greater attention with the experience gained, the industry will prove very encouraging and attract more people for greater and more extensive cultivation of the crop, relieving the country of the present crisis in menthol supply, not only making India self-sufficient in the commodity but even able to export to other countries in the long run.

NOTE: One acre of the crop is expected to yield 175 to 209 maunds of green leaves in a year, which when dried, will give 25 to 80 maunds of dry material for distillation of peppermint oil. At the rate of 2%, this material is expected to yield 37½ lbs. of peppermint oil proper, or when crystallised, 18½ lbs. of menthol and 18½ lbs. of dementholised oil. The prevalent price of peppermint oil is Rs. 25/- per pound, that of menthol Rs. 66/- a pound, and of dementholised oil Rs. 15/- a pound.

First Year			
Expenditure	Rs. A. P.	Income	Rs. A. P.
3400 suckers @ Rs. 2/- a doz.	536-0-0	37½ lbs. peppermint oil	937-8-0
3 ploughings @ Rs. 10/- each	30-0-0	Profit	75-8-0
12 tons of F. Y. manure	120-0-0		
1 cwt. of Ammonium sulphate	50-0-0		
1 cwt. of superphosphate	30-0-0	or	
Labour for planting	15-0-0	18½ lbs. menthol	1,218-12-0
12 irrigations	36-0-0	18½ lbs. Dementholised Oil	281-4-0
3 harvests (labour)	15-0-0		
Distillation & crystallisation	30-0-0		
Total	862-0-0	Total	1,500-0-0
		Profit	638-0-0

Second Year

NOTE: During the second and third of the crop there is no expense on account of suckers, preliminary ploughing and farmyard manure.

Expenditure		Income	
	Rs. A. P.		Rs. A. P.
1 cwt. of Ammonium Sulphate	50-0-0	Peppermint Oil as before	937-8-0
1 cwt. of superphosphate	30-0-0	Net profit	776-8-0
12 irrigations	36-0-0		
3 harvests	15-0-0	or	
Distillation & crystallisation	30-0-0	Menthol and Dementholised Oil as before	1,500-0-0
Total	161-0-0	Net profit	1,339-0-0

Third Year

	Rs. A. P.		Rs. A. P.
Expenses as in 2nd year	161-0-0	Income as in 2nd year as Peppermint oil	937-8-0
		Net profit	776-3-0
		or	
		Menthol and Dementholised oil	1,500-0-0
		Net profit	1,339-0-0

Net profit for the three years together:

A. As peppermint oil	1,628-8-0	Annual profit Roughly	542-13-4 or 540-0-0
B. As menthol and dementholised oil	3,316-0-0	Annual profit Roughly	1,105-5-4 or 1,100-0-0

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Effect of presoaking seeds in phytohormonal solution on the growth and yield of crops

by

SRI T. R. NARAYANAN and SRI K. VASUDEVA MENON

Introduction: The effects of presoaking the seeds of cereals like paddy (*Oryza sativa*) and cholam (*Sorghum* spp.), in nutrient salt solutions have already been reported (1958). Subsequently further experiments were carried out to study the effect of presoaking seeds of paddy (*Oryza sativa*) and ragi (*Eleusine coracana*) in growth-regulating substances like L-naphthaleneacetic acid (L-NAA) and B-indolylacetic acid (B-IAA) on the growth and yields, and the results are summarised in the following paragraphs.

Review of literature: Merosite *et al* (1938), by dusting different concentrations of IAA and NAA, observed some difference in the early growth of wheat varieties and density of stand between the treated and untreated plants and also obtained significant yield differences in grain and straw yields. Hopkins (1940) working on barley concluded that a beneficial effect could be obtained from seed treatment only under certain conditions and increased yield or growth could not be expected in all cases. Youden's (1940) greenhouse experiments on wheat and soya beans gave only negative results. Stewart and his co-workers (1942) found no significant increase in growth from seeds of radish treated with growth-regulating substances like L-NAA, B-IAA and Indolyl-butyric acid, over a wide range of concentrations, from 2 ppm. to 33,000 ppm., but Bharadwaj and Rao (1955) observed that soaking seeds in solution of L-NAA, B-IAA and 2, 4-dichlorophenoxy acetic acid in concentrations of 0, 10, 100 ppm. resulted in taller plants and at certain concentrations (viz. 100 ppm.) these hormones improved the yields by 42-54 percent respectively.

Rao *et al* (1957) by presoaking in different concentrations of IAA and NAA found that the germination percentage of groundnut kernels, variety TMV. could be increased by 86.0 to 94.4%. The yield of pods could also be improved, by the use of these growth-regulating chemicals, though the flowering earliness, the maturity period and the oil content remained unaffected. More recently, gibberellic acid is also reported as useful in increasing the yield of fodder grasses and for inducing earlier flowering in certain plants (1957).

Materials and methods: A known weight of these seeds were soaked in phytohormonal solutions so that the proportion of seeds to solution was kept at 3:1 (1958). In the case of ragi, after soaking, the seeds were kept in a refrigerator where the temperature was maintained at 5-6°C. After a lapse 16 hours the seeds were air-dried and then sown in the usual way.

Besides these presoaking treatments, a foliar spray treatment at the preflowering stage was also included.

The hormones used were *L*-NAA and *B*-IAA at two levels of 0 and 50 ppm. concentrations, singly as well as in combination with tribasic potassium phosphate at half-molar concentrations. The soaked seeds were sown in separate nursery beds. The ragi seedlings were transplanted in experimental plots after 20 days, while in the case of paddy the planting was done after 20 days, while in the case of paddy the planting was done after 30 to 40 days, depending on the duration of the variety used. The trials with paddy were carried out at two different locations viz., on the wetlands of Central Farm, Coimbatore and at the Agricultural Research Station, Aduthurai. The experiments were laid out in randomised plots, replicated six times, to facilitate statistical assessment of the results.

Plant heights were recorded, from a fortnight after planting and continued at fortnightly or monthly intervals, depending on the crop and its duration, until the adult stage. Ten representative plants from each plot in the field in the case of ragi, and 25 plant in the case of paddy were selected at random and measured. Tillers were recorded at the adult stage. In the case of ragi, the effect of treatments on flowering earliness was determined by recording the date of emergence of earhead of ten representative plants for each plot in the field. After harvest, the fresh weight of earheads and of straw were recorded and later the earheads were dried, thrashed and the final grain yield per plot was recorded. In the case of paddy both the fresh and dry weight of grain and straw were recorded.

Results - Paddy: (1) *Height:* At Aduthurai, the growth-measurement data showed no significant difference in the heights of plants from seeds soaked in growth hormone solutions, when compared to the controls. The plants obtained from seeds soaked in growth hormone in combination with K_3PO_4 were shorter than the control at the initial stages of growth, but at the reproductive stage, these differences got levelled off. Nor was there any difference in plant height, when *L*-NAA was given as a foliar application at the preflowering stage. At Coimbatore, however, plants from hormone-treated seeds were taller than untreated controls, from the boot-leaf stage onwards. At the reproductive stage, the plants from these treatments were taller than the control plants by 3.5 to 7.4%.

(2) *Tillering:* The tiller counts recorded from Coimbatore showed that tillering in plants from the IAA treatment was greater both at the vegetative and re-productive stage, while it was less than control at the vegetative phase, in the other treatments.

(3) *Grain yield:* The yield of grain at Aduthurai tended to decrease when the seeds were presoaked in NAA 50 ppm. while IAA treatment did not show any difference relative to the control. On the other

hand, the trend was reversed when presoaking was done in solutions of these hormones in conjunction with a nutrient solution like K_3PO_4 . There was no difference in the yield when IAA was applied as a foliar spray at the pre-flowering stage.

In the experiment carried out at Coimbatore, there was practically no difference in the yield of grain, due to presoaking treatments. Further, when IAA was given as a foliar spray a significantly lower yield was obtained. (Table I in the appendix).

(4) *Straw:* The data from Aduthurai show that IAA treatment decreased the production of straw (Slightly, by 1.5 per cent), while NAA increased the straw weight by 4.5%. Similarly NAA as foliar spray has proved to be helpful in stepping up the straw yield by 3.7 per cent, but differences were not large enough to be significant statistically. At Coimbatore, while IAA treatment has increased straw yield by 16.9% the NAA treatment reduced it by 5.6 per cent. Here again it is observed that presoaking in a mixture of the growth-hormone and K_3PO_4 adversely affected the yield. Foliar application of IAA at 100 ppm. at preflowering stage was helpful in improving the yield by 13%, while presoaking in K_3PO_4 cum foliar application of IAA has improved the yield to the tune of 17.2% (Table I in the appendix).

Ragi: Effect on plant growth: The data obtained on progressive plant heights show that plants obtained from seeds soaked in IAA 50 ppm. were taller than controls in the early stages, but the difference decreased with advancing growth until at the adult stage the plants were somewhat shorter than the untreated control. Similarly, the plants from seeds soaked in *L*-NAA (50 ppm.) showed practically no difference in plant height at any stage of crop growth.

Tillering: In regard to tillering, presoaking treatments do not seem to be helpful in ragi. In flowering too, there was no difference as a result of hormonal treatments.

