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EDITORIAL

The late Raja Sir Vasudeva Raja of Kollengode. We regret to record the death of one of the Patrons of the Madras Agricultural Students' Union, Raja Sir Vasudeva Raja of Kollengode at Bombay on April 7. Born on October 8, 1873 and educated in the Victoria College, Palghat, the Raja Saheb belonged to a very ancient and artistocratic family of landowners in Malabar, of which he was the senior member. Of a religious and charitable disposition, the Raja was connected with several educational and social institutions and either maintained or endowed many schools and hospitals. He was a fellow of the Madras University and was a member of the Madras Legislative Council from 1906 to 1912. In 1930, he was returned to the Central Assembly by the landholders of the Madras Presidency. He evinced a keen interest in agriculture and agricultural problems of the country and gave valuable evidence before the Royal Commission on Agriculture in India. We offer our condolences to the bereaved family.

Service conditions in the Imperial Council of Agricultural Research. It is now eleven years since the Imperial Council of Agricultural Research has been inaugurated and quite a large scientific staff is at present in the employment of this organisation. Several of these are officers borrowed from the services of the Agricultural, Live Stock and other departments of the constituent Provinces and States and who hold a lien on their permanent posts, but a considerable number is recruited directly to the services of the Council. It is in the very nature of the schemes financed by the Council that they are to run for short periods only, and as such, the employees cannot hope for a security of tenure comparable to what is obtainable in the Government services. It has however to be borne in mind that the scientist like every other human being can be happy, contented and efficient only when his future is not threatened with the nightmare of unemployment. Now that the Council's financial resources are established on a sound footing, it is our opinion that the Council should set its mind to devise ways and means to offer to its employees that much needed security of tenure, so essential for efficiency and contentment among their ranks. Instances have come to our notice where ex-employees of the I. C. A. R in some parts of the country have been left

to drift into the ranks of the unemployed after several years of useful service merely because this or that scheme of research has been closed down. The valuable knowledge and experience of these scientists are in danger of being lost to the country and their experiences dissuade the right type of men from offering themselves for future recruitment. We consider that it should not be difficult for an extensive organisation like the Imperial Council of Agricultural Research to devise a system, by virtue of which, experienced and efficient men thrown out of employment by the closure of one scheme can find employment in another scheme elsewhere, and we trust that this matter will receive the attention it deserves at the hands of the Council.

Notes on some spice crops

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Introduction. Spices and condiments like chillies, onions, garlic, turmeric, are useful to man to add flavour and taste to his food. Their use in food generally helps to stimulate the digestive organs. They serve as medicines or medical adjuncts. As a drench or as a tonic powder they are largely used for live-stock. It is not the purpose of this article to discuss the effect of the several spices as medicines. Spices being very useful to man in some form or other in daily life, the cultivation of three special spice crops viz. cummin, coriander and garlic is discussed in the following pages. These are not commonly cultivated all over the country because they can be grown only under certain favourable conditions of weather, soil and water supply. Also their cultivation is of a special nature. Now and then, several enquiries are received from ryots of various parts about the cultivation of these crops. Therefore, the information on certain aspects of their cultivation as practised in the Udumalpet taluk of Coimbatore District is detailed for the benefit of those who desire to cultivate them. As conditions favouring their cultivation are restricted, the profits which may be expected by the successful growing of such crops of almost universal use are certainly more than what may be got from the ordinary crops. The knowledge on the cultivation of these crops are therefore of much importance to the ryots.

I. Cummin.

(Botanical name—*Cuminum cyminum*)

Tamil	*Siragam.*
Telugu	*Jilakara.*

Cummin is cultivated over limited areas in parts of Coimbatore, Cuddapah and Kurnool. This does not come under scheduled crops and therefore the area under cummin in Madras is not known. It is a very delicate crop which requires much care from the preparation of seed bed to harvesting, threshing and bagging. A salubrious fine weather with mild sun and light drizzle as is available in parts of Pollachi and Udumalpet taluqs of Coimbatore District during the South West Monsoon season is essential throughout the progress of the crop. The success or failure of the crop is very much dependent on the season, especially at the time of flowering.

Season and weather conditions :— In Udumalpet taluk where cummin cultivation has been going on for a long time but over a very small area annually, the crop is sown at about the end of May (*Vaigasi* 15th) just in the season when the south-west monsoon is about to commence. The weather which is then mild and cool due to the light showers accompanied by a gentle breeze is conducive for the healthy growth of the crop. If the weather is otherwise and the atmosphere stuffy with moist heat and the sun

very bright and hot, the crop withers and the flowers shed, resulting in failure. There is also another season for the crop, i. e. *Margali-Thai* (about January) But the crop grown in this season is often affected by dew and mist which are harmful to the healthy growth of this crop. So this is a delicate crop which is very much dependent upon the vagaries of the season in which it is grown.

Soil and its preparation :— Rich red-loams and garden soils of a well-drained nature are best suited for the crop. Land for sowing must be very clean. Stubbles of the previous crop, pebbles and stones must be removed. A fine tilth and a firm seed-bed should be obtained. No direct manuring is done to the crop. *Cumbu* (Pearl millet) which generally precedes cummin should be heavily manured with well-rotten cattle manure or by penning sheep at 5000 per acre. The land becomes fit for cummin after a crop of cumbu during which the manure gets well-rotten and easily available. The weeds are got rid of and the soil becomes cool and friable. After harvesting cumbu, the stubbles should be removed which is ordinarily done with a mammatty. Otherwise, a light ploughing and breaking up of clods may be necessary before sowing cummin. The land should be absolutely free from weeds, especially *korai* (nutgrass) which is very difficult to weed out from the cummin crop. Sowing is done in beds which are long and narrow, 4 feet wide, 8 feet to 10 feet long to facilitate weeding of the entire plot by the women working from bunds only.

Seeds and sowing :— Seed cummin is different from the ordinary cummin sold in the bazaar. The seed cummin is a selected grain well dried and preserved. It is more costly than the bazar produce. The seed rate is about 1 to $1\frac{1}{2}$ maunds per acre (a maund = 25 lbs). The cost of cummin seed varies from Rs. 5 to Rs. 10 per maund. One man and 4 women can sow an acre and cover the seeds. After sowing the seed, beds are stirred carefully with a stick about two feet long and forked at the end to cover the seeds. Otherwise seeds may be buried too deep.

Irrigation :—The first two waterings must be very carefully done as otherwise there may be failure of germination by the seeds being covered with too much earth or being carried to one corner of the bed, floating on the surface. The crop requires to be irrigated once in three or four days. The total number of irrigations may come to 15 to 20 in 60 days which is the duration of the crop from sowing to harvest. A well fitted with two mhotes, may command 3 acres under this crop, if the water is not diverted for other crops.

After cultivation :— Weeding commences after the third watering i. e., the tenth or twelfth day after sowing. The tools used are small, 6" to 8" long with a sharp end and not of any special nature. Even small iron spoons are used for the work. Weeding is done by women working from the bunds, one from either side, the width of the bed being only 4 feet. Two women thus move together from bed to bed. Eight to ten women

manage to weed and hoe an acre and more labour is required if the field is very weedy. The total number of hoeings needed is three to four at intervals of 5 days to a week. Weeding and hoeing are done till the crop spreads itself out to shade the soil.

Forty days after sowing flowering commences. The crop is then 6" to 9" high. At this stage in spite of all care taken by the cultivator in the cultivation of the crop, if weather conditions are adverse, fruit setting will be poor. The ideal conditions of good breeze, mild sun and light drizzle will be congenial and will bring the crop to fruition. Excess of heat, stuffy atmosphere, want of breeze and heavy down-pour of rain are all injurious to the crop at this stage. No seed will set under the latter conditions.

Harvesting and threshing. Sixty days after sowing, the crop is ready for harvest. Then the plants are carefully pulled out with their roots, and placed in a blanket and bundled. The harvested crop is taken to the threshing floor, which should be very clean, hard and protected from wind. It is allowed to dry there for two days. Thin canes are used in threshing out the seed which is done by tender beatings. Small quantities from the heap are taken and beaten at a time, until the whole lot is finished.

Cleaning. The cummin and the dry broken stalks which get mixed up at the time of threshing are separated by winnowing in a light breeze or with a hand winnower.

Economics. The best yield obtained per acre is 50 maunds or 10 bags, the average being only 30 maunds. Some years back, a maund of seed was selling at Rs. 4 to Rs. 15 per maund. The cost of cultivation is about Rs. 50 per acre while the net income varies from Rs. 100 to Rs. 300 depending upon the yield and the demand for the seed. From Udamalpet it is exported to Madras, Calicut and other places. But when the supply of cummin falls short, the local demand is met from Bombay. The price of cummin has fallen now to Rs. 3 to Rs. 4 per maund.

Pests and diseases. The crop is attacked by 'mildew' (Kolli novu) which is caused by a fungus (oldiopsis taurice) When plants are affected by this, they become black and dry up. It is also subjected to some root-worm attack. This causes withering of plants.

Of recent years, owing to the very delicate nature of the crop and unfavourable season, the cultivation of the crop is limited to only small patches in this taluq. It is therefore as precarious a crop as it is valuable.

GARLIC

Botanical name		= ***Allium sativum.***
Tamil	,,	= ***Vellaipoondu.***
Telugu	,,	= ***Tellagadda.***

In Udamalpet taluk, garlic is known as a rare field crop. As a food, garlic is almost universally used in curries on account of its varied medicinal properties. Though it is allied to ordinary onions, it is a more valuable crop than onion and keeps much longer. It is also more costly. In this

taluk, it is cultivated side by side with ordinary onions almost under similar conditions of soil and water supply. Therefore, garlic crop as a rule, is cultivated by every ryot who grows onion in his garden lands which are not suited to the raising of the tobacco crop. In other words, it may be said that garlic suits the sweet water conditions well.

There are two seasons *(pattams)* for the crop in Udamalpet :—

1. June to September—*Vaigasi pattam* or *kar pattam.*

2. November to March—*Karthikai* or *Parvam pattam.* The duration of the *kar* or summer crop is 105 days while that of *paravam* or winter crop is only 90 to 95 days. It is raised from bulbs. The seed rate per acre is 8 to 10 maunds (1 maund = 26 lbs.) the lesser seed rate being for winter crop. The seed from the *kar pattam* is used for sowing in *parvam pattam* and vice versa. Keeping the seed beyond one season is uneconomic.

Soil. Good black-loam is best suited for the crop. It is however grown in red-soils also. The crop does well after ragi. It is, however, not uncommon to plant them in fallow fields kept well-ploughed for some time.

