

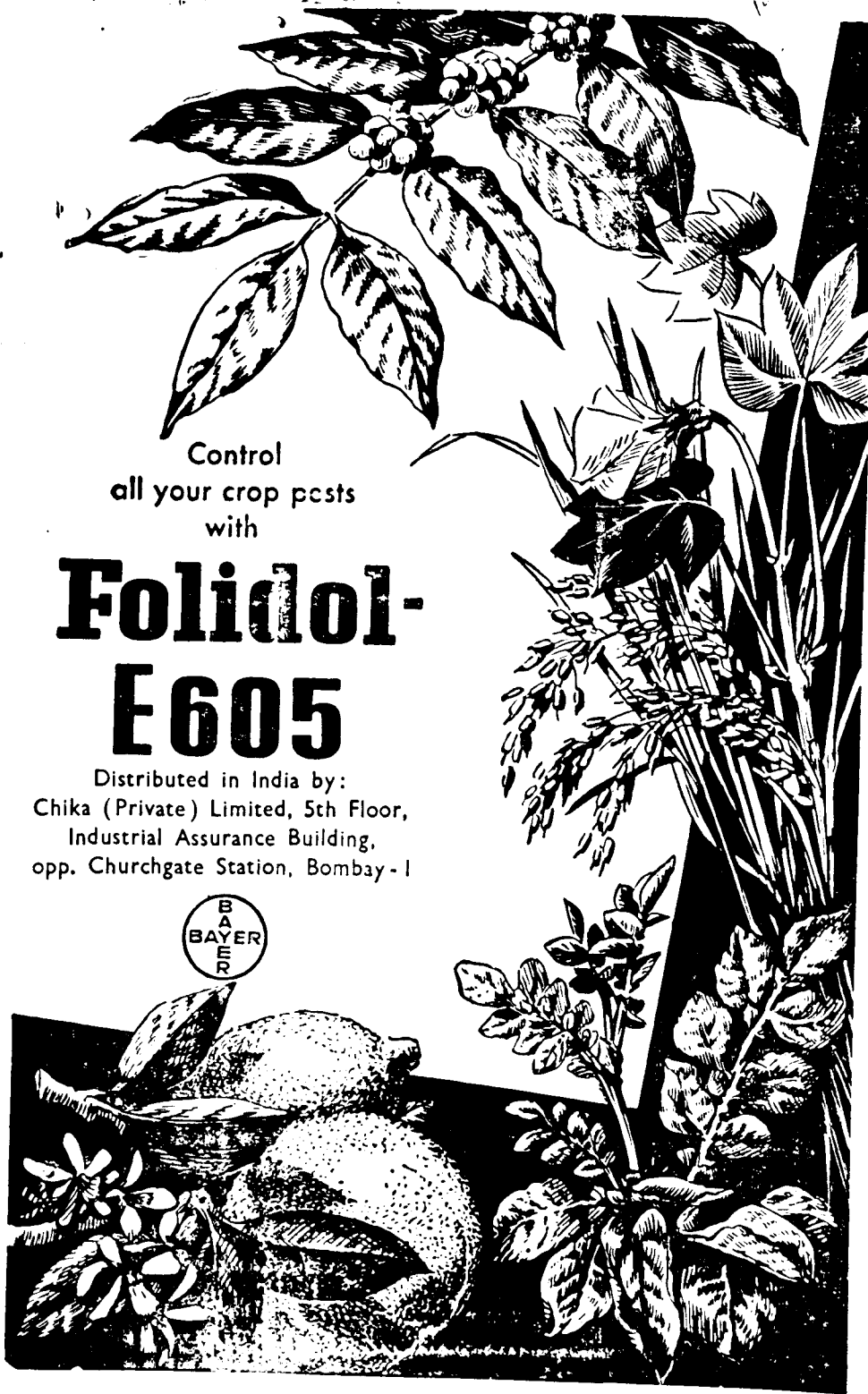
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Journal