Grain and straw yield: The data on grain yield (vide Table I in the appendix) serve to show that presoaking in growth hormones solution is helpful in enhancing the grain yield in ragi. Presoaking in IAA as well as NAA, produced higher yields of 2.5 to 5.0% over the untreated control. When the seeds were presoaked in a mixture of potassium phosphate and IAA, there was a further significant increase in the grain yield over the untreated control, by about 8.7%. However, when NAA was presoaked in combination with potassium phosphate a reverse trend was noticed, the yield being 5.9% below the untreated control. Similarly, NAA as a foliar spray at 20 ppm. at preflowering stage seem to have an adverse effect on the grain yield.

In regard to straw yield (vide Table II in the appendix) higher yields over control have been recorded wherever growth hormones were used for presoaking or as foliar spray, the order of increase ranging between 2.8 to 21.7%, although the differences were still not large enough to attain statistical significance.

Discussion: Presoaking treatments in hormones do not seem to have much influence on the growth of rice plants at Aduthurai while at Coimbatore the treatments appear to have influenced the growth of plants favourably. In the case of ragi, IAA treated plants were taller in the early stages but the difference got reduced by advancing growth, while in the case of NAA no difference in plant height is observed at any stage. Thus the results obtained vary from hormone to hormone and from crop to crop. In the case of paddy, the results obtained, are in line with the observation made by Bhardwaj and Rao (1955) on wheat.

In tillering too there has been no uniform response. In the experiment at Coimbatore on paddy, both IAA treated and *L*-NAA treated plants showed an increase of tillers at the productive stage but at Aduthurai, IAA showed no effect on tillering, while NAA decreased the number of tillers by 8.8 per cent. In the experiment on ragi, the treatments do not seem to have influenced tillering either way. Misra and Sahu (1957) observed that in the case of an early variety of rice, presoaking for 72 in NAA @ 100, 250 and 500 ppm. had the effect of delaying the earhead emergence by 4-7 days while IAA did not produce any effect on the earhead emergence. With regard to tillering also, there was a differential response while IAA increased the number of tillers and leaves, NAA did not produce any effect.

When IAA was used in conjunction with a nutrient solution like $\frac{M}{2}$ potassium phosphate, on ragi, the yield was improved significantly by 8.7% over control but *L*-NAA plus K_3PO_4 had an adverse effect on the grains output.

In the experiment with ragi, the straw yields were improved by 7% and 13.4%, in the case of IAA and NAA respectively. Addition of half molar concentration of K_3PO_4 to NAA has helped in further enhancing the yield of straw. In the case of IAA, no additional advantage was secured by combination treatments with K_3PO_4 . This is in contrast to the effect produced on grain yield by this hormone singly and in combination with K_3PO_4 solution.

The response to growth-hormones is also found to vary with location, thus at Coimbatore IAA improved the straw yield by 16.9%, while at Aduthurai the same treatment have straw yields less than in control.

Summary: Results from field experiments on the effect of presoaking paddy and ragi seeds, on growth, tillering and yield are presented and discussed.

The data indicate that presoaking ragi seeds in hormones like IAA and NAA can be helpful in increasing the grain yield, though its effect on plant height and tillering are not clear cut. In the case of paddy, the responses to hormones were different in different localities and hence further work is clearly needed to form any definite conclusions regarding the scope of these growth hormone chemicals. Foliar application of growth hormone chemicals at preflowering stage seems to be helpful in increasing the vegetative growth, as reflected in the increased straw yields.

Acknowledgment: The authors acknowledge the financial assistance given by the Indian Council of Agricultural Research for conducting this investigation. The help rendered by the Superintendents of the Central Farm at Coimbatore and the Agricultural Research Station, Aduthurai by way of facilities for the conduct of these experiments, is also acknowledged.

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TABLE I.
Effect of presoaking treatments on paddy yields

Design: Simple randomized plots
Replications: 4 (four)
Variety: Co. 25.

	Grain				Straw			
	Aduthurai		Coimbatore		Aduthurai		Coimbatore	
	Mean yield in lb/acre	Percentage control	Mean yield in lb/acre	Percentage control	Mean yield in lb/acre	Percentage control	Mean yield in lb/acre	Percentage control
1. Control	3209.5	100.0	4,422.0	100.0	5403.6	100.0	11,137	100.0
2. Water soaked	3072.7	95.7	4,650.0	105.2	4081.0	94.0	11,590	104.1
3. Soaked in K_3PO_4 Molar 2	2940.5	91.6	4,575.0	103.4	4879.3	90.3	13,015	116.6
4. B-Indolyl acetic acid 50 ppm. Presoaked	3226.0	100.6	4,475.0	101.1	5322.9	98.5	13,030	116.9
5. L-naphthyl acetic acid 50 ppm. Presoaked	3109.0	96.9	4,400.0	99.5	5645.5	104.5	10,517	94.4
6. (3) + (4)	2967.9	92.5	4,325.0	102.3	4879.3	90.3	10,062	90.3
7. (3) + (5)	3230.8	100.7	4,325.0	95.7	5040.6	93.3	10,527	94.5
8. Spray with IAA 100 ppm.	3230.8	100.7	3,600.0	81.4	5605.2	103.7	12,587	113.0
9. (3) + (8)	3214.7	100.2	3,375.0	80.8	5363.2	99.3	13,057	117.2
Significant or not	No.	No.	Yes at 5% level	No.	No.	No.	No.	No.
Critical difference at 5%	285.5	592 lb.	203 lb.	309.6	—	—	—	1934 lb.
Standard error								

TABLE II.

Effect of presoaking ragi-seeds treatment or ragi yields.
Showing the yield of grain and Straw lb/plot,

Lay out: Simple randomised. Treatments: 10 (ten).
Plot size: 0.5 cent net. Replications: 6 (six).

	Grain in lb/plot 0.5 cent		Straw in lb Plot.	
	Mean weight	Percentage control	Mean weight	Percentage control
1. Control	13.33	100.0	36.0	100.0
2. Watersoaked Room				
Temp.	13.67	102.5	44.5	123.6
3. do. Cold.	14.00	105.0	37.5	104.2
4. K_3PO_4 Molar/2 room				
Temp.	13.33	100.0	39.2	108.9
5. do. Cold.	13.17	98.7	37.8	105.0
6. IAA 50 ppm. cold.	13.67	102.5	38.7	107.5
7. (5) + (6)	14.50	108.7	37.0	102.8
8. NAA 50 ppm. cold.	14.00	105.0	40.8	113.3
9. (5) + (8)	12.67	94.1	43.8	121.7
10. Spray at preflowering stage NAA. 20 ppm.	12.33	92.5	38.3	106.4

Significant or not Yes at 1%.
Critical difference. level No.
at 5% 0.56 lb. 4.29%

Insecticidal control of termites attacking sugarcane.

by

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Introduction: Termites are one of the major pests of sugarcane in India considered probably next in importance to moth borers. Two species of termites have so far been recorded on sugarcane in South India, viz. *Odontotermes obesus*, R. and *Eutermes heimi*, W. The former attacks the setts below the ground while the latter is more a leaf eater, but the great bulk of damage to the crop is done by *Odontotermes obesus*, R. which entirely eats away the setts underground and makes them hollow with the result that the germinating buds are completely destroyed in many cases. This occurs especially in garden land areas (semi-dry areas) where irrigation facilities are not adequate. Serious and wholesale loss of germinating seedlings are often reported from newly planted areas. Being subterranean and invisible inhabitants, the control of termites is a serious problem and several experiments have been and are being conducted in India and elsewhere to tackle this pest. During the past two years some work has been done towards the control of this pest and the present paper gives a review of the work on the subject together with an account of the experiments conducted by the Sugarcane Insect Pests Scheme, Coimbatore, under the auspices of the Indian Central Sugarcane Committee.

Review of work done: Earlier attempts to control this pest were by destroying termite mounds in the vicinity of the crop and mixing crude oil or tar emulsion in the irrigation water as a palliative. More intensive work was done only after the new synthetic pesticides were available for use in the control of crop pests. Gupta (1950), Rao (1951 and 1953), Narayanan and Lal (1952) Singh *et al* (1954) found that soaking the seed cane pieces in suspensions of BHC and DDT or application of BHC dust at 20 lbs. to 40 lbs. per acre in furrows at the time of planting gave good control of termites and good germination of eye buds. In later years more elaborate trials have been conducted with some of the new insecticides like Aldrin and Dieldrin. Agarwal and others (1954) have reported that the damage by termites to the setts at Pusa was least and the germination to be highest in plots treated with Aldrin and Dieldrin prior to planting either as dusts, emulsions or dips. They have further reported that post planting application of Aldrin and Dieldrin in standing crop of sugarcane kept in check the termite activity and increased the yield. Thakur and others (1956 & 1957) conducted similar trials with Aldrin and Dieldrin

as dusts and emulsions in the soil and found that Aldrin @ 1 lb. of the actual ingredient per acre as dust appeared to be superior to other treatments.

Based on the findings of the above experiments investigations were taken up in Madras State during 1957 and 1958 and the nature of results are given below.

Material and methods: Experiments were taken up in the Sugarcane Zonal Farm, Rajadanikkottai, Madura district here termites usually occur, during 1957 and 1958 in the main season crop planted in May. A number of new insecticides viz. Aldrin, Dieldrin, Heptachlor, Chlordane and BHC were tested under replicated conditions. The insecticides were first dusted in the furrows at rate of 1 lb. of the actual chemical per acre prior to planting. The dusts were well mixed in the soil by stirring and the setts were planted immediately. No further treatments were given to the crop.