Manuring. The manuring aspect of the crop is an important one and it should be properly attended to. Being a 'root-crop', the field to be planted requires a heavy application of manure. The ryots apply to the crop about 40 to 50 cart-loads of cattle manure besides sheep penning up to 6000 sheep per acre. Application of potash manures in addition to vegetable composts would be beneficial. Municipal rubbish and house-sweepings contain potash and may be applied with advantage.

Sowing. Sowing is done with the hand after beds are formed ; the size of beds depends on local practice. The whole bulbs are separated into segments by rolling them on a hard floor. After sowing they are covered lightly with soil and then irrigated. A day or two later, the bulbs that are exposed are gently pressed down with the fingers into the soft earth. Twenty to thirty waterings are necessary at intervals of 3 to 5 days and four weedings, within two months.

Harvesting and Preparation for the market. Harvesting is done when flowering commences. The proper time for harvest is ascertained by removing a few plants at random from some of the beds (after the 90th day from sowing). When three '*porais*' (separate bulbs that project like knobs from the surface of the entire bulb) are formed in, say, 6 out of 10, the crop may be considered to be ready for harvest. Harvesting is done by levering up the entire plant with a small iron stick termed '*ambu*'. The stuff, after harvest, is left in the field for 1 or 2 days to dry with the leaf. If the crop is very good, the leaf may be cut then and there. Later, it is brought to the drying floor where it is dried in the sun till the green leaves completely dry up. The bulbs harvested at the right time, should be hard and white. If the harvest is delayed, a pinkish tinge may develop on the surface of the bulb. This reduces the market value of the produce, hence the importance of timely harvest. When the bulb is well dried for 4 or 5 days in the

sun, it is kept spread out over-night. The next day, the produce is bagged in lots of 5 maunds each and is then ready for the market.

The yield obtained per acre varies with the season, the treatments given and the health of the crop. The crop being one of a delicate nature is subject to the attack of insects like thrips and fungus diseases like *Alternaria palundii.*

Twenty to twenty two fold (20-22 maunds from a maund of seed) is considered a good yield. 10 to 15 maunds for one maund of seed is regarded as a medium crop and 7 to 10 maunds is considered poor. The crop used to fetch Rs. 5 to 6 per maund though the present price is as low as Rs. 2 to Rs. 3 per maund. The price varies according to the size and quality of the bulb.

Garlic is despatched to outside districts. It goes to Trichinopoly, Tanjore, Palghat, Ernakulam, Cochin, Nilgiris, Madras, Dindigul, Madura, South Arcot and Guntur. From some of these places it is exported to Ceylon.

Given good tilth, sufficient manure and frequent irrigations, a good crop is usually obtained. Clear bright weather during the growing period is very desirable.

It is interesting to note that garlic that is produced in Udamalpet taluk is not used locally as it is of a very pungent quality. It is said that the local garlic is suited only to places hotter than Udamalpet. Annually about 5000 maunds (1 maund = 26 lbs) are exported to out-side districts. The ruling price is Rs. 2 - 4 - 0 per maund of 26 lbs. For local consumption, hill garlic (*malai poondu*) from the Travancore High Ranges and Kodaikanal hills is imported. About 300 to 400 maunds are consumed in Udamalpet annually. The hill garlic is a mild one as compared with the local one and it is said that it is favoured in places like Udamalpet. The price of hill garlic is always Rs. 1—0—0 to Rs. 1—8—0 more per maund than the local garlic. The present price of hill garlic is from Rs. 3—0—0 to 3—8—0 per maund of 26 lbs.

Onion is a serious competitor for the garlic crop. The area under this crop is generally regulated by the price of the onion crop. Fungoid diseases also seriously affect the crop. The present low price is also standing in the way of extension under the crop.

The cost of cultivation and the profits per acre from the crop are roughly as follows:—

Cultivation Details.

		Rs.	As.	Ps.
Ploughings 5 @ Re. 1—4—0 per ploughing	...	6	4	0
Forming beds (4 men)	...	1	0	0
Seed: 10 maunds	...	30	0	0
Sowing: 10 women	...	1	4	0
Watering 32 at 3 Rs. per irrigation.	...	96	0	0
Sheep penning (6000)	...	15	0	0

Cart loads of cattle manure or Village sweepings 25	...	25	0	0
Hoeing and weeding: 60 women for 4 hoeings	...	7	8	0
Harvesting	...	1	0	0
Cutting the leaves and cleaning: 20 to 25 women	...	3	0	0
Drying and bagging	...	1	8	0
Total	...	187	8	0
Yield 150 maunds at 2—4—0 per maund of 26 lbs.	...	337	8	0
Expenses	...	187	8	0
Gain per acre	...	150	0	0

The profit is calculated for a crop of normal yield. The crop in Udamalpet taluk is loosing ground due to continuous bad seasons, risky nature due to diseases and insects and low price for garlic.

CORIANDER

Botanical name	*Coriandrum Sativum*
Tamil „	*Kottumalli*
Telugu „	*Dhanialu*

Coriander seed is much used in South India as a condiment. The plant in its seedling stage is used as a green vegetable to flavour certain dishes. It is grown in Madras presidency to a large extent, on about a lakh of acres a year, chiefly in Tinnevelly and Coimbatore districts. The crop is confined to the black soil. It is mainly grown as a mixed crop with dry cotton. But in deep black cotton soils, it is also cultivated as a pure crop.

Mixture with Cotton. As a mixed crop with cotton, no special cultivation is given to it except what is done for cotton. For cotton, the field is ploughed two to three times in the hot weather between May and September. With the North-east moonsoon in October, a mixture of cotton and coriander is sown broadcast in the ratio of 10 : 1 (i. e. 10 lb of cotton seed and 1 lb of coriander seed per acre) and the seeds are covered by the country plough. It comes up and grows alongside with cotton. Two weedings and hoeings, one in November and another in December are done. Three and a half months after sowing, coriander is ready for harvest. The yield comes handy to the ryot at the time of his first payment of kist.

The cost of cultivation as a mixture crop is not more than a rupee which includes the value of seed sown and the harvesting and threshing charges.

Curing. The crop is harvested early in the morning and is taken to the threshing floor tied up in bundles. The bundles are stacked in such a way that the shoots are towards the centre of the heap and roots are pointing outside. In the stack they undergo fermentation which probably helps the development of aroma and renders threshing easy. On the evening of the second or third day, the stack is disturbed and the bundles are taken out and spread on the threshing floor with heads upwards. They are kept thus exposed over one cold night. Early next morning, teams of cattle are used in threshing. In case of a small crop, treading is done by

human labour. The seed which is mixed up with dry leaves and broken stalks is winnowed and dried before bagging. A bag of well dried seed weighs about 80 lbs measuring 54 Madras measures. In the case of a mixture crop, the yield is about 100 lbs and the net profit per acre is about Rs. 4.

Pure crop. Coriander as a pure crop receives all the operations which were detailed above for a mixture crop of cotton and coriander. The seed rate is, however, more, 10 to 12 lbs. per acre, and also the yield is high—400 to 500 lbs. per acre. Deducting the cost of cultivation from the value of the produce, the net profit per acre out of a pure crop is about 10 to 15 rupees.

The cotton crop succeeding a pure coriander crop in dry lands is said to grow and to yield well. Therefore it is considered a good crop to rotate with cotton.

Garden land cultivation. In garden lands, coriander is cultivated in June. The land after being ploughed well 4 or 5 times, is manured heavily. Before sowing, clods are broken to obtain fine tilth of soil. Beds measuring 10 feet by 4 feet are then formed and the seed is sown broadcast at 10 to 12 lbs. per acre. After the seed is sown, water is applied gently, from bed to bed. The first irrigation is given 3 days after and subsequent irrigations at the same interval. The seeds germinate in 10 days. The crop is, afterwards, watered once a week till the harvest time.

In the case of an irrigated crop, the cost of cultivation is high on account of the irrigation charges and the cost of manuring, unlike in the case of a dry crop. The yield got from the irrigated crop is about 1500 lbs. The cost of cultivation is about Rs. 25 and the net profit per acre is about Rs. 60. In gardens near towns, the tender coriander leaves, if sold as vegetable, fetch a better profit.

Coriander seed is disposed of by the growers through the commission agents who export the produce to outside districts like Tanjore, Trichinopoly, Tuticorin and Madras. There is a keen demand for the seed in Ceylon where it finds a market. It is exported there from the Tuticorin port. The Indian coriander has to face a strong competition in the Ceylon market, from foreign coriander from Russia and Morocco. Russian coriander often commands a higher price than the Indian produce because merchants in Ceylon consider the foreign product better than the Indian coriander in being clean and of better quality. On examination of the different samples of the coriander seed at the Agricultural Research Institute, Coimbatore, it was found that they contained impurities as shown below :—

Morocco Coriander	1·6	per	cent
Russian ,,	5·2	,,	,,
Tuticorin ,,	20·8	,,	,,
Rangoon ,,	5·8	,,	,,
Coimbatore ,,	1·1	,,	,,

The Coimbatore coriander was the best and it contained less adulteration of stalks and sticks, stones and mud, 1 part only in every 100 of material. It is the Tuticorin coriander that gives our coriander a bad name in the Ceylon market. Russian coriander is considered better in point of flavour. But this is a disputable point, since flavour and smell varies with people and places. But one thing has to be said about the flavour, viz., the freshness of seed. If the seed is stored for a long time, it may turn rancid and may also be attacked by insects.

It is therefore to be said that while the Indian coriander is not in any way inferior in quality to the Russian coriander, the dirty condition in which it is marketed is probably the reason for its having lost favour in the Ceylon market. This defect can be remedied by the grower and vendor by following the hints given below:—

(1) During cultivation, see that all weeds are removed, so that other seeds may not get mixed during harvest.

(2) Harvest carefully, taking care to winnow out stalks, sticks and empty light seeds and seeing that no stones or mud get mixed up.

(3) After cleaning the seed, store carefully in bags and market as soon as possible.

(4) Avoid adulteration of any kind in the hope of making extra weight; if this is done, it will soon be found out and buyers will lose confidence in you and your reputation will be lost.

These rules are simple and easy to follow. The care in cultivation and honesty in marketing are the golden rules of success.

In recent years, owing to high price for the commodity, its cultivation is extending and it is becoming a more prominent subsidiary crop in this presidency.

The crop is subjected to 'Mildew' ('*Sambal Novu*') which appears at the time of flowering. On account of the disease the flowers wither and shed without setting seed. The cloudy and dewy weather in the cold weather months encourages diseases and pests.

Physiological Studies during Vernalization in Rice*

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Introduction. The term vernalization is a comparatively new one and its original equivalent in Russian is *Jarovizotie.* The term signifies (a) a stage of development during the germination of seeds; (b) the process developed by Lyssenko by which the flowering phase of a plant is forced earlier than usual by certain pre-treatments of the seed.

Theory of Vernalization. The main theoretical conceptions on which vernalization is based are (1) growth and development are two independent processes; (2) morphological features are no indication of development; (3) plants have different stages of development.