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July 1957

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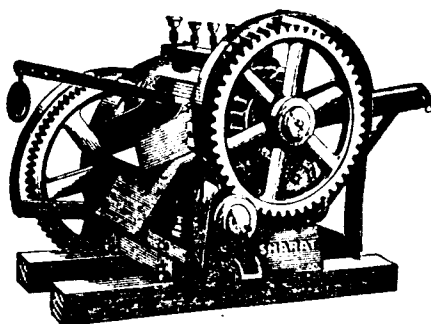
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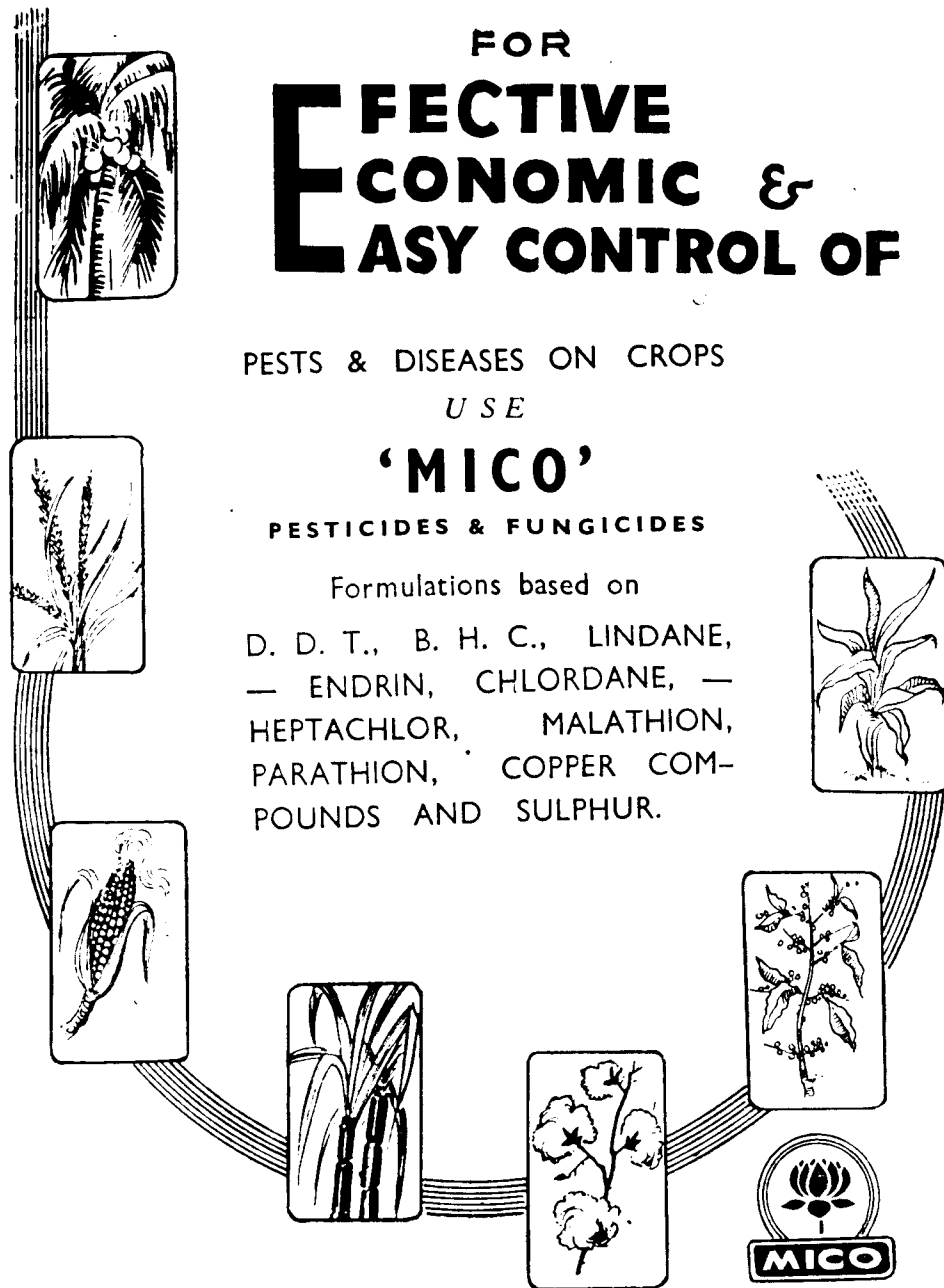
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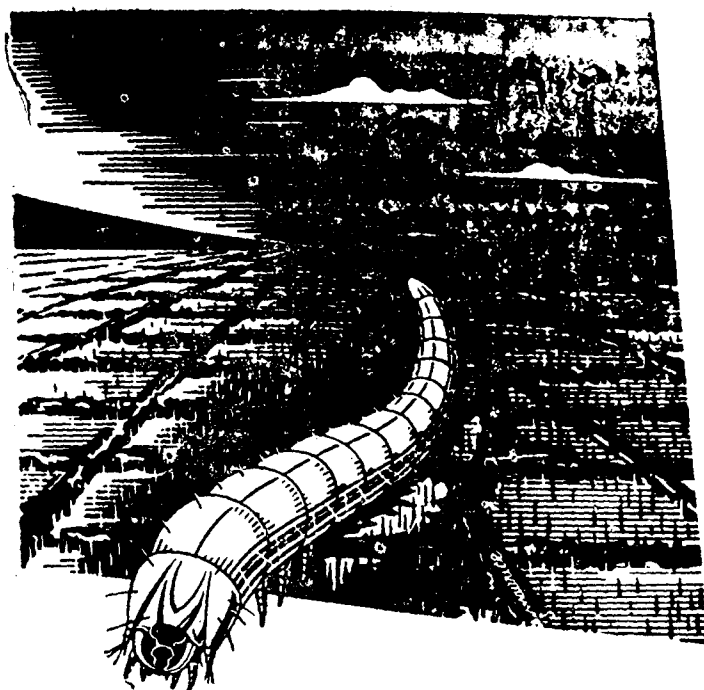