To assess the results, the incidence of termites was recorded by counting the tillers in the entire plot and recording and removing the termite infested tillers. The setts affected by termites were also recorded at the time of the final observation.

Experiments and results: The trial was first started in the Sugarcane Zonal Farm, Rajadanikkottai during 1957 in the main season crop planted during May, 1957. The insecticides Aldrin, Dieldrin, Heptachlor, Chlordane and BHC and one control were replicated four times taking 2 cents per treatment per replication. The chemicals were applied in the soil as dusts prior to planting. Incidence of the termites in the tillers was recorded 6 weeks and 14 weeks after planting. The incidence of termites in the setts was recorded during the last count. The results are furnished in Table No. I.

The trial indicated that Heptachlor, Chlordane, Aldrin and Dieldrin treatments recorded the maximum control of termites in the tillers, and the incidence of termites to the setts was minimum in the case of Aldrin Heptachlor treatments.

Based on the above observations, the trial was repeated during 1958 with the same chemicals and under similar conditions. The incidence of termites in the tillers was recorded 4 weeks, 1 weeks and 12 weeks after planting and in setts 15 weeks after. The results are furnished in Table No. II.

In this experiment also Aldrin, Dieldrin and Heptachlor recorded the maximum control in the tillers and in the setts.

Discussion: Aldrin and Dieldrin have been successfully tried against termites in the sugarcane crop as dusts and emulsions. Aldrin at the rate of 1 lb. of the actual chemical per acre has been found superior. While conforming to the results of previous workers, that the application of Aldrin and Dieldrin @ 1 lb. of the actual chemical per acre minimises the incidence of termites. Heptachlor dust in the same concentration was also found to be effective.

The cost of the chemicals used in the experiments are given below:—

Aldrin (Aldrex)	... Rs. 20/- per acre.
Dieldrin (Dieldrex)	... Rs. 43—6—0 per acre.
Heptachlor	... Rs. 13—10—0 per acre.
Chlordane	... Rs. 11—11—0 per acre.
BHC	... Rs. 4—9—0 per acre.

Taking the cost of chemicals for the treatments, it may be said that Heptachlor can be used in the place of Aldrin and Dieldrin as the chemical is cheaper and at the same time as effective as the other two.

Summary and Conclusions: Two species of termites have been recorded to attack sugarcane in South India. The bulk of damage to the setts is caused by *Odontotermes obesus*, R.

A brief account of the review of the work done on the control of termites is given.

Field experiments were conducted at the Sugarcane Zonal Farm, Rajadanikkottai (Madura District) during the years 1957 and 1958. Five chemicals were dusted in the furrows prior to planting the setts at the rate of 1 lb. of the actual chemical per acre.

Aldrin, Dieldrin and Heptachlor recorded maximum control of termites. Of the three chemicals, Heptachlor is recommended in view of the cheapness.

Acknowledgment: The authors wish to acknowledge the facilities provided by the Assistant Agronomist, Sugarcane Zonal Farm, Rajadanikkottai for conducting the trials in the farm.

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TABLE No. I.

Trials conducted at the Sugarcane Zonal Farm, Rajadanikkottai during 1957.

Year	...	1957
Locality	...	Sugarcane Zonal Farm, Rajadanikkottai (Madura district)
Date of Planting	...	9-5-1957
Date of Treatment	...	8-5-1957
No. of Treatments	...	6
Replications	...	4
Area of each Plot	...	2 cents
Variety	...	Co. 419

S. No.	Treatments	Incidence of termites		
		Percentage of infested tillers		Percentage of infested setts
1	2	6th week	14th week	14th week
		3	4	5
1. Aldrin	...	0.13	0.7	7.3
2. Dieldrin	...	2.8	0.2	10.8
3. Heptachlor	...	0.15	0.3	7.6
4. Chlordane	...	0.6	0.5	14.2
5. BHC	...	4.6	0.7	11.4
6. Control	...	5.7	0.7	18.5

Note:— The data gathered were statistically analysed and found to give significant results in Heptachlor, Chlordane, Aldrin and Dieldrin treatments. The statistical analysis was carried out after affecting the inverse sine transformation.

2. The percentage of infested setts given in Col. (5) denotes the setts killed outright by termites.

Bar diagram:

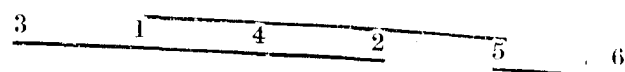


TABLE No. II

Trials conducted at the Sugarcane Zonal Farm, Rajadanikkottai during 1958

Year	...	1958
Locality	...	Sugarcane Zonal Farm, Rajadanikkottai (Madura district).
Date of planting	...	6-5-1958.
Date of treatment	...	6-5-1958.
No. of treatments	...	6
Replications	...	4
Area of each Plot	...	2 cents.
Variety	...	Co. 419

Serial No.	Treatments	Incidence of termites			
		Percentage of infested tillers			Percentage of infested setts
		4th week	8th week	12th week	12th week
1	2	3	4	5	6
1. Aldrin	...	...	0.07	0.21	42.9
2. Dieldrin	...	...	0.02	9.22	16.6
3. Heptachlor	...	0.04	0.02	0.23	40.0
4. Chlordane	...	0.1	0.2	0.31	78.5
5. BHC	...	...	0.5	0.42	86.7
6. Control	...	3.2	0.6	0.80	100.0

Note:— The statistical analysis was carried out after effecting the inverse sine transformation. The analysis gave significant results in Aldrin, Dieldrin and Heptachlor treatments.

2. The percentage of infested setts given in Col. (6) denotes the setts showing termite incidence.

Bar diagram:



Mixed cropping

by

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Mixed Cropping is primarily intended to economise land, labour and water and also to counteract the ill effects of adverse weather conditions in rainfed crops. Even under the most unfavourable seasonal conditions one crop or other gives some yield, thus preventing total loss. Varying mixtures are adopted throughout the state and pulses are generally mixed with cereals. In South Arcot district growing of Ragi and Groundnut is a popular practice although other types of mixtures are not uncommon. The results of experiments conducted at the Agricultural Research Station, Palur on the mixed cropping of Ragi, Cotton and Groundnut are presented in this paper.

Previous work: Previous work done on the problem of mixed cropping has been reviewed by Seshadri *et al* (1956) in a previous paper. Mixed cropping was found to be more remunerative than pure cropping. The combination of Groundnut and Tenai at Hagari, Cotton and Groundnut at Guntur and Redgram and Groundnut at Siruguppa were found to be more suitable. Trials conducted at the Agricultural Research Station, Kovilpatti showed that groundnut has the least effect on cotton among the different crop mixtures. Cereal interplanted with groundnut gave a better return than cereal grown in rotation with groundnut. For growing as a mixture with groundnut, Cumbu was found to be the best cereal under dry conditions and Ragi the best cereal under irrigated conditions. Mixed cropping experiment was conducted at the Agricultural Research Station, Palur (Madras) from 1951. Results obtained during the periods from 1951 to 1955 have already been published (Rayappa Pillai *et al* 1957). This paper deals with the results obtained during the period from 1955—'57.

Materials and methods: The experiment was initiated in the year 1952—'53 and closed in 1957—'58. Following variants were tried in the trial.

1. Ragi (P. L. R. 1) alone.
2. Cotton (P. 216 F) alone.
3. Groundnut (TMV. 4) alone.
4. Ragi — Cotton.
5. Ragi — Groundnut.
6. Cotton — Groundnut.
7. Ragi — Cotton — Groundnut.

Treatment (6) Cotton — Groundnut was included in the trial, only from 1954—'55.

Ragi is sown in the middle of December and transplanted in the second week of January adopting a spacing of 6" either way. Cotton is

Mixed cropping

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dibbled 6" apart in rows laid 2 feet apart a week after planting Ragi. Groundnut is sown in the first week of March. The spacing for Groundnut is 6" in the row and 8" row to row. Weeding and hoeings were given as and when necessary. A basal dose of 5 tons of cattle manure and a top dressing of 150 lb. of Ammonium sulphate were given to the crop. Harvesting was done as each crop matured.

Experimental data: The summary of results obtained from the trial conducted during 1956—'58 have been presented in Table I & II.

Discussion: Results of trials conducted during the period from 1953 to 1956 have shown the highest value of produce per unit of time in respect of the combination of ragi and groundnut with the pure crops of cotton giving the lowest. In respect of the data obtained during 1956—'57 the differences between the treatments were found to be not significant. In the year 1957—'58 the 6th year of trial, the value of produce was highest for Ragi and Groundnut, with the mixed cropping of Ragi, Cotton and Groundnut on a par with it. The yield of cotton in Ragi — Cotton combination was very poor as ragi smothered the growth of cotton in its early stage. A similar situation was experienced by the cotton crop in the combinations of Ragi — Cotton Groundnut. In the combinations of Cotton — Groundnut, the cotton crop smothered the growth of groundnut and thus the yield of groundnut was reduced. The pure crop of Ragi or Cotton or Groundnut was not as remunerative as Ragi — Groundnut combination though the groundnut crop gave the maximum return per unit of time. The yield of ragi in Ragi — Groundnut combination was higher in five years out of the six years of the trial than the pure crop of Ragi. The exact reason for the higher yield of Ragi — Groundnut combination is a subject worthy of investigation. The significantly higher monetary return by the Ragi — Groundnut combination in the present experiment agrees with the previous findings of the trials conducted in the Agricultural Research Station, Palur.