Growth and development are two independent processes that take place in a plant. The length of the vegetative period is not fixed for a plant. It is determined by a set of external factors though an individual factor can hinder the growth of a plant. Factors determining development are different from those determining growth and they are not antagonistic to each other. The time required by a plant to flower is determined by certain factors whose nature and magnitude are different for different plants. These factors may be allowed to act on germinating seeds or on growing plants. The duration of such stimulants varies in like manner both for the germinating seed and for the green plant. The process of sexual development is determined even in the germinating seed.

Lyssenko mainly recognises five stages of development. The plants follow strict sequence and cannot proceed to the next stage unless the previous stage is completed. Of the five stages only two are completely understood. The first one is "vernalization stage" or "thermo-stage" and the second one is "photo-stage". The third stage, according to Kraevai and Kiricenko (1935) is associated with gametogenesis.

Photoperiodism. Klebs was the first to recognize the fact that the flowering duration in plants is not inherent in them but can be altered. Light is one of the factors. Garner and Allard (1920) divided plants into the following classes. (1) Long-day plants which progress quickly towards maturity under an artificially prolonged day. (2) Short-day plants which progress quickly towards maturity under shortened day. (3) Plants which are indifferent to light period.

On-set of flowering. In addition to the theory of photo-periodism there are two more theories regarding the on-set of flowering—(1) Hormone theory and (2) Carbon-nitrogen ratio theory. Lyssenko refutes the conception that there is antagonism between development and growth of plants. The main

* Summary of part of the thesis approved by the University of Madras in 1937 for the award of M. Sc. degree.

difference between Lyssenko and others lies in the material used for experiments. The former dealt with vernalized seeds and others dealt with green plants. The latter in their attempts to make the plant flower earlier shortened the assimilation period and thus brought about poorer vegetative growth. Lyssenko experimented with vernalized seeds and found that provided the required amount of darkness was given to the vernalized seed, the plant came to flower earlier even in continuous illumination. Lyssenko is of opinion that C : N ratio is only a result of the on-set of flowering and not the cause of it. Since the state of vernalization does not spread from part to part of a plant, the hormone theory does not hold good.

Vernalization in Rice. Ukrainskii (1934) found that the reduction of the length of day to 12 hours accelerated flowering by six days. Hence rice is concluded to be a short day plant. Ossewarde (1935) found that the plants of the two weeks treatment were 2–7 days earlier than the control. Haig (1934) in Ceylon found that the treatment for six to 10 days shortens the duration of rice when compared with dry sown seeds. The reduction in duration is mathematically significant but not economic.

Bio-Chemical studies. Biochemical processes relating to vernalization were studied only in Russia. Demkovsky (1932) found a general increase of enzyme activity and also a change in the inter-relation between different groups of enzymes. He expects to derive an indirect method to determine the stage of seed vernalization by changes in the enzyme complex. Rancan (1933) made a comparative study of the changes in the activities of diastase, protease, peroxidases and catalase, on winter wheat. Catalase showed a double maximum on the twentieth and twentyfifth days and the maxima were followed by a sharp fall. The study of Rubin and Naumova (1934) showed that there was a correlation between the energy of plant development and the action of enzymes, particularly that of catalase.

Material and method. The experiments were conducted on the strain of paddy G. E. B. 24 and four other strains obtained from Coimbatore Paddy Breeding Station. The seeds were sterilised in mercuric chloride solution and soaked in water for 18 to 20 hours. The water was then drained off and the moisture adhering to the seeds removed. They were then placed in dishes and kept in a cool chamber. The temparature of the chamber was maintained between 10° and 20°C. When the seeds appeared dried up, a small quantity of water was sprinkled over them. By careful adjustment of moisture the further growth of the seedling was prevented. One set of seeds was kept in a chamber which was illuminated continuously by a 500 Watt bulb. Another set was kept in a dark chamber. The temperatures of the two chambers did not differ very much. The seeds were subjected to this treatment for three weeks. The individual flowering duration of the plant from these seeds was determined by observation in the field and it was found that the flowering duration of the control was 101 days after transplanting while that of the seeds vernalized in darkness was 96·2 days. The difference though significant is not economic.

Experiments on Diastase and Catalase :— The changes in the quantity of diastase and catalase during the process of vernalization in G. E. B. 24 were followed. Diastase was estimated by pulverising the seeds and preparing 1%water extract. 10 cc. of 1%starch solution buffered at pH 4. 6 was added to 10 cc. of the extract and the enzyme action was allowed to proceed for 1 hour in a water bath maintained at 40°C. The reducing sugars formed were estimated by Shaffer and Hartman's micro method. The milligrammes of glucose so formed represent the diastase activity in 10 cc. of the extract or its equivalent of 0· 1 gm. of the seeds. From this the total activity in 100 seeds is calculated. The catalase activity was determined by pulverising 25 seeds with $CaCO_3$. This was placed in one arm of Heinicke's tube and in the other 5 cc. of neutralized Merck's H_2O_2 was placed. They were mixed and shaken at the rate of 25 shakings per minute. The quantity of oxygen evolved at the end of 5 minutes was taken as the measure of catalase after being reduced to N. T P. The total catalase activity for 100 seeds was then calculated.

Diastase :— The diastase present in the seeds during the vernalization process is greater than that in un-germinated seeds. In appearance the vernalized seeds show no difference from the ordinary seeds except for the small crack in the seed coat at the region of the embryo The diastase present in the seeds that are vernalized in light is greater than the quantity present in the seeds vernalized in darkness. The data are presented below :-

TABLE I. Quantity of diastase in vernalized seeds:—
(Figs. in mgm. of glucose for 100 seeds).

Day of vernalization.	Vernalization in	
	light.	darkness.
3	58·08	67·24
4	183·04	44·00
5	159·44	25·68
6	92·56	23·60
7	114·40	60·88
11	148·20	30·28
24	132 48	—
25	152 76	30·28

The two sets of G. E. B. 24 seeds that were vernalized in light and darkness were then placed for germination in trays after 40 days of the treatment. All seeds germinated and they were analysed for diastase. The data are presented below :—

TABLE II. Quantity of diastase in vernalized seeds when they germinate.

Hours after soaking.	Seeds vernalized in		Control untreated seed.
	light	darkness	
48	197·75	93·85	112·60
72	435·20	408·15	317·52
96	608·70	666·40	636·48
120	913·10	998·60	558·04

The seeds treated in light show a larger diastase content up to the third day; later the seeds treated in darkness show a larger content. The quantity present in the treated seeds are considerably greater than those in the untreated seeds.

Catalase. The sampling of the seeds for determination of catalase was done on the same day as that for diastase determinations, so as to find out the course of change in the two enzymes in relation to each other. The data are presented in the following table:—

TABLE III. Quantity of catalase in vernalized seed:—

Days of vernalization.	Vernalization in	
	light.	darkness.
3	24·58	7·10
4	18·95	7·44
5	20·67	8·13
6	11·84	7·78
7	14·90	11·18
11	10·84	7·45
24	16·20	9·79
25	12·81	9·78
26	11·46	9·44
37	9·16	10·17

It is found that the quantity of catalase in seeds treated in light is very high on the third day, but it slowly falls until on the 37th day it is dwindled to 1/3 the original content. The catalase present in the seeds treated in darkness is almost steady. However, the quantity is less than that in light treatment in the initial stages and the two are almost equal after 37 days of treatment.

The quantities of catalase present in the treated seeds when they germinate were followed. The data are given below:—

TABLE IV. Quantity of catalase present in the vernalized seeds when they germinate.

Hours after soaking	Vernalized in		Control untreated seeds.
	light.	darkness.	
48	7·61	10 15	36·36
72	39·34	48 64	88·73
96	85·12	95·29	146·38
120	114 62	134·14	180·02

The catalase content of the seeds vernalized in light is less than that of the seeds treated in darkness. The comparison between the catalase content of the vernalized seeds and that of the control is interesting. The quantities of catalase present in the treated seeds are far less than those of the control.

Discussion. The experiments show that the seeds undergoing vernalization treatment contained larger amounts of diastase and catalase than

ungerminated seeds. Control seeds when they germinate on moist blotting-paper grow rapidly and in 48 hours the radicle grows to nearly 0·1 to 0·2 inches length. At this stage of growth the diastase content of 100 seeds is 112·60. The seeds undergoing vernalization treatment have shown more than this quantity of diastase though with regard to growth they have only burst open the seed coat near the embryo and are not growing any further. The diastase content of the seeds vernalized in light is very high and there are daily fluctuations. The diastase content of the seeds vernalized in darkness is far less than that of the light vernalized seeds. When the vernalized seeds were germinated on moist blotting paper after 40 days' treatment the higher diastase content of light vernalized seeds is maintained only up to the third day and later the darkness vernalized seeds take the lead. Both the treatments have effected a greater diastase content throughout the course of germination than that of untreated seeds.

Changes in the quantity of catalase in the vernalized seeds are similar to those of diastase. During vernalization in light the seeds show a very large increase in catalase in the initial stages but it slowly decreases. The seeds that are vernalized in darkness show almost a steady catalase content. When the seeds are kept for germination there is increase in catalase in both the lots. The seeds treated in darkness show slightly a larger amount of catalase than the ones treated in light. Both of them show considerably low contents of catalase as compared to the control. Therefore it may be concluded that while the vernalization treatment causes an increased diastase content in the germinating seeds it impairs the catalase production. The experiments show that the enzyme complex in the seeds undergoes a change during vernalization. The change is seen during the course of the treatment as well as when the seeds germinate after the treatment. A detailed study of the enzyme complex at different stages of vernalization may be useful to determine the degree of vernalization.

Summary. The vernalization treatment has reduced the flowering duration of rice by about 5 days.

Both diastase and catalase increase during the vernalization process. The treatment in light has caused greater increase than that in darkness. In the former treatment catalase decreases slowly until it is equal in both. When the seeds are germinated the increase in diastase is greater and that in catalase less than those of untreated germinating seeds.

Acknowledgment. I wish to express my gratitude to the Univerity of Madras for granting me a scholarship for two years to carry the investigations in Coimbatore. I am also grateful to K. Ramiah M. B. E., the then Paddy Specialist to the Government of Madras for guidance.

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SELECTED ARTICLE

Development of Modern Composting Methods.

By Y. D. Wad, Institute of Plant Industry, Indore, Central India.

The deliberate use of rotted organic wastes—vegetable and animal—for the purpose of growing larger quantities of better crops seems to be as old as the art of agriculture itself. It is conceivable that primitive man may have simultaneously (1) noticed the superiority of natural vegetation growing in virgin forest land rich in organic matter, and (2) discovered the possibility of artificial cultivation of some of the plant species suitable for his food.