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Editorial

In this fast changing world, technological progress in all fields have been breath-taking and that in the field of fertilisers is no exception. The developments in our knowledge of the role of plant nutrients and their production technology have been revolutionary. From a new-born infant during the middle of the last century, this one hundred-year-old industry now occupies a position of vital importance in the agricultural economy of the world. As a sure method of increasing crop yields, greater and more efficient use of commercial fertilisers occupy a high priority in countries all over the world. Production and consumption of fertilisers have touched very high levels and are still moving forward and in India too, rapid progress has been made to increase production of synthetic fertilisers.

In Madras, the use of fertilisers has expanded rapidly in the last decade. The consumption last year was 1,40,000 tons and this is expected to go up to 1,60,000 tons during the current year. As our Minister for Agriculture, Sri. M. Bakthavathsalam observed the other day while opening the superphosphate factory at Avadi, the supply of fertilisers is still inadequate to meet the needs of our State. Apart from increased consumption, there has been a marked change in the geographical pattern in the use of fertilisers. As against their intensive use for plantation crops and potatoes on the hills some decades ago, fertilisers are now extensively used for a variety of other crops all over the State. The use of straight fertilisers that was in vogue previously is gradually giving place to the use of mixed

fertilisers. Newer materials as sources of plant nutrients as for example urea and ammonium nitrate are coming into greater use and the search for efficient and economical use of these is going on all the time.

The expansion in the use of fertilisers, the change-over to the use of fertiliser mixtures and the use of newer fertiliser ingredients have all created fresh problems in respect of quality, methods of application and economic dosages. It is therefore timely that the Government have now enforced the Fertiliser Control Order with a view to ensure minimum standards in the quality of the fertilisers put on the market. The farmer is now protected in regard to the quality and price of the fertiliser mixture he is buying. This is a very healthy development because, of late, a large number of mixtures of unknown composition and quality have flooded the market, each vying with the other in claiming special qualities. Elsewhere in this issue, we give a review of the results of a large number of experiments carried out all over our State and the conclusions arrived at on the use of fertilisers which would interest our readers.

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Secretary.
Madras Agricultural Union

Influence of Temperature and Humidity on the Growth of Sorghums

by
R. APPATHURAI
Agricultural Research Institute, Coimbatore

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Introduction: Ponnaiya and Appathurai (6) have discussed the yield behaviour of millets when sown in the different months of the year. A further study of the data, in relation to the weather factors reveal a few interesting indications about the influence of temperature and humidity on the growth of two Sorghum types.

Materials and Method: Two Sorghum types were studied (i) *Cholam K. 2* (Sorghum subglabrescens), a pure-line strain from the summer Vellai Cholam of the Tirunelveli area having a duration of 90 days and (ii) *Cholam Periyamanjal Irungu* (A. S. 7081) (Sorghum dochna), an extracted type from a cross between the Periamanjal Cholam (Sorghum durra) of Coimbatore and the Irungu Cholam of the Tirunelveli (Sorghum dochna). For the purpose of discussion in this paper the former type is being named as summer type and the latter as main season type.

The materials were sown over two small plots of 0.15 cents each, on the 15th day of every month commencing from June, 1951 to May, 1952, in the red-soil area of the Agricultural Research Station, Kovilpatti. The seeds were sown in lines 2 links apart and the plants were thinned to a final spacing of 1 link between the plants in the rows and 2 links between rows.