Summary and conclusions: A mixed cropping trial was conducted for a period of six years with seven varieties viz., (1) Ragi PLR. 1, (2) Cotton P. 216 F, (3) Groundnut TMV. 4, (4) Ragi—Cotton, (5) Ragi—Groundnut, (6) Cotton — Groundnut, (7) Ragi — Cotton — Groundnut. The mixed cropping of Ragi and Groundnut was found to be more economical than the other variants.

Acknowledgment: The authors acknowledge with thanks the help rendered by the members of the staff at the Agricultural Research Station, Palur both in the conduct of the experiment and compilation of the data.

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TABLE I
Mixed Cropping Experiment January '56 to September '56.

Variants:		Layout: Randomised Block					
1. Ragi (PLR. 1)		Replications: Four					
2. Cotton P. 216 F		Size of Plot: 25' X 35'					
3. Groundnut-TMV. 4		Sown on:		Planted on:			
4. Ragi + Cotton		Ragi 6—12—55		7—1—56			
5. Ragi + Groundnut		Cotton 13—1—56					
6. Cotton + Groundnut		Groundnut 29—2—56					
7. Ragi + Cotton + Groundnut							
Particulars	Ragi	Cotton	Groundnut	Ragi + Cotton + Groundnut	C. M. %	'F' test satisfied or not	P. (C. D.)
Acre yield in LB.	3271	1302	2053	3662 + 3412	4114 + 1274	303 + 350	3147 + 345 + 898
Value of produce per acre	499.11	598.92	765.33	710.48	1287.31	564.07	1058.02
Cost on S. Standard	100	120.10	153.30	143.20	257.80	113.10	211.90
Cost of Cultivation per acre Rs.	199	224	237	335	350	375	456
Net Profit per acre Rs.	300.11	374.92	528.33	375.48	937.31	189.07	602.02

Foot Note: Value of Produce Ragi grain 0.14 per lb. Straw, }
1.00 per 100 lb. }
Cotton kapas 0.46 per lb. Groundnut pods 0.36 }
per lb. Haulms 1.00 per 100 lb. }

Conclusion: The difference between the value and produce from the treatments were not statistically significant.

TABLE I (Contd.)
Economics of Mixed Cropping Cultivation.

Sl. No.	Particulars	Limits of Investment (Average cost of cultivation in four years)		Duration of Crops in field (Days)	Limits of Investment per day		Value of Produce per acre		Cost of cultivation per acre		Net Profit per acre		Value of Net Profit per day of the duration during the year	
		Rs.	Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	2	3	4	5	6	7	8	9						
1.	Ragi alone	248	85	2.92	499.11	199.00	+300.11	+3.53						
2.	Cotton alone	211	220	0.96	598.92	224.00	+374.92	+1.70						
3.	Groundnut alone	344	162	0.67	765.33	237.00	+528.33	+3.26						
4.	Ragi + Cotton	333	320	0.60	710.48	335.00	+375.48	+1.17						
5.	Ragi + Groundnut	375	162	0.43	1287.31	350.03	+937.31	+5.78						
6.	Cotton + Groundnut	375	220	0.59	564.07	375.00	+189.07	+0.86						
7.	Ragi + Cotton + Groundnut	448	220	0.49	1058.02	456.00	+602.02	+2.74						

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TABLE II

Field No. 51-52. *Mixed Cropping Experiment (December, 1956 to September, 1957)*

Variants:

1. Ragi (PLR. 1)
2. Cotton (P. 216 F)
3. Groundnut (TMV. 4)
4. Ragi + Cotton
5. Ragi + Groundnut
6. Cotton + Groundnut
7. Ragi + Cotton + Groundnut

Lay out: Randomised Blocks:

Replication Four.

Size of Plot: 25' x 35'

Sown on:

Ragi 15-12-1956

Cotton 27, 28-1-1957

Groundnut 28-2-1957

25-2-1957

Planted on:

13, 18-1-1957.

...

(Treatment 6)

Treatment 3, 5, 7.

Particulars	Ragi	Cotton	Ragi + Groundnut	Ragi + Groundnut	Cotton + Groundnut	Ragi + Cotton + Groundnut	C. M. S. E.	F test Satis- fied or not	C. D. P=0.05
Acre yield in lb.	2616	695	2544	2546 + 151	2647 + 1638	621 + 1194	2634 + 170 + 1425	...	...
Value of Produce per acre	445	313	626	605	861	547	844	...	...
on Standard	100.00	57.36	140.80	136.10	193.30	123.10	189.80	Yes	81.00
Cost of Cultivation per acre Rs.	222	186	175	263	325	288	365	Yes	18.23
Net Profit or Loss per acre Rs.	+223	+145	+451	+342	+536	+259	+479	...	...

Conclusion: 1957-58 5, 7, 3, 4, 6, 1, 2.

Foot Note: Value of Produce Ragi Grain 0.16 per lb.

" Straw. 1.00 per 100 lb.

Cotton Karyas 0.45 per lb.
Groundnut Pods 0.22 per lb.
" haulms 1.00 per 100 lb.TABLE II (Contd.)
Economics of Mixed Cropping Cultivation
(December 1956 to September 1959)

Particulars	Limits of Invest- ment (Average cost of cultivation in five years		Duration of crops in field (Days)	Limits of Invest- ment per day		Value of Produce per acre		Cost of cultiva- tion per acre		Net Profit per acre		Value of Net Profit per day of the duration during the year	
	Rs.	Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1. Ragi alone	218	85	85	2.6	445	222	+ 223	+ 2.6					
2. Cotton alone	214	220	220	0.97	331	186	+ 145	+ 0.62					
3. Groundnut alone	243	162	162	1.5	626	175	+ 451	+ 2.8					
4. Ragi + Cotton	333	220	220	1.5	605	263	+ 342	+ 1.6					
5. Ragi + Groundnut	370	162	162	2.3	861	325	+ 536	+ 3.3					
6. Cotton + Groundnut	375	220	220	1.7	547	288	+ 259	+ 1.2					
7. Ragi + Cotton + Groundnut	450	220	220	2.04	844	365	+ 479	+ 2.17					

Research Notes

Aspidomorpha miliaris F. As a new pest of *Ipomoea carnea* Jacq. in South India

Several insects have been noted to feed on sweet potato (*Ipomoea batatas*) in South India (Ramakrishna Ayyar 1932 and Fletcher 1921). Many of these, however, cause only minor injury to the crop. *Aspidomorpha miliaris* F. (Cassidinae, Coleoptera) is a large tortoise beetle which feeds on the leaf but is of very little economic importance. During December 1958, the insect was observed feeding in large numbers on *Ipomoea carnea* at Saptur, Tirumangalam Taluk, Madurai District. *Ipomoea carnea* is now grown on a large scale as a green leaf manure crop in this State especially in dry areas and hence the record of this insect on this plant has considerable significance. The attack was severe in this case in which the leaves were reduced to mere skeletons with only the veins remaining and the green portions eaten away. The grubs are found in large numbers on the leaves and pupate in groups of 8-12 in each leaf. This is the first time this insect has been noted as a pest of *Ipomoea carnea* in this State.

Fletcher (1921) states that this beetle feeds on sweet potato in South India and on *Gmelina* and wild *Ipomoea* in the west coast of Central India. Among the species of *Ipomoea*, *I. sepiaria*, *I. pescaprae*, and *I. staphylina* have been noted as growing wild in S. India. *I. carnea* is grown as an ornamental plant in gardens and as green leaf manure crop in cultivated fields. Therefore the record of the beetle on *I. carnea* in this region appears to be new.

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2. Ramakrishna Ayyar, T. V. (1932) Annotated List of the Insects Affecting the important cultivated plants in S. India. Bulletin No. 27, pp. 31-32, Govt. of Madras Publ.

Morphological features of Meenampalayam Tobacco

Introduction: Chewing type of Tobacco is one of the chief commercial crops grown in Coimbatore District and the tobacco known under the trade name of Meenampalayam Tobacco commands a very high market value on account of its taste and keeping quality, which are attributed to the nature of the soil and the brackishness of the well water.

Under this Meenampalayam Tobacco there are two varieties, viz., (1) *Vazhaikappal* and (2) *Vattakappal*. The morphological features of these two varieties are furnished below.

(1) **Vazhaikappal:** The name is derived on account of the shape of the leaf which resembles (Vazhai) banana leaf. The plants usually range from 4½ feet to 5 feet in height. Stem is thick. The auricle is very heavy. The leaves are long and they are broad in the middle. The leaves arranged at an angle of 90° to the stem. The petiole is set at an angle of 40° to 50° to the stem. This is because of the bend taken by the leaf above the region of the petiole. The auricles end as flaps on the petiole, when the whole leaf is viewed. The margin of the leaf is wavy or undulate. The leaf is lanceolate in shape. The apex of the leaf is a bit acute and the lamina of the leaf is pubescent. The leaf feels flushy because of the resin content. The mid rib is yellowish green and the veins are regular and they do not further divide to form a net work of veins. The puckering intensity is normal here. At the time of maturity the leaf presents a shiny appearance. This is one of the typical characters of the Meenampalayam Tobacco. The stem is terete and is full of pubescent hairs. The leaves are alternately opposite on each side and in a whorled pattern. The colour of the leaf is highly green. The floral parts are as in Solanaceae, regular, bisexual, hypogynous. The calyx is gamo-sepalous and persistent. The petals are gamopetalous. There are five stamens alternating with petals and the ovary is superior and bicarpellary, ovules many, axile placentation. The fruit is a capsule.