At any rate, the importance of farmyard manure to crop growth has been stressed in ancient Indian and European literature on agriculture (Russell and Richards, 1917). Kind (1926) has described in detail how the Chinese peasants of old, took elaborate care to collect all available wastes and convert them systematically into well-rotted composts. It is noteworthy that in every part of the world this system of returning its own waste material to land has maintained soil fertility in spite of continuous cropping through the ages The crowded population of China is still being maintained on the produce of its soil after its agricultural use for over forty centuries. This is perhaps the most convincing proof of the perfect balance of ancient systems of agriculture with their environment. It is very striking, indeed, that modern composting technique has very little to add to the basic principles underlying the Chinese method of making manure from agricultural wastes.

Liebig published in 1840 his essay *Chemistry in its application to Agriculture and Physiology*. This marked the beginning of a period when scientific investigations and commercial enterprise concentrated on the stimulation of crop production by means of factory-made chemical manure. Subsequent work at Rothamstead and elsewhere established the manufacture of artificial fertilizers on a sound footing. Factories engaged during the war in the fixation of atmospheric nitrogen needed new markets afterwards. This further intensified the use of chemical manures. The use of bulky farm manures fell into the background. It was even asserted that this practice was not an essential feature of agriculture. A school of scientific workers, however, soon arose who maintained that a certain proportion of humus is essential to preserve the crumb structure in soils and that such a structure in turn was essential for efficient plant growth (Russell, 1934 ; *Symposium on Soil Organic Matter*, 1927).

Another group of scientists (Howard, 1937, 2) believed that the artificial stimulation of soil activities for commercial cropping was sure to upset the natural balance of soil factors and in the long run might lead to evils not yet fully realized. They maintain, therefore, that in any agricultural system adequate provision is absolutely necessary for returning all the waste products of agriculture back to the land. Howard (1937,1) even maintains that in specialized systems such as the planting industries it may be necessary to make provision for the supply of humus to the soil by manufacturing it at extra cost from other sources to enable the soil to meet the abnormal strain resulting from highly intensive cultural practices.

Also, the large majority of the cultivators in the world still believe that the produce obtained by the use of chemical manures is not always equal in quality to that obtained by the use of ordinary farm manure.

Recent discoveries of workers on animal nutrition have apparently confirmed this belief by their findings (McCarrison, 1926, 1937; Viswanath and Suryanarayana, 1927; Ramiah, 1933). It has also been claimed (Howard, 1937,1) that the use of humic manures from vegetable and animal wastes imparts disease resistance both to crops and the animals that feed on them. Recently, a fresh impetus was received by the investigations into the nature of soil humus and the decomposition of organic wastes to humus (Russell and Richards, 1917; Waksman **et al.**, 1929; Du Toit and Page, 1930, 1932; Waksman and Iyer, 1932, 1933; and others). This was accompanied by zealous attempts of other workers to discover how to make larger quantities of humic manures and how to increase the speed of the decomposition (Carbery and Finlow, 1928; Rao and Subrahmanyan, 1932, 1935; Anstead, 1932; Gadgil and Hegdekatti, 1937). These workers aimed at ensuring a copious supply of cheap aud properly made humic manure.

Richards and Hutchinson (1921) artificially converted straw to humus by the help of ammonium sulphate. This led to the development of the patented "Adco" process.

Fowler (1930) and Howard concentrated their efforts on the utilization of all available organic residues for making composts of the Chinese type. Fowler stressed that it is necessary to build up an intensively active biological starter of the proper type to ensure a good start and maintain the speed thus secured throughout the course of decomposition. His system of making "activated composts" is founded on this principle and is applicable equally to both farm residues and town wastes.

Howard aimed chiefly at making all types of residues into composts and thus increasing the supply of cheap humus. He saw in this a means to compensate for the existing shortage of cattle dung for manure-making in India where cattle dung is badly needed for fuel purposes in the absence of a satisfactory substitute. His work in this direction culminated the development of Howard and Wad's Indore Process (1931, 1935).

This process aims at utilizing the harder residues by making them less refractory to the influence of the fermenting microorganisms by the physical cracking of tissues or by exposing them to the corrosive environment of actively decaying material of a better composition. It lays special stress on starting the heap with a physical structure capable of maintaining adequate aeration without undue loss of moisture all through the period of decay notwithstanding its compaction due to the shrinkage of the rotting mass. It is maintained that a properly made heap will very soon develop within it all the required intensity of microbiological activity by itself. All the temperature ranges and sequences of the types of micro-organisms necessary for composting will automatically appear. The process is aerobic, clean and sanitary as well as cheap and simple. The final product always maintains the proper standard of quality.

This process, therefore, spread rapidly all over the world and is applicable to a large variety of cultural systems and environments. It can convert all types of wastes quickly into well-rotted composts. This is typically illustrated by its application (1) to the disposal of habitation wastes (Jackson and Wad, 1934, Howard, 1935, 1937 1938), (2) the composting of cane trash (Tambe and Wad, 1935; Dymond, 1923, 1938) and of sisal wastes, the wastes of tea, coffee, rubber and coconut and oil palms (Bagot, 1937; Howard, 1938) and its modifications for making composts with rain water (Timson, 1939) and by the intermittent supply of water from canals (Jackson, Wad, and Panse, 1934),

Fowler (1930) seems to have considered partially anaerobic conditions during the later stages of decomposing heaps as having some beneficial effect.

The author of this note has observed that under the hot arid climate of the Rajputana desert the compost made with three turns had an inferior chemical composition than that produced by one turn only. It appeared that due to the different degrees in the course of fermentation of the various components of the heap the more easily decaying portions under the stimulus of local climate reached the stage of complete oxidation aud consequent losses by the time the more refractory parts were sufficiently crumbled down. It is possible that losses of this nature may be kept down by lessening the number of turns or altering their intervals to regulate the ventilation to the desired degree.

While investigating the possibilities of the hot fermentation process Rajgopal *et al.* (1936) have concluded that in compost heaps a better conservation of carbon and nitrogen is possible when anaerobic conditions follow after a vigorous aerobic start with rise of temperature. The mechanisms by which this is brought about is yet to be fully investigated.

Howard (1937) has recently evolved what he calls "Sheet Composting". This seems to suit wherever labour is scarce or costly. Residues of field crops are composted *in situ* in the field without collecting and removing them. The conditions in sheet composting are perhaps semi-aerobic. The following description by Howard will illustrate the application of this principle :—

This development was worked out during the last two years on the potato areas of South Lincolnshire which have been noted to suffer from shortage of humus. After the pea-crop grown for canning has been harvested, the land is immediately drilled with beans. The sown area is then covered with a layer of crushed straw from the shelling machines followed by a thin layer of farmyard manure. The Indore process then sets in on the surface of the soil. The beans grow through the fermenting mass and at the end of September are ploughed in with the layer of finished compost. Decay is rapid and by the time the fields are planted in potatoes the following spring the resulting humus has been incorporated in the soil and is ready for nitrification. This modification is known as sheet composting—the making of humus in a thin layer all over the surface. Catch crops of beans or mustard or a crop of weeds can also be manured with humus or farmyard manure before ploughing in in the autumn when sheet composting again takes place. The turf of old pastures or old leys can be converted into humus in a similar fashion. The Indore process has in this way been applied w.th success to no less than three important practical problems, green manuring, the effective utilization of weeds and stubble and the better utilization of the old turf of grass land.

Similar attempts at simplification are being made by applying waste organic matter direct to the soil with inorganic reinforcements (Eden, 1935, 1936). The present system of burying tea prunings and loppings of shade trees along with the chemical manures may also be considered a similar operation.

It appears to the author that perhaps the most economic and convenient method of returning waste material to land will be a preliminary aerobic decomposition to suitable stage followed by direct application to the field, a few weeks before sowing time, before preparatory cultivation begins. There seems to be some scope for such a method as it involves the least deviation from current routine as well as the minimum of labour and care. *Agriculture and Livestock in India* Vol. IX Part V.

Research Notes.

Agathi (*Sesbania grandiflora*, **Pers.**) Sesbania forms the last genus of the tribe Galegeae with a haploid chromosome number 7 (Galegeae n=8) Gamble gives a synonym *Agati grandiflora*, Desv. Five species are recorded from the Madras presidency.

Sesbania grandiflora is a tall growing woody plant with large showy flowers. Three colour varieties and two habit varieties have been met with. The chief characters of these types are summarised below :—

(1) Habit varieties according to the height=Tall and short (tending to be bushy).

(2) Colour varieties (according to the manifestation of the anthocyanin pigmentation (purple in the flowers)=white, medium-red, and red

Variety Colour	Flowers.			Lengths in cm.			Height of plant cm.
	standard	wings	keels	leaf	flower	pod	
White	White, light purple streaks on inner side.	No colour.	No colour.	·24	10	50	450—600
Red-medium	White, light purple wash on inner side.	Dorsal margin and tip faintly light purple.	No colour.	21	9	50	450—600
Red	Deep purple on both surfaces.	Deep purple on both surfaces.	Deep purple on both surfaces.	17	7	30	210—300

Apart from these morphological differences it was also noted that the verieties showed a definite trend in their first flowering after sowing. The older plants, of course, showed stray flowering throughout the year. A series of monthly sowings were done at Coimbatore to determine the optimum time for sowing and also the period required for flowering relatively to such sowing. Two of the varieties, the common 'white' and the 'red' were used for this experiment. The following observations were made:—

(1) The flowering season for the whites is in December and January, and that for the reds is from August to March.

(2) The plants require a definite minimum vegetative growth before they could produce flowers. This in the case of the tall whites (with a narrow flowering period) is 7½ months. In the case of the short reds (with a wider flowering period) it is 4 months.

(3) The height decreases as the sowings approach the flowering time. The height of the plants at the time of first flowering I reduces according to the duration upto the flowering time, provided the required minimum growth period is satisfied.

(4) The plants standing longer than a year do not obey this periodicity completely. The maximum flush of flowers and pods is as noted above, but the plants show stray flowering all through the year.

(5) The optimum time for sowing is about the beginning of August.

The reciprocal crosses of the three colour varieties *inter se* were done, with a view to study the inheritance of characters. Only the F_1s were raised. The following is the behaviour of the F_1s of the various crosses.

Red X medium-red. F_1s (5). Standard—back paler than mother, inside similar to mother. Wings—similar to father. Keel—very faint streaks of purple. Average length of flower—7·4 cm. (like mother). Average length of pod—46·3 cm. (intermediate). Height of plants—about intermediate (300 cm.).

Medium red X red. F_1 (1). Similar to reciprocal but colour slightly more in quantity.

Red X white. F_1s (3). Colour of flower similar to cross red X medium, Average length of flower—7·2 cm. (like mother). Average length of pods—49 6 cm (like father). Average height of plants—342 cm. (intermediate).