Vattakappal: As the leaves are circular (vattam) in shape this type is called as Vattakappal. The plants range from 3¾ feet to 4½ feet in height. They have thick stems with pubescent hairs and are not rounded but a bit fistular. The leaves are broad in the middle and long and spherical. Even in the nursery stage the shape is conspicuous. The internodal length is shorter than that of Vazhaikappal. The leaves fold back in their middle region along the margins. As they approach maturity they drop down. The leaves are alternately opposite on either side. When viewed from a distance they appear as whorl of leaves, crowded on all sides. The leaves are placed at the axis at an angle of about 50°. Because of the expansion of the auricle towards the petiolar region and midribs in continuation of the lamina of the main leaf, it is difficult to distinguish the auricle from the lamina. The intensity of puckering is more than that in Vazhaikappal. The leaf is darker green and thick in texture. At the time of maturity, the resin deposit is more pronounced than that in Vazhaikappal. The floral parts are as in solanaceae and no prominent changes are found in the floral parts when compared with that of the Vazhaikappal variety.

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Selected Article

PROGRESS OF THE CO-OPERATIVE MOVEMENT IN HUNGARY DURING 1959.

1959 was the most successful year in the already ten years old Hungarian Co-operative Movement. On ground of the directives laid down by the resolution of the Hungarian Socialist Workers' Party from December, 1958, there followed an upswing unheard of before.

Within less than a year the number of joining-up peasants, and the area of land pooled in, reached thrice the ciphers of the previous period. During the first of half 1959, 343,000 working peasants joined farmer's producing co-operatives already existing or formed new ones, and the co-operatives' share of the country's ploughing area rose from 14.6 to 36.6 per cent. Instead of the 50 co-operative towns and communities in 1958 their number was now 1955. In the counties Győr-Sopron, Veszprém, Szolnok, and Somogy practically the entire working peasantry chose the road of collective farming. At present the co-operative sector of agriculture holds already more than 4 million cadastral yokes of land / 3.2 million yokes of this are collectively formed, with 4,50,000 families and more than half a million actual members. Thus including the state farm, large scale socialist production is being done on more than half the country's arable area.

One of the main causes of this mass joining-up by the peasants was the confidence in the government policy developed in the time after the counter-revolution. This was due, above all, to an agrarian policy aiming at the granting of production security, and at the same time consolidating and the economic strengthening of the farmer's co-operative as well as to the observing of the voluntary principle. But also the fact that the older co-operatives, by way of higher yields, of an advanced and more upto-date farming were able to grant a higher living standard than those peasants who still toiled on small plots played an important part in winning these over. This explains why during the last year the co-operatives were being joined not only by peasants with little or no land but to the overwhelming part by small and middle holders / these making up the gross of the working peasantry / who now by thousands turned their back upon individual small-plot farming. Whilst in previous years the land pooled in reached scarcely one third of the co-operatives' entire estates / a large part of the collective land being former state reserve fields / now, in 1959, due to the mass joining up of small and middle holders this rose to more than two third. Apart from the fields themselves the joining holders also pooled in stock and equipment of considerable value. Thus the common stock increased within a few months by some 1,70,000 cattle / 75,000 cows among them /, 1,00,000 horses, and more than hundred thousand hogs and sheep.

The chairmen and other members of the board came likewise, in majority of the cases, from among the highly experienced middle holders. To assist these the state sent hundreds of experts with university degrees, of agricultural engineers and agronomists with large scale production practice whose task is the organizing, shaping and advancing of co-operative farming / up to now some 1500 co-operatives.

Now were the new farmer's co-operatives / or those with a now considerably larger area / left to themselves in other respects. The authorities supplied these co-operative both for spring, and for autumn sowing / either on an exchange basis or, if there were no exchange provision, in form of credit / with improved seed sufficient for several millions of cadastral yoke, granting a higher yield and better security in production, as well as with artificial manure. The Hungarian labour class and the befriended countries helped the co-operatives now starting on the road of collective farming with some 3200 new tractors and the necessary working machines.

Large scale stock breeding needs one basic condition: a common building. The state helped the co-operatives in building new common stables with investments of more than one billion Forints. During summer and autumn of 1959 more cow-barns / entirely upto-date with granary lofts, ready to be mechanized, with self-watering equipment, a fodder room, and a milk house / were being built than during the last ten years altogether / or during the "most prosperous" ten years of of capitalist Hungary, at that /. Before winter some 200 modern barns / holding 75,000 cows / had been finished, all of them technically properly founded and destined to last 50 to 100 years. Those co-operatives which were in need of it received from the state breeding cattle, cows, heifers, sows, piglets, and poultry in form credit, and these credits amounted to many millions of Forints. Apart from these cow-barns so called "open-barns" of a simpler finish are being erected for some 1,00,000 young cattle. And the new feeder farms and drapping boxes hold some 85,000 pigs whilst 1,50,000 sheep and 3,50,000 chicken and other poultry got new or rebuilt sheds.

But the co-operatives' peasantry does not await everything from the state. In using the state's aid in a prudent and circumspect way it relies above all upon its own economic strength and its zeal. On account of the work and the efficient farming of the peasants, as well as of the proper economic policy of the government and the according measures, the new farmer's producing co-operatives, and those with considerable increased areas have stood well the hard test of their first year. During the first months, in the beginning, the co-operatives, greatest enemy was the weather. The Hungarian villagers suffered drought unheard of for decades. Then early in summer, weeks of never-ceasing rain endangered the yield of the fields and meadows only to be relieved again by an extraordinary drought setting in at the end of the summer and lasting nearly till the end of the year.

In those hard months every working man and woman in the country, whether toiling in factories or shops at the lathe, or in an office at the writing desk, turned his or her thoughts towards the peasants. The question was: will the yield in the boundaries of the villages be all right, will not the large number of young co-operatives cause a set back, and how will these co-operatives held their place in this their first year?

Now, after the end of the economic year, these questions are being answered already by the yield results themselves. In spite of last year's extraordinary changeable weather the wheat yield per cadastral yoke was,

on an average, in the state farms 13.4, in the farmer's co-operatives 11, and in the individual farms only 8.6 quintals. The ciphers for autumn barley were 15, 13.5, and 11.8 quintals, for maize 17.5, 16, and 11.4 quintals respectively. But the individually toiling peasants could obtain even these lowest average yields only by working from yearly dawn till late in the night, by straining their abilities beyond the very limit.

It is true that in plant cultivation, due to the very nature of it, it is much easier to develop large scale collective farming. For here, as a result of large scale labour organization, of a proper use of machines, artificial manure and plant protecting stuff, the co-operative will obtain larger yields than the individual peasants already in the very first year of its existence, and will supply more market corn. This is well proven by last year's experience in these countries which achieved the greatest successes in furthering the co-operative movement. In Győr country, for example, the farmer's co-operatives sold to the state purchasers, for public consumption 140 quintals of bread grain per hundred cadastral yokes, the individual holders only 88 quintals; in Veszprem county it was 105 as against no more than 22 quintals, and in Szolnok county 126 as against 50 quintals from the individual peasants.

In the co-operatives collective stock breeding situation is naturally somewhat more complicated. For the developing of large scale stock breeding is, again due to the very nature of the thing, a longer process and thus needs a certain time. In this line the co-operatives achieved the comparatively best results in regard to cattle. Mainly as a result of the stock pooled in by joining up peasants the common stock increased to 14.4 per 100 cadastral yokes against the farmer 12 animals per area unit. But collective stock breeding resulted also in higher market production. In Győr-Sopron county, for example, the farmer's producing co-operatives including the household plots of their members supplied in the first nine months of 1959 a total of 40.5 million litres of milk, by 4.5 million litres more than during the same period of the previous year for public consumption, and during the same time the state purchasers bought totally 109,350 quintals of fattened cattle an increase of 17,000 quintals against the corresponding period of the previous year, and the slaughter weight was now 487 instead of the farmer 380 kilogrammes.

Collective sheep raising showed a similarly favourable picture for not only did the sheep stock itself increase but the wool yield was higher, too. Though only about half of the country's arable land belongs to the socialist sector already 60-70 per cent of the sheep stock is owned by co-operatives or state farms. All in all, the herds provided the industry with by 50000 quintals of wool more than a year before.

In regard to collective pig breeding the picture is not yet quite so favourable. Because of that the state undertakes considerable material endeavours to provide the co-operatives with sow stock, fatted piglets, and to further the building of dropping boxes and piglet sheds. Here the state farms offer great help by handing over excellent breeders whilst the state purchasing enterprises offer assistance by way of fattening contracts so as to enable the new co-operatives to increase their takings from the rather lucrative pig breeding.

During the last years a much debated question was whether one could develop the farmer's co-operative movement without causing a set back in agricultural production and thus in the population's supply with provisions. In other words, is it possible to solve that double task simultaneously so that parallelly to the socialist reorganization of agricultural and particularly market/production would steadily increase. This goes especially for the Second Five Year Plan/1961-65/for which period agricultural production/in a five years' average/must be raised by 30-32 per cent in comparison to the average level of 1954-1959.

The economic year of 1959 has proven that this complicated and far from easy task can be accomplished. The now strengthening co-operative farms themselves offer the opportunity for an essential progress in agricultural production by making use of the achievements of modern science and technique. If last summer all still existing small plots had been sowed and harvested by the co-operatives, collectively or in fields, some 2.5-3 million quintals of bread grain more could have been obtained: such a quantity could have been sold over and above the actual cipher, and would have increased therefore the peasants' very income.

Nothing speaks better for the responsibility and the good work of the co-operative peasantry than the fact that parallel to the considerable successes in numerical progress the economic and organizational consolidation produced such quick and lasting results as never before in the movement's ten years of development. This is being reflected also by the increased labour unit which reckoned for a 14 months average; for with first January, 1960, the economic year ending formerly by October 31st has now become identical with the calendar year/will receive presumably 34 Forint, as against 31.7 Forint for last year. This means that the income per family resulting from collective work will rise, in the old farmer's co-operatives, from the 12,300 Forint in 1958 to 15,700 in 1959, and in the newly formed ones from 8,300 to 8,400 Forint.

The economic strengthening of the co-operatives and the upswing of collective farming has been largely furthered, apart from the zealous work of the members themselves, by the Government's agrarian policy practised in the last three years, particularly by the so called "No. 3004 Decisions" decreed first in January of 1958, and since that time every year.

These Government decrees created a uniform system of furthering co-operative farming, and they co-ordinated/in accordance to the material situation of national economy and to its load bearing capacity/the volume of state aid with the endeavours of the co-operative membership itself. The Government's aid is aimed at enabling the co-operatives to become, as soon as possible, intensively farming and properly profitable socialist large scale estates.

The greatest assistance is being granted to the new co-operatives and those with a suddenly vastly increased area for these are most in need of material, organizational and other expert help. The older co-operatives, upon the earlier, extensive aid by the state, have not only fully recovered but even considerably strengthened, and their average yields vastly surpass those of the individual peasants/in corn this was, in

1959, by 30-35 per cent higher/. Nor does the state neglect them in the future, either. They may request the services of the machine-cum-tractor-stations at reduced rates, they may enjoy the advantages of producing on contract, they receive a large scale production bonus when selling their produce etc. In case they augment regularly the common funds their own investments will be round off by large investment allowances, and there are yet a lot of other ones.

The Government authorities pay particular attention to furthering soil power economy in the new co-operatives and those with vastly increased territories. Because of that these co-operatives can buy artificial manure at a rebate of 25-75 per cent, materials needed for the amelioration of the soil will be received entirely free of charge, and half of any respective machine costs is being paid by the state.

The farmer's co-operatives are also granted considerable advantages for planting large scale fruit orchards and vine-yards, for raspberry plantations, and for the developing of irrigation systems. Eighty per cent of the planting costs are being refunded by the state if the co-operative refreshes a formerly irregularly or too closely planted orchard, or if a hitherto unploughed area of at least ten cadastral yokes is planted with grapes or fruit.

So as to promote the developing of the common cattle stock by the co-operatives' own sources they may be granted an adequate credit. Those co-operatives which themselves raise heifers for further breeding may receive a credit refund of 800-2000 Forints per heifer.

The quickest form to produce an income from collective work is the pig and the poultry breeding. For this purpose, and for the building of the necessary sheds, the co-operatives may receive an additional credit and a fodder loan.

Ever more members of farmer's co-operatives express the wish to receive, throughout the year and regularly, cash advances according to the labour units accomplished. For this purpose the state offers short-term credits to the co-operatives the basic condition of which is that these should sign contracts for the production of as much market goods as possible.

The state owned machine and tractor stations are the very bases of up-to-date large scale technique. Their combines, thrashing machines, their caterpillar and universal tractors with the necessary working machines, watering equipments etc. allow the old co-operatives a rebate of 10-15 per cent from their standard prices, and the new ones even 25-75 per cent.

The co-operatives may however, if they have the necessary means, purchase any power machine / with the exception of combines and thrashing machines, / tractors, working machines / including the plant-protecting ones / for their own use, and even may get a state credit for that purpose. Any repairing of co-operative-owned big machines is being done, upon request, by the state repair stations at preference prices.

We have surveyed the results of the Hungarian co-operative movement which does not mean, however, that there are no more worries or difficulties, be it either in regard to forming the economic basis of the co-operatives or to the daily problems of production. There is still a lot to do for anybody who knows that it is a absurdity to expect that an up-to-date large scale farm can be established within one year. Those peasants who only yesterday toiled still individually, on small plots, cannot master the most up-to-date production methods within a few months. And there is much to be done for the flourishing of collective stock breeding for inspite of the fact that / including the livestock in the household plots / a higher number of cattle etc. falls to each 100 cadastral yokes of co-operative land, the members themselves are neither content with this cipher nor with the absolute number, and the quality of common stock.

Yet the country views the farmer's producing co-operatives full of joy for those who united forces in collective farming have well come up to expectations, they have mastered even the biggest difficulties and are now successfully forming up-to-date large scale farms in place of the former small-plot farming so out of date. The economic successes have enhanced the assurance of the already collectively working peasants and it is evident that, sooner or later, these will convince the remaining individual holders too; those peasants who join co-operative farming march on the right road and work both for the public and for their own benefit. This trend manifests itself also by the ever more favourable opinion, among the individual holders, of the producing co-operatives due to which during the first winter weeks further then thousands of peasants joined the existing ones or founded new co-operatives.

Weather Review — for March, 1960.

RAINFALL DATA (IN INCHES)

Region	Station	Total rainfall for the month	Departure from normal	Total since 1st January
North	Madras (Meenambakkam) ...	0.0	— 0.3	1.0
	Tirurkuppam* ...	0.5	+ 0.4	1.1
	Vellore ...	0.0	— 0.2	0.0
	Gudiyatham* ...	0.7	0.0	0.7
East Coast	Palur* ...	0.0	— 0.4	0.5
	Tindivanam* ...	0.0	— 0.5	0.1
	Cuddalore ...	0.0	— 0.7	0.9
	Nagapattinam ...	0.0	— 0.8	3.5
	Aduthurai* ...	0.0	— 0.3	0.7
	Pattukkottai* ...	0.1	— 0.6	2.8
Central	Salem ...	0.0	— 0.5	0.0
	Coimbatore (A. M. O.)* ...	6.3	+ 5.5	6.6
	Coimbatore ...	0.4	— 0.2	0.4
	Tiruchirapalli ...	0.4	0.0	0.8
South	Madurai ...	0.2	— 0.5	0.4
	Pamban ...	0.0	— 0.7	3.3
	Koilpatti* ...	0.4	— 0.7	1.3
	Palayamecottai ...	2.4	+ 1.4	4.5
	Ambasamudram* ...	1.8	0.0	4.9
	Nagerecoil* ...	0.7	— 0.7	1.2
Hills	Kodaikanal ...	2.0	+ 0.2	2.5
	Coonoor* ...	13.4	+ 9.6	14.7
	Ootacamund* ...	0.3	— 0.8	0.3
	Nanjanad* ...	0.5	— 0.4	0.6

1. * Meteorological Stations of the Madras Agricultural Department.

Except for scattered thundershowers which occurred in South Madras State on 4—3—1960, dry weather prevailed over the region for the first seven days of the month. Rain or thundershowers were scattered over Madras State on 8th, 9th and 11th March, 1960, with some isolated heavy falls. On 10—3—1960, showers occurred at a few places in South Madras State. Thereafter dry weather continued to prevail over the region till the end of the month, except on 24—3—1960, when scattered thundershowers occurred in South Madras State.

The day temperatures were generally above normal in interior Madras State only on 1—3—1960. They were nearly normal on most of the other days. The night temperatures were generally above normal in Madras State throughout the month.

The noteworthy rainfalls and the zonal rainfall for the month are furnished hereunder:—

Noteworthy rainfalls.

S. N.	Date	Name of Place	Rainfall in inches
1.	9—3—1960	Coimbatore (Cotton Breeding Station)	
2.	10—3—1960	Coonoor	4.59
3.	11—3—1960	Coimbatore (Agricultural Meteorology Observatory)	5.30
4.	24—3—1960	Coonoor	2.31 4.52

Zonal rainfall (in inches)

Name of the Zone	Rainfall for March, 1960	Departure from normal	Remarks
North	0.3"	Nil.	Just normal
East Coast	0.0"	— 0.6	Below normal
Central	1.8"	+ 1.2	Above normal
South	0.9"	— 0.2	Just below normal
Hills	4.1"	+ 2.2	Above normal

Agricultural Meteorology Section,
Lawley Road Post, Coimbatore-3.
9th April, 1960.