Medium-red X white, and white X medium-red. F_1s (3). Standard similar to medium. Wings and keel—no colour. Length of flowers—8·4 cm. (intermediate) Length of pods—no change. Height of plant—no change.

It is seen that in these crosses the anthocyanin pigmentation inheritance shows the F_1 intermediate although there is a definite tendency for the higher grade of pigmentation to dominate. Other characters are intermediate.

Agricultural Research Institute,
Coimbatore, S. India.
21st January, 1940.

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SNAILS AS PESTS OF PADDY

Introduction. Snails have been reported as pests of paddy from Burma as early as *1917* (a). In Madras it was only in *1936* (b) that reports regarding the severe damage to paddy by snails were received. In 1937 and 1938 also there were reports but the damage done was not so severe as in 1936.

Species of snails affecting paddy. Four species of snails *Viviparus variatus*, *Frauenfeld*, *Pila virens* Lamarck, *Indoplanorbis exustus*, Deshayes and *Limnaea acuminata*, Lamarck form *rufescens*, Gray were collected from the affected fields. Of these the first mentioned was present in large numbers in all the areas; the second and third were distributed in all the areas but not in such large numbers as the first. The last one was collected only from one of the fields.

Nature of attack. Snails cut the transplants as a result of which the top portions float on the surface of the water. The cutting of the stems is a slow process; about 2 to 3 hours being taken to cut a stem of 1/3″ in thickness. The transplants are cut 3″ to 4″ from the base below the surface of the water in the field. The cut ends showed an irregularly serrated surface. The snails were active only during nights getting on to the plants after dusk. The presence of water in the fields facilitated the movements of the snails. In the absence of water the snails were found stuck up in the puddle by the weight of their shelf. In a few fields where the water was drained off, the temperture on a hot day was sufficient to kill most of the creatures.

(a) Report of the Proc. of the Second Entomological meeting—Pusa—1917, page 160.

(b) Administration reports of the Govt. Agricultural Chemist, Entomologist, and Mycologist for 1936—37, page 21.

Localities affected and extent of damage. In 1936 the pest was severe in Kaikalur, Bundar and Gudivada taluks in the Krishna Dt and Bapatla taluk in Guntur Dt. The areas affected were mostly situated at the end of channels comprising low-lying fields. In some of the worst affected fields in Kaikalur taluk, there was severe loss and the fields had to be transplanted.

Association with crabs. A few crabs were also seen along with the large number of snails in the fields but their number was very limited. The major attack was by snails.

Agricultural Research Institute, Coimbatore. 4th April, 1940.

M. C. Cherian,
P. S. Krishnamurthi.

ABSTRACTS

Magnesium-deficiency of fruit trees. Wallace, T.—J. Pomol, 1939, 17:150—66, bibl. 31.

An account of previous work relative to magnesium deficiency in various countries and for various crop plants is given and the possible role of magnesium in plants is discussed. Reference is made to the relationship of magnesium to calcium and potassium and to the problem of magnesium-toxicity in plants. The possible importance of magnesium-deficiency in problems of spray injury is indicated. Evidence of magnesium deficiency in apple trees at 3 centres in England is given and it is shown how the composition of the leaves of terminal shoots may be used to determine the condition of the foliage with regard to supplies of lime, magnesia and potash. Where supplies of calcium and magnesium are adequate in apple leaves the amounts present are similar to those in tobacco leaves of satisfactory quality Methods of treating soils with magnesium containing materials in cases of magnesium-deficiency are given. (*Horticultural Abstracts* 9 (1939) : 233).

Spray injury studies. Progress report 1. Some observations on the probable causes of lime-sulphur injury.—Berry, W. E. and A. R Long, Ashton Res. Stat. for 1938, 1939, pp. 124—44, bibl 29.

Symptoms of lime sulphur injury are described and a list presented showing the relative susceptibilities of some varieties of common fruit plants to sulphur injury. The penetration of spray materials into the leaf is discussed with particular reference to cuticle permeability and the effect of nutritional climatic factors. An experiment is described which suggests that foliage injury from lime sulphur may be correlated with temperature, humidity low and sunshine. Maximum injury occurred when temperature was high, humidity low and sunshine continuous. The possibility that desiccation by spray deposit may be a major cause of injury was investigated. Concentrated sprays of surcrose and calcium chloride produced little damage compared with lime-sulphur. It is concluded that loss of water due to the purely osmotic effect of spray deposit is not alone responsible for spray injury. Detached leaves of Lane's Prince Albert and Laxton's Superb apples exhibit rapid increases in respiration when sprayed with 2 % lime-sulphur and show symptoms of injury similar to those observed in the field. Necrotic patches are believed to result from local penetration of spray fluid but the increase in respiration seems due to more general physiological effect on the whole leaf. Possible causes of the observed effects are discussed and it is due to gaseous or volatile compounds, which, the evidence suggests, may be hydrogen sulphide. (*Horticultural Abstracts* 9 (1939) : 240)

EXTRACTS

Liming.

Sir A. D. Hall, the late Director of the Rothamsted Experimental Station once said, "Of all soil factors making for fertility, I should put lime the first. Upon its presence depend both the processes which produce available plant foods in quantities adequate for crop rotation at a high level and those which naturally regenerate and maintain the resources of the soil." The action of lime on different soils is physical, chemical and biological. Physically the action is one which improved soil texture. This is most mainfest on strong soils where it acts by flocculating the finer clay particles. The heavy soil thus becomes less retentive of moisture, warmer and better aerated, allowing earlier spring cultivation and becoming more friable when dry. On light sandy soils the action of lime is apparently opposite to that on heavy clay soils, in as much as it tends to bind the particles together, increasing the cohesiveness of the soil and improving the moisture relationships. Chemically, lime has the important function of tending to correct soil acidity. Sour soils contain free acids present in sufficient quantities to be injurious to plant life, and such soils are "sweetened" by its application. Lime is able to liberate inorganic plant foods from combination in the soil, and they then become available to the plant. The fertility of a soil does not depend upon the total plant food present, but upon the amount of available plant food present. Lime has its biological effect in discouraging harmful or undesirable micro-organisms and encouraging beneficial ones. The process of nitrification in which organic substances are converted into nitrates is brought about by certain types of soil bacteria, and these cannot carry on their necessary work if the soil is too acid. Plant life is also influenced by the relative acidity of the soil. For instance, plants such as sorrel, favour more acid conditions, while those of the legume family e. g., the clovers, requires a soil relatively rich in lime.—*Tasman, Jour. Agri* 10 (1939) : 1935.

The Use of Colchicine.

(By Claud Saunders.)

From reports of a remarkable really new discovery made by scientists at the Carnegie Institution in the United States, it seems that gardeners may look forward to growing gigantic forms of existing plants from seed in the near future.

The discovery, which is likely to have far-reaching effects, concerns the effect of a drug, called Colchicine, on the growth of plant. The drug itself is extracted from a well-known flower the Autumn Crocus, and is used in the treatment of rheumatism. When a solution of the drug was sprayed very very finely on growing plants, it was discovered that their growth became very abnormal, twisted and deformed. Among such deformed plants and flowers it was found that some developed to out-size proportions both of the plant and its flowers. What is even more striking is the fact that seed saved from the giant plants among the drug-teoted treated inherits the giant characteristics of its parent; and without any special treatment, the seed grows into an enlarged edition of the original plant.

Treatment with the poisonous drug, either by spraying or injecting the solution into the plants or by treating the seeds, may be carried out on plants of the first generation of giants to produce a further increase in size. I suppose that there must be a limit to the number of times the drug can be used to increase in size; but apparently treatment has been repeated to produce plants at least four times their original size.

Another remarkable effect that the Colchicine treatment has been revealed to have on plants is in altering the number of cells that carry the characteristics of a plant. By being enabled to control this now, plant-breeders will be able to attempt to cross unrelated species of plants with a big chance of success As a result of this, in the course of time we are likely to have many strange hybrid plants in our gardens. Even where species crosses have been made between plants in the past, the hybrids more often than not, will not produce seeds. It appears however, that the use of the drug by hybridizers will ensure that new crosses will be fertile and produce seed freely. Some of the plants of which giant new forms have been produced by the experimenters at the institution include, I understand, cosmos, foxgloves, nasturtiums, onions, phlox and radishes. I learn, too, that commercial plant breeders and seed growers are making use of the discovery and soon, no doubt we shall be able to enjoy the results in our gardens. Though it is a fascinating thought to look forward to growing giant specimens of existing plants from seed and new hybrids, I believe successful results from the wonderful new treatment are not attained without much careful and patient work in breeding and selection. *The Gardner* Vol. 3; No. 4.

Gleanings.

Curative Properties of Pine-Apple. Pine apple juice is an excellent remedy for lumbago and kindred ailments. In doses of 6 to 8 ounces taken 3 to 4 times a day in an undiluted form and sweetened to taste, it relieves pain in the course of two or three days and almost brings about a complete cure in five or six days. If the juice is taken immediately after lumbago appears, the patient does not develop the painful form. The juice is quite pleasant and agreeeble that one takes it not as a medicine but as an excellent cordial or beverage. Scrape off the hard outer coat, grate the entire fruit to pulp with the aid of a grating tin plate common in the Indian household. Another efficient method of grating pine apples consists in cutting the fruit across into two and scraping out the 'meat' with the aid of a coconut scraper of the Malabar pattern. The shell and the hard core are left intact while all the meat is scraped off. The juice is then pressed through cheese cloth or other suitable tough material.

New achievements in the Biological sciences in 1939. Experiments showed that Light, either artificial or from the sun, serves to increase the ability of plants to withstand midsummer heat.

A new method was devised for measuring soil moisture, by passing electric current through a buried block of gypsum.

Seedless watermelons were produced by chemical treatment of unpollinated flowers.

A plant growth-retarding substance was discovered.

A substance that makes plant wounds heal was discovered and named traumatic acid.

Legs were successfully cross-transplanted among embryos of chickens, turkeys and other fowl.

Colchicine was extensively applied in the breeding of new varieties of plants.

A new type of rubber cavity filling for tree wounds was designed to provide an inexpensive treatment.

A new co-operative system for artificially inseminating cows, ewes and other farm animals was inaugurated in several states. *Science supplement.* Vol. 90 No. 2347 December 22 1939.

Crop & Trade Reports.

Subject:—Statistics—1939-40—Cotton—Fourth forecast report. The average of the areas under cotton in the Madras Province during the five years ending 1937-38 has represented 9·9 per cent of the total area under cotton in India.

2. The area under cotton up to the 25th January 1940 is estimated at 2,102,900 acres. When compared with the area of 1,873,900 acres estimated for the corresponding period of last year it reveals an increase of 12·2 per cent.