C. B. M., B. S. & M. V. J.

Departmental Notifications

Gazetted Officers—Madras Agricultural Department
Postings and Transfers during the month of April, 1960

Name and Designations	Posted or Transferred to
Sri S. Annaswamy, Marketing Asst. Tirunelveli	Dist. Agrl. Officer, Cuddalore
„ M. K. Lingiah D. A. O., Cuddalore	Asst. Extension Specialist, Agrl. College & Research Inst., Coimbatore
„ K. Kuppamuthu, Asst. Extension Specialist, Coimbatore	L. A. P. for 3 months from date of relief
„ N. Raghavan, Nursery Asst. Govt. Botanic Gardens, Ootacamund	Asst. Horticulturist for Research to improve and stabilise off-season mango production
„ C. M. Bakthavathsalu, Statistical Asst. Coimbatore	Banana Research Officer, Aduthurai
„ S. Iyemperumal, Asst. in Cotton.	Asst. Cotton Specialist, Srivilliputhur
„ N. R. Chandrasekaran, Asst. in Oilseeds	Asst. Oilseeds Specialist for co-ordinated manurial trials
„ V. Subbiah do. do.	do. Pollachi
„ V. Krishnamurthy, Manager Office of the Director of Agriculture, Madras	Administrative Officer, D. A's. Office, Madras
„ R. Ratnam, Administrative Officer, D. A's. Office, Madras	Administrative Officer, Central Office, Coimbatore

Name and Designations	Posted or Transferred to
Sri S. Venkatachalam, Asst. Agri. Chemist, Sugarcane Res. Station, Cuddalore	Asst. Soil Chemist, Soil Testing Laboratory, Coimbatore
„ N. Jaleel Ahmed, Asst. in Mycology	Asst. Mycologist in the Vegetable Scheme
„ J. Sakaram Rao, under training in U. S. A.	Addl. Lecturer in Botany, Coimbatore
Dr. V. Santhanam, Reader in Genetics, A. C. & R. I., Coimbatore	Head of Regional Res. Centre for Research on Cotton, Oilseeds and Millets.
Sri V. S. Raman, Cytogeneticist, Coimbatore	Reader in Genetics, Coimbatore
„ P. S. Narayanaswamy, Agriculturist, Coimbatore	Asst. Entomologist (Sugarcane Scheme) Coimbatore
„ S. Venugopal, Asst. Entomologist, Coimbatore	Asst. Entomologist, Vegetable Scheme, Coimbatore
„ K. C. Thomas, Special D. A. O., (crop sampling) Madurai	Seed Development Officer, Madurai
„ S. Ramachandran, Seed Dev. Officer, Madurai	D. A. O., Palayamkottai
„ A. Venkataraman, D. A. O., Palayamkottai	Principal cum B. D. O., Rural Extension Training Centre, Bhavanisagar
„ T. R. Subramaniam, Addl. Lecturer in Entomology, A. C. & R. I., Coimbatore	Deputed to United Kingdom for Training in various aspects of Crop Protection
„ T. Santhanaraman, Addl. do.	Addl. Charge of Sri. Subramaniam's duties
„ M. S. Sethuraman, Asst. Lecturer in Agronomy, Coimbatore	Asst. Agronomist, Koilpatti
„ D. John Durairaj, Reader in Soil Science, Coimbatore	Reposted to his Original Post after Training in U. S. A.
„ R. Sundararajan, do. do.	Addl. Lecturer in Chemistry, Coimbatore
Sri C. K. Rajagopal, Addl. Lecturer in Chemistry, Coimbatore	Assistant Soil Chemist, Soil Testing Laboratory, Aduthurai.
„ K. Srinivasan, Assistant Director (Drilling) Coimbatore	Assistant Director in charge of the entire engineering activities in Salem District.
„ T. S. Dakshinamurthy, Seed Development Officer, Coimbatore	Earned leave for 25 days from 21-4-'60.
„ P. P. Syed Muhamud, Dy. Director Coimbatore	Current charge of the Seed Development Officer's post.

Name and Designation	Posted or Transferred to
Sri C. V. Govindaswami, Asst. Mycologist (Nitrogen Fixing Blue Green Algae Scheme) Coimbatore	Earned leave for 90 days from 16-4-1960.
Srimathi C. K. Sowmini Rajagopalan, Lecturer in Mycology, Coimbatore	Addl. Charge of Sri C. V. Govindasami's duties.

Upper Subordinates—Agricultural Department
Postings and Transfers during the month of April, 1960

Name and Designation	Posted or Transferred to
New Appointments	
Sri N. K. Thangappa Nair	Soil conservation Asst. Ootacamund.
„ S. Ramakrishnan	Oil seed Development Asst. Krishnagiri.
„ G. Bepin Bose	Cotton Asst. Periyakulam.
„ S. Sukumaran Nair	Farm Manager, State Seed Farm, Marudur, Trichy District.
„ Mani Varghese	Plant Protection Asst. Trichy (North).
„ N. M. Joseph	Farm Manager, Livestock Sheep Farm, Almadi, Chinglepet District.
„ N. Shanmugam, Upper subordinate	Services lent to Thiru Arooran Sugars Ltd., Madras 2 for employment as Plant Protection Assistant in Tanjore District.
„ S. A. Radhakrishnan, P. P. Asst. Salem	Deputed to the Government of Pondicherry for 1 year from date of relief.
Kumari V. Kamala	Mycology Assistant, Coimbatore.
Sri E. Krishna Pillai	Assistant to Curator, Government Botanic Gardens, Ootacamund.
„ P. Seshadri, Instructor in Agri. Rural Extension Training Centre, Krishnagiri	Asst. Lecturer in Agronomy, Coimbatore.



Review of market conditions of commercial crops in the notified areas of Madras State for the month of March, 1960.

Cotton: In this Section Cotton Kapas: Pothis of 280 lbs.
Cotton lint: Candy of 784 lbs.

Coimbatore District: Season: During the month there were some light showers received in the district which benefitted the Karunganni crop to some extent. Pickings of cotton from dry lands in villages were reported to be coming to a close in Pollachi and Coimbatore taluks. It was reported that the late sown Cambodia crop in Coimbatore and Avanashi taluks were badly affected by boll worms and stem borers. On several cases the damage had been so severe that the crop had to be pulled out prematurely and the fields to be prepared for sowing cholam.

Arrivals and Transactions: Lint: The market opened with a stock of 3808 candies of Cambodia and 93 candies of Karunganni lint in Tiruppur market area. The total arrivals during the months (upto 26-3-1960) were 9000 candies of Cambodia and 42 candies of Karunganni which included 2420 candies of Cambodia and 39 candies of Karunganni lint locally ginned. Despatches from Tiruppur were 6493 candies of Cambodia and 79 candies of Karunganni lint. There was a closing stock of 6315 candies of Cambodia and 56 candies of Karunganni lint (27-2-1960).

Kapas: The market (Tiruppur market area) opened with a stock of 5939 pothies of Cambodia and 20 pothies of Karunganni kapas. The total arrivals during the month upto March 1960 (upto 26-3-1960) were 67,360 pothies of Cambodia and 2162 pothies of Karunganni. The disposals during the month were 51,156 pothies of Cambodia and 1932 pothies of Karunganni. The closing stock were 22,143 pothies of Cambodia and 250 pothies of Karunganni on 26-3-1960.

Prices: The price ranges of cotton lint and kapas during the month as compared to that of previous month were as hereunder :

Variety.	<i>Lint</i>	
	March, 1960	February, 1960
Cambodia Superior quality	Rs. 935 to 981	924 to 981
Cambodia Average quality	„ 886	899
Karunganni Superior quality	No transactions	
Karunganni Average quality		
M. C. U. I. Lint rates range	„ 1036 to 1087	1059

<i>Kapas</i>	
Cambodia Superior quality	Rs. 133 to 153 125 to 142
Cambodia Average quality	„ 110 to 132.50 105 to 122.50
Karunganni Superior quality	„ 124 to 136 117.39 to 129.37
Karunganni Average quality	„ 115.50 105
M. C. U. I. Lint rates range	No transactions.

During the month there was no parity between the prices of kapas and lint and therefore the dealings in lint were for the most part subject to survey by the East India Cotton Associations, Bombay.

Ramanathapuram District: Season: Hot and dry weather accompanied by warm nights prevailed throughout the district with practically poor rains during the month.

Arrivals and Transactions: The arrivals and sales of cotton in three markets of Virudhunagar, Sattur and Rajapalayam during the month were as follows :

<i>Kapas</i>					
Name of Markets	Opening Stock	Receipts	Disposals	Closing Stock	
1. Virudhunagar	...	33200	31200	2000	
2. Sattur	...	7250	7250	...	
3. Rajapalayam	...	7500	7500	...	
		47950	45950	2000	

<i>Lint</i>					
1. Virudhunagar	...	40	2300	2240	140
2. Sattur	...	...	725	725	...
3. Rajapalayam	...	1700	800	1200	1300
		1740	3825	4125	1440

Delayed seasonal arrivals and estimated poor yields due to adverse seasonal conditions caused good demand, for kapas from millers. The market in general was brisk and active with enquires for lint and kapas for Karunganni. However for the Uganda cotton the market continued to rule dull with very little transactions in both certified and uncertified varieties.

Prices: The prices of cotton lint and kapas during the month as compared to that of previous month were as hereunder:

Lint. Price per cdy. of 784 lbs. in Rs./nP.

	March, 1960	February, 1960
Karunganni	... Rs. 896 to 981	Rs. 840 to 936
Tinny Karunganni	... " 880 to 936	...
Certified Uganda	... " 1150 to 1186	1186
Uncertified Uganda	... " 1080	" ...
Cambodia best	... " ...	" 960
Cambodia average	... " ...	" ...
Cambodia inferior	... " ...	" 780 ...

Kapas. Price per pothi of 280 lbs. in Rs./nP.

Karunganni Ist crop	} ... Rs. 117 to 131	Rs. 116 to 136
Karunganni IInd crop		
Tinny	... " 102 to 118	" ...
Tinny Karunganni	... " 110 to 1126	" ...
Uganda average quality	... " ...	" ...
Uganda inferior quality	... " ...	" ...
Cambodia	... " ...	" 108 to 142

Cotton Seeds. (Prices per Md. of 82—2/7 lbs. in Rs./nP.)

Karunganni	... Rs. 11.42 to 14.03	Rs. 15.68 to 16
Tinny	... " 11.74 to 15.01	" 16.32 to 16.64
Uganda	... " ...	" ...
Cambodia	... " ...	" 8.84 to 9.14

South Arcot District: Season: Except Ulundurpet and Tittagudi where four inches of rains were recorded in other places the weather was dry. Sowing of summer crops were in full swing throughout the month and concluded by the end of the month. The condition of standing crops was reported to be fairly satisfactory.

Groundnut: (In this section a candy of Groundnut kernel is 531 lbs.)

During the month the arrivals amounted to 1673 tons of which 976 tons from other districts viz. Tiruchirapalli and North Arcot. Export to Pondicherry was 8 tons while despatches to other districts namely

Madras, and Tanjore was 536 tons. The quantities consumed by oil Mills and country chekkus with in the state were 1186 tons and 211 tons respectively. Wastages were calculated at 50 tons. The month closed with a stock of 610 tons with the trade.

The average prices of groundnut kernels in all the markets in the district ranged from Rs. 174.03 to 202.77 per candies of 531 lbs. as against Rs. 179.75 to Rs. 195.10 per candies of 531 lbs. during the previous month.

North Arcot District: The weather continued to be dry with no rains. Summer conditions have set in earnest all over the district. The condition of the standing summer crop of groundnut in the district is satisfactory. Harvesting of summer groundnut have commenced towards the close of the month in Tiruvannamalai.

Arrivals and transactions: The arrivals, disposals, stocks etc., of groundnut in the district during the month were as follows:

Quantity in tons				
Name of crops	Opening Stock	Arrivals	Sales	Closing Stock
Groundnut pods in tons	241.27	1785.889	1906.948	120.211
Groundnut kernels in tons	162.634	1486.878	1347.927	301.589

Arrivals of groundnuts at all centres in the district continued to be moderate but declined gradually. Purchases were mostly country chekku owners and local oil mills.

The following were the price ranges of groundnut pods kernels and oil in various markets in the district during the month as compared to that of previous month:

Prices in Rs./nP.			
	March, 1960	February, 1960	
Groundnut pods (bag of 80 lbs.)	Rs. 19 to 24	18 to 23	
Groundnut kernels			
(candies of 531 lbs.)	" 198 to 210	196 to 205	
Groundnut oil (candies of 500 lbs.)	" 348 to 397	370 to 397	

Ramanathapuram District: During the month the arrivals, sales and stock of groundnut pods, kernels in the district were as follows:

Quantity in tons				
	Opening Balance	Arrivals	Sales	Closing Balance
Groundnut pods	Rs. 100	200	300	
Groundnut kernels	Rs. 2,700	2,200	3,400	1,500

The following were the prices that prevailed for groundnut pods, kernels, oils and cake in the district during the month as compared to previous month:

	March, 1960	February, 1960
Groundnut pods (Mds. of 82.2/7 lbs.) Rs.	21 to 22	Rs. 21 to 22
Groundnut kernels (candies of 531 lbs.) „	198 to 215	„ 186 to 205
Groundnut oil (candies of 500 lbs.) „	367-00	„ 364 to 375
Groundnut oil cake (candies of 82 2/7 lbs.) „	11-70 to 13-88	„ 12-70 to 13-38

Tiruchirapalli District: Season: During the month dry conditions prevailed. The stand of summer groundnut crop was reported to be good. The harvest of the crop is expected towards the end of the month. Harvest of tobacco was over.

Arrivals and Transactions: Arrivals of winter groundnuts into the markets of the district dwindled considerably during the month. Only big markets like Alangudi, Jayankondan and Karur were getting some arrivals. The arrivals at the regulated market at Jayankondan amounted to 3950 bags (80 lbs) as against 5523 bags during the previous month.

The average prices of kernels that prevailed in different markets in the district during the month ranged from Rs. 220 to 230 per candy of 531 lbs. as against Rs. 189 to 204 per candy of 531 lbs during the previous month.

Gingelly: (A bag: 168 lbs.)

South Arcot: The arrivals of gingelly amounted to 802 bags comprising of 452 bags from district produce and 350 from Trichirapalli. Despatches to other districts amounted to 48 bags. The quantity crushed in the country chekkus came to 497 bags. The stock with the trade at the end of the month stood at 806 bags.

The average prices in the several markets ranged from Rs. 60 to 79—73 per bag of 168 lbs according to quality.

Tobacco: (A candy of 500 lbs).

At the end of the month under report there was a stock of 11,135 candys of chewing and 2060 candys of cheroot tobacco. About 3270 candies of chewing and 875 candies of cheroot tobacco were exported to Bombay, Andhra, Mysore, Kerala State and to other districts in Madras State.

The prices that prevailed during the month as compared to previous month for different grades were as hereunder:

Prices per candy of 500 lbs: in Rs. nP.

Variety	I Grade		II Grade		III Grade	
	March 1960 Rs. nP.	February 1960 Rs. nP.	March 1960 Rs. nP.	February 1960 Rs. nP.	March 1960 Rs. nP.	February 1960 Rs. nP.
1. Chewing tobacco (Sun cured):						
(a) Meenampalayam	450 - 510	400 - 500	325 - 425	330 - 400	200 - 250	250 - 300
(b) Other varieties	375 - 490	360 - 465	295 - 380	295 - 375	220 - 280	205 - 270
2. Cheroot varieties (Sun cured):						
(grown in Erode and Bhavani taluks)	280 - 340	280 - 340	210 - 270	210 - 270	160 - 200	140 - 200
3. Chewing tobacco: Pit cured (grown in Palladam & Sular areas)	200 - 275	200 - 250	150 - 190	150 - 195	80 - 130	80 - 130

Cardamom: During the month arrivals of Cardamom in the important assembling centres like Bodinaickanur, Pattiveeranpatti, Thevaram etc. were furnished as hereunder.

Despatches: The following were the opening stock, arrivals, despatches of cardamom during the month:

Names of Assembling Markets	Opening Balance	Arrivals	Sales	Closing Stock
	(Quantity in lbs.)			
1. Bodinaickanoor	12,000	16,000	8,000	20,000
2. Thevaram	15,000	6,000	10,600	10,400
3. Pannaipuram	8,000	N. R.	N. R.	...
4. Kombai	5,000	N. R.	N. R.	...
5. Uthamapalayam	2,000	N. R.	N. R.	...
6. Cumbum	65,000	30,000	40,000	55,000
7. Gudalur	7,000	N. R.	...	...
8. Pattiveeranpatti	6,000	N. R.	...	...
9. Virudhunagar	45,000	11,000	13,000	43,000

Prices: The price ranges of cardamom in different markets, during the month were as hereunder :

1. *Bodinaickanoor :*

Name of quality.	Price in Rs./n.P. per lb.
(1) Superior Bulk	10 — 10.05
(2) Medium Bulk	9 — 9.70
(3) Inferior Bulk	8.60 — 8.97
(4) Lights	7.50 — 8.16
(5) Splits	8.20 — 8.22
(6) Seeds	10.90 — 11.40

2. *Pattiveeranpatti :*

(1) Sun dried	9.68 — 10.19
(2) Medium and Bulk	9.18 — 9.66
(3) Inferior and small	8.70 — 9.10

Store Green :

Extra Bold	14.02
Superior and Bold	10.60 — 11.10
Medium Bulk	9.60 — 9.98
Inferior small	9.18 — 9.32

3. *Virudhunagar :*

(1) *Pattiveeranpatti grades :*

Store Green bold	10.75
Bulk Green	10.10 — 25
Smalls	9.20 — 9.60

F. A. Q. Quantities :

Bold and Greed — average quality	10.50
Mottu green	9.50
Shipment green	8.62 — 8.75

Review of administrative activities of Market Committees during March, 1960

The Market Committees of South Arcot, North Arcot, Coimbatore, Tiruchy, Ramanathapuram and Tirunelveli continued to function during the month.

Enforcement : The progress of enforcement during the month were as detailed below :

Name of Committees	Section 5 (1)		Section 5 (3)		Weighmen	
	A	B	A	B	A	B
South Arcot Market Committee	190	916	79	603	78	569
North Arcot Market Committee	273	804	249	762	123	436
Coimbatore Market Committee	177	845	148	665	68	422
Trichy Market Committee	42	179	186	418	186	418

A = Licences issued during the month.

B = " " up to the end of the month.

Quality Analysis : Nil.

Quality Competition : Nil.



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PATRONS.

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2. Raja Sri Krishnachandra Gajapathi Narayana Dev, Parlakimidi P. O.
3. Sri V. C. Palaniswami Gounder, M. L. A., Vollaikinar, Coimbatore Dist.
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5. Sri Jeevandass, Varnasi, Parlakimidi P. O.
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8. Sri R. K. Kandaswamy, "Brindavan", Tiruchi Road, Coimbatore
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42. " K. Santhanam, Suvarnavur, Villupuram
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44. " K. M. Venkatachalam, Dip. Econ., 16, Chockalingam Pillai Street, Chidambaram.
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