322,600 acres have been reported as sown since the last December forecast was issued. This extent comprises chiefly 214,800 acres under Tinnevellies including Karunganni in Coimbatore, 50,600 acres under Cambodia, 26,000 acres under white and red northerns, 16,000 acres under westerns, 11,600 acres under Warangal and Cocanadas and 3,800 acres under Salems. The area sown in December and January falls short of that sown in the corresponding period of the previous year by 45,900 acres or by 12·5 per cent.

3. The increase in area in the current year as compared with the area in 1938–39 occurs in all the important cotton growing districts of the Province outside Guntur, Nellore and Tinnevelly and is attributed to favourable rains and good prices during the sowing season. The variations are marked in Coimbatore (plus 94,500 acres), Madura (plus 23,500 acres), Ramnad (plus 23,600 acres) and Tinnevelly (—32,400 acres). The area estimated in respect of Guntur and Nellore districts is the lowest reported in recent years.

The area under irrigated cotton, mainly cambodia, is estimated at 180,900 acres as against 162,200 acres for the corresponding period of the previous year, an increase of 11·5 per cent.

4. Pickings of the mungari or early sown cotton crop in the Deccan have concluded. The yield was slightly below normal due to the bad bursting of bolls.

The crop was affected to some extent by drought in December in the districts of Madura, Ramnad and Tinnevelly. Normal yields are reported from all districts except South Arcot, Tanjore, Madura, Ramnad, Tinnevelly and Malabar where the yield is reported to be below normal.

5. The seasonal factor for the Province as a whole works out to 97 per cent. of the average as against 94 per cent. in the previous year. On this basis, the total yield is estimated at 435,400 bales of 400 lb. lint as against 375,800 bales for the corresponding period of the previous year. It is however, too early to estimate the yield with accuracy as the harvest has not yet commenced in the major portion of the area and much will depend upon the future weather conditions and the toll taken by insect pests.

6. The estimated area and yield under the several varieties are given below.

(Area in hundreds of acres, i. e., 00 being omitted; yield in hundreds of bales of 400 lb. lint i. e., 00 being omitted).

Variety.	Area from 1st April to 25th January		Corresponding Yield.	
	1939–40.	1938–39.	1939–40.	1938–39.
1	2	3	4	5
	Acres.	Acres.	Bales.	Bales.
Irrigated Cambodia	1,684	1,530	1,034	879
Dry Cambodia	1,828	1,784	378	341
Total Cambodia	3,512	3,314	1,412	1,220

Variety.	Area from 1st April to 25th January.		Corresponding Yield.	
	1939–40.	1938–39.	1939–40.	1938–39.
1	2	3	4	5
	Acres.	Acres.	Bales.	Bales.
Uppam in the Central Districts.	258	186	41	27
Nadam and Bourbon.	201	33	10	2
Total, Salems.	459	219	51	29
Tinnevellies*	6 438	5,152	1,499	1,226
White and Red Northerns	1,930	1,780	241	222
Westerns	7,600	7,040	951	846
Warangal and Cocanada	1,017	1,176	191	208
Chinnapathi (Short staple)	73	58	9	7

* Includes Karunganni Cotton grown in the Coimbatore District and Uppam, Karunganni and mixed country cotton grown in the South.

7. The average wholesale price of cotton lint per imperial maund of 82 2/7 lb. as reported from important markets on 5th February 1940 was about Rs. 22—1—0 for Cocanadas, Rs. 23—12—0 for White Northerns, Rs. 25—8—0 for red Notherns, Rs 25—10—0 for westerns (Jowari crop), Rs. 22—13—0 for Westerns (mungari crop), Rs 33—15—0 for Coimbatore Cambodia, Rs. 31—0—0 for Southern Cambodia, Rs 31—11—0 for Coimbatore Karunganni, Rs. 30—7—0 for Tinnevelly Karunganni, Rs. 30—10—0 for Tinnevellies and Rs. 24—11—0 for Nadam cotton. When compared with the prices published in the last report, i e., those which prevailed on 8th January 1940, these prices reveal a rise of about 19 per cent in the case of red Northerns and 11 per cent in the case of white Northerns and a fall of about 7 per cent in the case of Western (mungari crop), 5 per cent in the case of Cambodia (Coimbatore and the South), 3 per cent in the case of Westerns, (Jowari crop), and Tinnevelly Karunganni, 2 per cent in the case of Cocanadas, and one per cent in the case of Coimbatore Karunganni and Tinnevellies, the prices remaining stationary in the case of Nadam cotton. (*From Director of Industries, Madras*).

Cotton Raw, in the Madras Presidency. The receipts of loose cotton at presses, and spinning mills in the Madras Presidency from 1st February to 12th April 1940 amounted to 87,850 bales of 400 lb lint as against an estimate of 366 800 bales of the total crop of 1939—40. The receipts in the corresponding period of the previous year were 86,636 bales. 112,562 bales mainly of pressed cotton were received at spinning mills and 5,120 bales were exported by sea while 38,770 bales were imported by sea mainly from Karachi and African ports. (*From Director of Industries, Madras*)

Mofussil News and Notes.

Dharmapuri—Admancotta—Cattle Fair and Agricultural Exhibition. The biggest cattle fair in this taluk is held during the descending phases of the Moon in the month of *Panguni* in Admancotta—a village 5 miles from Dharmapuri R. S. Most of the stock of animals brought to the fair for sale are of Alambadi breed—from the neighbouring taluks. This year the fair was held from 26th March to 2nd April and during this week, as many as 60,000 animals were assembled. The prices ranged from Rs. 300 downwards per pair.

An agricultural exhibition was held during this period which attracted a large gathering. Improved varieties of different crops, green manure crop seeds, improved strains of sugarcane were placed for exhibition, in addition to improved implements.

A similar cattle fair, though not a big one, will also be held during the last week of April at Indur—a village 8 miles from Dharmapuri. P. V. S.

Givada Agricultural Exhibition. An agricultural exhibition was held at Givada in Tenali Taluq, on 7th and 8th March 1940, during the 4th Annual cattle show held under the auspices of the '*Gunturuseema Rytu Sangham*', during the Sivarathri festival, which attracted large crowds from various places. Lectures on improved methods of cultivation and gardening were delivered by the agricultural demonstrator, Tenali. N. R.

Guntur Divisonal conference. A conference of the Demonstrators of the Guntur division was also held at Vuyyur and valuable discussions were held. Excellent arrangements were made by the Sugar Factory authorities for the stay of the officers and for visitors to the factory.

Month gathering of officers at the Agricultural Research station, Guntur:— At the instance of Mr. R Swami Rao. Asst. Director of Agriculture, Guntur all the officers of the Agricultural and live stock Research Stations and those working at Guntur along with some of the prominent ryots of the locality, meet early every month at the Research Station, at a social gathering and discuss various topics of interest. This has become a regular feature and affords an opportunity to study the problems arising out of the work at the station in company with others whose advice and suggestion are likely to be valuable. S. V. D.

Karamadai Agricultural Exhibition. An Agricultural Exhibition was held at Karamadai from 23rd February 1940 to 25th February 1940, during the Car festival. Demostrations on Bee-Keeping and honey extraction were conducted during these days and lectures on Bee-Keeping, crop production and Insect pests and Diseases control, were delivered in the evenings.

The cattle fair conducted by the Local Boards attracted large crowds and nearly 1500 pairs of work animals, mainly Alambadis from Mysore tract, were brought in for sale:— The best pair was sold for Rs. 1050. K. H. S.

Mannargudi Agricultural Exhibition. An Agricultural Exhibition was held at the premises of the Municipal office during the Health and Baby week at Mannargudi from the 14th to 17th February 1940. The exhibition was opened by Sri V. N. Ramanatha Rao, the District Munsif of Mannargudi. Among the various exhibits put on show, special mention may be made of malt foods from Ragi, cholam and rice, samples of different fruits and vegetables, honey etc. A good number of visitors visited the show and they were taken round and shown by the officers of the Agricultural Department. A. G. N.

Pattukottai:—Agricultural Exhibition at Nagaram. An Agricultural Exhibition was held on a large scale at Nagaram during the "*Pangani Utharam*" festival from the 21st to 25th March. Chief varieties of Paddy and rice, improved breeds of poultry from Aduturai, Oil seeds from Tindivanam, Sugarcane varieties and fodder crops from Pattukottai Farm, Millets from Palur, samples of Coconut seed nuts from Kasargod, Pine apple fruits from Pattambi, malts from the Govt. Agricultural Chemist, green manure seeds and plants, bee hive with accessories, plantain, fig, graft plants from Panyam and various labour saving implements and charts on Agricultural subjects were exhibited. Demonstrations were held on bee keeping. Lectures with the aid of magic lantern were delivered by Agricultural and Health Departments.

During the exhibition ryots reported attack of insects in chilli crop. Gardens were inspected and tobacco emulsion was sprayed for aphis and mealy bug.

A. G. N.

Tiruchendur :—Cattle Fair, at Tiruchendur in Tinnevelly District. The Tinnevelly District Board conducts a cattle Fair every year at the famous pilgrim centre Tiruchendur, during the *Masi Magam* Festival. During this year the cattle fair was held from 18—2—40 to 3—3—40 and some 8,000 heads of cattle assembled. The Agricultural and Health departments arranged exhibitions from the 24th to 29th February 1940. Improved implements, pure seeds of paddy, strains green manure seeds, samples of cotton and ground nut, artificial fertilizers and concentrated organic manures were exhibited by the Agricultural Department. Pest and disease control methods and bee-keeping were also demonstrated. A large number of visitors were greatly benefitted by the exhibition. R. C. P.

College and Estate News.

Students' Corner. *Farewell to Final year Students* :— The customary function of bidding farewell to the out-going students came off on 19—3—40, when the students of 1st and 2nd year B. Sc. Ag., were 'At Home' in the Freeman Hall to the final year and short course students. After tea, speeches on behalf of the lecturers, tutors, coaches and representatives of the various classes were made. The function terminated with the concluding speech by the Principal, Mr. R. C. Broadfoot, wishing the outgoing students all success in life.

A committee of hosts were 'At home' to the Final year students at a Tea Party held on 24—4—40 in the Hostel quadrangle.

Annual Dinner at the students' Hostel. The students of the Agricultural College Hostel met some officers on the Estate at a delightful dinner party on 27—3—40 at the long block of the hostel.

University Examinations. The University Examination for the B. Sc. Degree in Agriculture was conducted from 1—4—40 to 16—4—40. The practical examinations were all over by the 23rd instant.

Personal. On the eve his transfer Dr. M. K. Nambiar of the Lawley Road Dispensary, was entertained by a few residents on the Estate at a delightful dinner party in the premises of the officers club on 5—4—40.

Mr. M. K. Venkataramana Mudaliar, Veterinary Asst. Surgeon of the college veterinary Hospital, who was under orders of transfer to Annur, was met at a dinner party by his friends on 17—4—40 in the premises of the officers' Club.

Dr. R. Sankaran has left the Institute to take up the new appointment as Cotton Botanist, Sind.

Visitors:— Mr. K. T. Alwa Headquaters Deputy Director of Agriculture, who came here as an external examiner in Agriculture, stayed in the Estate from 14—4—40 to 18—4—40.

Dr. B. N. Iyengar, Retired Director of Agriculture, Mysore, an examiner in Chemistry for the recent B. Sc. Degree examination was here from the 16th to 18th instant.

Obituary :— *The Late Rajah Sir Venganad Vasudeva Rajah of Kollengode* :— We regret to record the death of Rajah Sir Venganad Vasudeva Rajah of Kollengode on 7—4—40 at Bombay. The late Rajah was a patron of the Madras Agricultural Students' Union.

The late T. Varahalu, B. A., M. Sc:— We deeply regret to record the sudden death of T. Varahalu on 9—4—40 under tragic circumstances. The late Mr. Varahalu was born on 8th February 1901 in Vizagapatam District. He entered service in the Agriculture Department on 6—7—1926 and was throughout a very enthusiastic and energetic assistant in the Chemistry section. He was a regular contributor to the *Madras Agricultural Journal* and his contributions on the 'Chemistry of Jaggery' have been greatly appreciated by the readers of the Journal in and out of India. He was also a winner of the Ramasastrulu Munagala Prize. We deeply mourn his loss and convey our heartfelt condolences to the members of the bereaved frmily.

The Agricultural college Estate. Ladies club:— In the General body meeting held on 18—4—40, the following office bearers were elected for the year 1940—41.

President:— Mrs. K. M. Thomas. Vice-President:— Mrs. H. Shiva Rao. Secretary:— Mrs. K. Sanjiva Shetty.

GREEN LEAF MANURE

[*We publish below a valuable Press note issued by the Govt. of Madras, Development Department. Ed. M. A. J.*]

Water and manure represent the principal requirements of an agricultural population. In some respects the latter is a more important requirement for it is axiomatic that what is taken off the land by grain crops must be replaced or else the crop productivity will diminish. This replacement is done by the application of manures to the fields. Of the manures, both chemical and farm yard manures are costly and beyond the means of most of the poor ryot. He is left with only Green Leaf manure. Suitable trees and shrubs grow everywhere. The ryots lop a variety of trees, in fact any broad leaved species, their availability being the main desideratum but the following species are preferred :

Botanical name.	Tamil.	Telugu.	Kanarese.	Malayalam.
Tephrosia purpurea	*Kolinji*	*Vempali*	*Kogge*	*Kolinnil*
Pongamia glabra	*Pungam*	*Kanuga*	*Honge*	*Punnu*
Dodonea viscosa	*Velari*	*Bandari*	*Bandare*	*Unnataruvu*
Cassia auriculata	*Avaram*	*Tangedu*	*Taugedi*	*Vviram*
Adathoda vasica	*Adadodai*	*Addasaramu*	*Adusoge*	*Atalotakum*

The last species is important in that it acts as a weed exterminator,

2. **Mode of use.** The fields are flooded and the green leaf manure is spread evenly, trodden in and allowed to rot. A week later the agricultural crop is introduced.

3. **Sources of supply.** The rich ryot grows his own manure leaf trees, usually *Pongamia glabra* and *Cassia spp.*, but the majority depend on trees growing either on private or state property, especially the latter. Unreserves and reserved forests belonging to Government have to meet most of the demand. With the gradual breaking up of the unreserves for cultivation and the depletion of the tree growth in them, the demand on the reserves has been on the increase.

4. **Policy of the Government.** This demand on the reserves for leaf manure was recognised by the Government as early as 1903 and the Forest Department was asked to make provision for its supply to the public, at a cheap rate. At the same time the Government realised that manure leaf removal was incompatible with the realisation of the more important objects of management of forests, namely, that of supplying the various other (and more important) domestic and agricultural needs of rural life. So they asked the Agricultural Department to endeavour to popularise the cultivation of manure leaf crops by the people themselves. The Government have declared in unequivocal terms that their ultimate aim was the total prohibition of leaf manure removal from the forests and that everywhere it was time that the agriculturist ceased to depend on the forests for this product.

4 (a). The reasons for the formulation of the above policy by the Government can be easily understood. To derive the fullest benefits from the forests two things must be ensured—the vigour of the trees should not be impaired, and the leaf canopy should not be interfered with, especially in the growing season. Leaf manure removals jeopardise both. Pollarding for leaf manure usually takes place in the rainy season, which is the main growing season of the forest trees. The trees bereft of their full leaf cover naturally put on less increment, since leaves are the principal manufacturers of plant food. Further they spend their energy in trying to reclothe themselves The trees naturally stagnate under such treatment and ultimately die. With the absence of full leaf cover in the rainy season, the mechanical obstruction which leaves offer to rain drops is greatly reduced and soil erosion, one of the greatest calamities that can occur to a nation, follows. Soil manufactured in thousands of years is lost in a single downpour. Under repeated pollarding, the potential soil value of the forests also diminishes and they can no longer bear trees of good quality.

4 (b). We cannot afford to manure the forests artificially and the only manure they get are the leaves which drop from the trees, and are transformed into humus. If the leaves are lost, the fertility of the forest soil must necessarily deteriorate, and it is false economy for the nation to sacrifice their forests in order to assist the more short-sighted agriculturists. Thus it will be seen that removal of leave manure is fundamentally opposed to the first principles of forestry. If the forests are to take their rightful place in the national economy, leaf removals must be prohibited. Such prohibition cannot, however, be completely enforced at once, without hardship to the agriculturist. He must first be taught to grow his own crops of leaf manure.

5. **History of the Methods of Supply of Leaf Manure by the Forest Department.** First the ryots were permitted to remove leaf manure from specified species in the forests, on their buying a permit for the same ; but, in actual fact, removals were not confined to these species and this led to the rapid deterioration of the forest growth. The trees became moribund and ultimately died under repeated pollarding, and it was not possible to control the removals, which were wide spread and usually took place in the early hours of the morning. A Forest Guard on whom the protection of nearly 10 square miles of forests depends, even if he wants to, cannot see that the felling rules relating to leaf manure removals are obeyed by the public. Further on account of the scattered nature of the exploitation and the unsuitability of the soil in many cases for practising the cheeper methods of regeneration, it is not possible to replace the dying trees by new ones.

6. In view of the above disadvantages the permit system is being replaced by the coupe system. Manure leaf series containing two or three coupes are formed in localities, from which the ryots are accustomed to remove their leaf manure. While removal takes place in one coupe the other coupes are given rest so that the trees in them may recover. The success of this system depends on the proper location of the series ; if they are at a distance from his village, the average ryot does not put himself to the trouble of getting his requirements from them, but helps himself elsewhere. This, to a large extent prevents our locating the series in places where cheap methods of artificial regeneration will be possible. Under the coupe system it has been found possible to increase the stocking of manure leaf species, by artificial methods, but not to the extent we would desire, because finance is a ruling factor. But where manure leaf removals have to be permitted from the reserves, the coupe system does less harm than the permit system. Even this coupe system is not the last word on the subject. No doubt the trees get some rest before they are pollarded again, but this will only retard the destruction of the trees, without averting it.

7. Recent experiments have indicated that regeneration of tree species with *Kumri* cultivation is the cheapest method, and this practice can be adopted for raising manure leaf plantations either in forest reserves or elsewhere. *Kumri* consists of the intercultivation of tree species with field crops. This method costs the Forest Department little or nothing, for the *Kumri* cultivator gets the benefit of the field crop, and in return raises and looks after the forest crop during the period he cultivates the land. But this *Kumri* method can be tried only in arable localities. Manure leaf species may be raised in this manner and they can be pollarded for leaf manure till the trees show signs of stagnation. Then the whole area can be clear felled and the cut plant growth burned on the land itself and a new crop of manure leaf plants can be raised by the *Kumri* method. The burning and the resultant ash will restore, at least partially, the fertility of the forest soil. The above seems to be a distinct possibility for the future and it is intended to try this method, with the co-operation of the public, in fairly level localities where erosion is unlikely, but where green leaf manure is necessary and where, at the same time, there is a demand for land on these terms.

8. **Green Leaf Manure supply and the Agricultural Department.** The experiments conducted by the Agricultural Department have revealed *that much better grain crops can be grown with the aid of green manuring crops raised on the land itself, and ploughed in than by the application of tree leaves.* The mechanical effects on the soil, of a crop grown "*in situ*" and ploughed in, are much more permanent than those of tree leaves carted from outside and applied to it.

For an expenditure of Rs. 5 per acre, a green manuring crop can be produced which will give results equal to the application of Rs. 25 worth of oil cake (Poonac).

9. About 12 tons of green manure per acre have been produced by sowing *Sesbania aculeata** (Telugu :— *Errajiliga* ; Tamil :— *Mudcombai, Nircombai* ; Malayalam :— *Kittenna,*) a good green manure, on the wet lands, after the paddy crop had been harvested. One acre under this plant will produce sufficient green manure for at least four acres, i. e. it will come to three tons or eight cartloads per acre, the quantity which an average ryot applies to his land per annum. So the cost of green manuring an acre according to the above method will come to only Re. 1—4—0, whereas if the ryot wants to get the same quantity of green leaf manure from the reserve, he will have to pay the Forest Department Rs. 16 at the rate of Rs. 2 per cartload permit. In addition he has to bear the cost of collection. This shows how remunerative it will be for ryots to raise their own crop of green leaf manure.

10. The above facts, based as they are on extensive experiments carried out by the Agricultural Department, prove that the ryots need not necessarily depend on the reserves and the unreserves for their green leaf manure; they themselves can raise it without difficulty, at a low cost and without much trouble. In this connection it is reassuring to read from the reports of the Agricultural Department that the practice of growing green manure crops is increasing in popularity in the Presidency, and it is hoped that the demand on the reserves and the unreserves for leaf manure will progressively diminish, and ultimately die out, leaving the forests to fulfil their proper functions, instead of subjecting them to an additional and *unnecessary* demand, which always involves their deterioration, and ultimately must lead to their complete destruction.

C. P. Karunakara Menon,
Secretary to Government, Development Dept.

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* Popularly known as *Daincha* Ed. M. A. J.

Correspondence.

To

The Editor,

Madras Agricultural Journal.

Sir,

Messrs The Mysore Spun Silk Mills Ltd., Channapatna (Mysore State) are prepared to purchase pierced Eri cocoons at 8 to 12 annas per lb. F. O. R. Channapatna depending on the quality. Further particulars can be had from the company direct.

Yours truly,
M. C. Cherian,
Government Entomologist.

Coimbatore,
April 18, 1940.

Weather Review—MARCH 1940.

RAINFALL DATA

Division	Station	Actual for month	Departure from normal @	Total since January 1st	Division	Station	Actual for month	Departure from normal @	Total since January 1st
Circars	Gopalpore	6·9	+6·4	7·0	South	Negapatam	0·0	-0·3	0·1
	Calingapatam	3·8	+3 4	4·1		Aduthurai *	0 0	-1·4	0·2
	Vizagapatam	1·4	+1·1	1 8		Madura	0·6	+0·1	0·6
	Anakapalli *	1·4	+0·9	4·6		Pamban	0·0	-0·5	2 2
	Samalkota*					Koilpatti*			
	Maruteru *	1·8	+1·6	1·8		Palamkottah	0·1	-0·9	0·2
	Cocanada	3·0	+2·5	3·0					
	Masulipatam	2·7	+2 4	2 7					
	Guntur*	4 0	+3 9	4·0	West Coast	Trivandrum	0·0		0·0
						Cochin	0 0	-2·0	0·1
Ceded Dists.	Kurnool	0·0	-0·3	0·1		Calicut	0·0	-0·5	0·1
	Nandyal*	0·0	0·0	0·0		Pattambi *	0·0	-1·0	0·0
	Hagari *	0·0	-0·2	0·0		Taliparamba *			
	Siruguppa*	0·0	-0·2	0·0		Kasargode *	0·0	-0·6	0·0
	Bellary	0·0	-0·2	0·0		Nileshwar*	0·0	-0·3	0·0
	Anantapur	0·0	-0·2	0 0		Mangalore	0·0	-0·1	0·0
	Rentachintala	0·1		0·1					
	Cuddapah	0·3	+0·1	0 3					
	Anantharaju-pet *	1·0	+0 8	1·0	Mysore and Coorg	Chitaldrug	0·0	-0·3	0·0
						Bangalore	0·1	-0·4	0·1
Carnatic	Nellore	0·8	+0·6	1·0		Mysore	0·0	-0·3	0·0
	Madras	0·2	0·0	0·3		Mercara	0·0	-0·6	0·0
	Palur *	0·0	-1·9	0·0					
	Tindivanam *	0·0	-1·5	0·6	Hills	Kodaikanal	1·4	-0·6	1·4
	Cuddalore	0·3	+0·1	0·6		Coonoor			
Central	Vellore	0·1	-0·1	0·1		Ootacamund *	0·5	-0·2	0·5
	Salem	2·3	+1·8	2·3		Nanjanad *	0·0	-1·0	0·0
	Coimbatore	0·1	-0·4	0·1					
	Coimbatore A. C. & R. I.*	0·2	-0 6	0·2					
	Trichinopoly	0·3	-0·1	0·3					

*Meteorological Stations of the Madras Agricultural Department.

@ From average rainfall for the month calculated upto 1937 published in the Fort St. George Gazette.

Weather Review for March 1940. The weather was generally dry over the peninsula except on the North Madras Coast during the beginning of the month when secondary low pressure areas derived from western disturbances traversing upper India, caused thunder storms and rain. In the south of the peninsula thunder storm activity was very low and only about the 25–26th a few scattered thunderstorms occurred in the vicinity of the hills.

Rainfall was in large excess in the North Madras coast and was generally in defect elsewhere. The chief falls reported were:

Calingapatam	3·3 inches on the 9th.
Gopalpore	1·6 inches on the 8th and 1·3 inches on the 28th.
and Salem	1·2 inches on the 26th.

Skies were moderately to heavily clouded in the North Madras Coast, Malabar and North Konkan; and lightly to moderately clouded in South East Madras; and clear or lightly clouded elsewhere. Humidity was in excess in the Bombay Deccan and parts of North Madras Coast, and was in defect in South Deccan, Malabar and South East Madras. The maximum and minimum temperatures were below normal in the Bombay Deccan and North Hyderabad while they were above normal in South East Madras and South Hyderabad.

Weather Report for the Agricultural College and Research Institute Observatory. Report 3/40.

Absolute maximum in shade	...	98·0°F.
Absolute minimum in shade	...	63·0°F.
Mean maximum in shade	...	94·6°F.
Departure from normal	...	–0·2°F.
Mean minimum in shade	...	68 3°F.
Departure from normal	...	–1·4°F.
Total rainfall for the month	...	0·20″
Departure from normal	...	–0 60″
Heaviest fall in 24 hours	...	0·20″ on the 26th.
Total number of rainy days	...	1
Mean daily wind velocity	...	1·5 m. p. h.
Departure from normal	...	–1·2 m. p. h.
Mean humidity at 8 hours	...	64·1%
Departure from normal	...	–5·6%

The weather was dry during the month but for a light shower on the 26th. The rainfall, maximum and minimum temperatures, the mean humidity at 8 hours were all below normal, but temperatures rose to above normal at the end of the month.

P. V. R. & F. L. D

Association of the Upper Subordinates:— The Secretary of the Association of Upper Subordinate Officers of the Madras Agricultural Department writes under date 24th April 1940:— "The Annual general body meeting of the Association of the Upper Subordinate Officers of the Madras Agricultural Department will be held during the "College Day Week" in the month of July 1940. All members of the Association are invited to be present at the function".

Departmantal Notifications.

Gazette Notifications.

Appointments.

Sri T. Budhavidheya Rao Nayudu, Deputy Director of Agriculture, (on leave) Cuddapah is appointed to act as Superintendent, Livestock Research Station, Hosur, in Category 6, Class I, Madras Veterinary Service with effect from the date of taking charge.

Sri E. Kunhappa Nambiyar, Upper Subordinate, Agricultural section is appointed as officiating Assistant Director of Agriculture, St. Thomas Mount without prejudice to his leave

Sri L. Narasimha Acharya, Agricultural Demonstrator, Chittoor is appointed to officiate as Assistant Director of Agriculture, St. Thomas Mount Vice No. (iii) on leave.

Transfers.

Name of officers.	From	To
Sri C. Ramaswami Nayudu,	Junior Lecturer in Agri. and Asst. Supdt., Central Farm, Coimbatore.	Offg Dy. Director of Agriculture, II Circle, Cuddapah.
,, M. Kanti Raj Nayudu,	Asst. D. A., St. Thomas Mount,	Junior Lecturer in Agri. and Asst. Supdt., Central Farm, Coimbatore.

Subordinate Service.

Promotions.

Sri P. Krishna Rao, Assistant in Millets Section, Coimbatore in IV grade (old) to III grade (old) on Rs. 200 to be provisionally substantive, with effect from 1st March 1940.

Sri V. Panduranga Rao, Assistant in Millets V. Grade (old) IV grade (old) on Rs. 120—10—170—to be provisionally substantive with effect from 1st March 1940.

Confirmations.

Janab Muhamad Obaidulla Shah Sahib, upper subordinate in the Madras Agricultural subordinate service is confirmed as Assistant in Paddy Section in the new III grade provisionally, with effect from 1st March 1940.

Transfers.

Name of officers.	From	To
Sri V. Kumaraswami,	F. M., A. R. S., Nandyal,	A. D., Kandukur.
,, L. Narasimhacharya,	Offg. Asst. D. A., St. Thomas Mount,	A. D., Chittoor.
,, G. Venkataramana,	A. D., Bapatla,	A. D., Vinukonda.
,, K. V. Reddi Naidu,	A. D., Vinukonda,	A. D., Bapatla.
,, M. Satyanarayana,	A. D., Pithapuram,	A. D., Yelamanchily.
,, K. Satyanarayanamurthy,	A. D,, Madanapalle,	A. D,, Chittoor.
,, P. K. Natesa Ayyar,	Agri. Instructor, Warda Training School, Coimbatore.	A. D., Omalur.
,, R. Soundararajan,	Offg. F. M , A. R. S., Pattukottai,	Offg. Asst. in Mycology, Coimbatore.
,, James Colaco,	Offg. F. M. A. R. S., Nanjanad,	Offg. F. M., Sim's Park, Coonoor.

Leave.

Name of officers.	Period of leave.
Sri K Rajabapaniah, F. M., A. R. S., Guntur.	Extension of l. a. p. for 2 days half average pay on m. c for 2 months and loss of pay for 1 month and 29 days from 30-3-40.
„ P. Kesavanunni Nambiar, A. D., Manantoddy.	L. a. p. on m. c. for 1 month from 12—4—40.
„ T. D. Easwara Ayyar, Asst. F. M , Sim's Park, Coonoor,	L. a. p. for 4 months from 1—4—1940,
„ M. K. Gopalan, A. D., Proddathur.	L. a p. for 1 month from 1--4—40.
„ K. Govindan Nambiar. A. D., Cheyyar.	L. a. p. on m. c for 4 months from 28—3—40
„ P. Narayana Nair, A. D., Coimbatore.	L. a. p. for 30 days from 26—2—40,
„ R. Subramaniya Ayyar, Asst. A. D , Nannilam.	L. a. p. for 1 month from 21—3—40.
„ P. Subramaniam, Millet Asst., Nandyal.	L. a. p. for 2 months from 15—4—40.
Janab H. Soopi Hajee Sahib, Lower Subordinate.	Extension of l. a. p. for 1 month from 1—4—40.
Sri E. K. Govindan Nambiar, F. M., A. R. S., Taliparamba.	L. a. p. for 4 months from 15—4—40.
„ K. M. Jacob, A, D., (on leave).	Leave on half average pay on m, c. for 2 months from r. lief.
„ P. K. Kannan Nambiar. F. M., A. R. S., Nileshwar.	L. a. p. for 1 month from 1—4—40.
„ M. Kalimuthu, Teaching Asst. in Agri. Coimbatore.	L. a. p. for 2 months from 15—4—40.
„ C. S. Rajarathanam, Asst. A. D. in Mycology.	L a, p, for 1 month from 28—3—40.
Dr. R. Sankaran, Asst. Cotton, Coimbatore.	L. a. p. for 1 month from 27—3—40.
Sri G. Narasimhamurthi, F. M., A. R. S., Siruguppa.	L. a. p. for 30 days from 1—4—40.
„ K. Gurumurthi, A. D , Tobacco Market Committee, Guntur.	L. a. p. for 1 month from 13—3—40.
„ M. Gopala Unnithan, A. D., Tirupattur.	L. a. p. for 30 days from 17--4—40.
„ M. Vencoba Rao, Asst. in Cotton, B. T. S., Hagari.	L. a. p. for 1 month from 22—4—40.
„ S. Ramachandra Ayyar. A. D., Tinnevelly.	L. a. p. for 1 and ½ months from 25-4-40.
„ K. Rama Rao, A. D., Bellary.	L, a. p. for 2 months from 15—4—40.