The following observations were recorded:

- (1) Seedling weights (average of 5 sets of 10 seedlings each) were recorded on the 13th day after sowing for the crops sown each month.
- (2) The mean height of 20 plants from each type was recorded on the 13th day after sowing, on the 20th day and once in twenty days thereafter until harvest.
- (3) The flowering dates were recorded for each month's crop and the duration worked out from it.
- (4) The yield of grain and straw were also recorded for the different months. The occurrence of diseases and pests were noted then and there. Threshing percentages were also calculated to have an idea of the seed setting when sown in different months.

Discussion: (a) *The Vegetative Behaviour:* By studying the height attained by crops sown in the different months at different stages of growth (Table I) it can be observed that the rate of growth for Cholan K. 2 is maximum between the 20th and 60th day after sowing and differences due to seasons are noticed to the maximum extent only during this period. The period of maximum rate of growth for Cholan A. S. 7081 extends upto 80 days and the changes in growth due to seasons are also felt only between the 20th and 80th day after sowings. It is observed that the growth ceases soon after flowering, the general span between sowing and flowering, being 60 days for Cholan K. 2 and 80 days for Cholan A. S. 7081. The crops sown in December and January grows upto 80 days in the case of Cholan K. 2 and 100 days in the case of Cholan A. S. 7081 as they flower late when sown in these months.

It is interesting to note that the graph representing the weight of 10 seedlings on the 13th day after sowing almost follows the course of those for the average maximum and minimum temperature for 15 days following sowings. This is almost the same for both the crops which shows that both the types respond to temperature conditions in the same manner upto a fortnight after sowings. The maximum weight is attained by the crops sown in the months of August, September, October and April, when the mean maximum temperature is 94 deg. to 98 deg. F and the minimum 75 to 76 deg. F. As the temperature is very high (99.5 deg. F) in May the young seedlings probably could not withstand it which might have resulted in reduced seedling weight. As both the temperatures were very low (maximum 87 deg. F and minimum 67 deg. to 70 deg. F) for the crops sown in December and January the weight tends to be reduced. A minimum temperature below 74 deg. (March) or above 77 deg. (June, July) also seems to reduce weight irrespective of maximum temperature. The height also more or less follows the course taken by the weight of seedlings on the 13th day after sowings though there are changes which will be explained subsequently.

By studying the graphs representing the daily maximum and minimum temperatures, relative humidity, wind velocity, rainfall and sunshine in relation with those for height at various stages of growth and weight of seedlings on the 13th day after sowings the following general conclusions can be drawn.

September, October and April seem to be the best for the summer cholam type (Cholan K. 2) as far as the maximum height (vegetative vigour) is concerned. For the main season type

FIG 1
MEAN WEIGHT OF 5 SETS OF 10 SEEDLINGS
ON THE 13th DAY AFTER SOWING

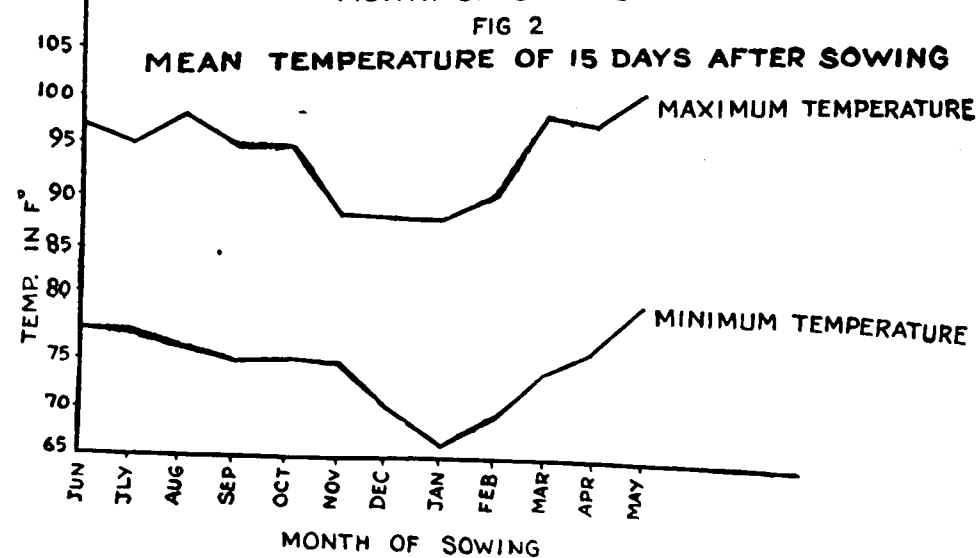
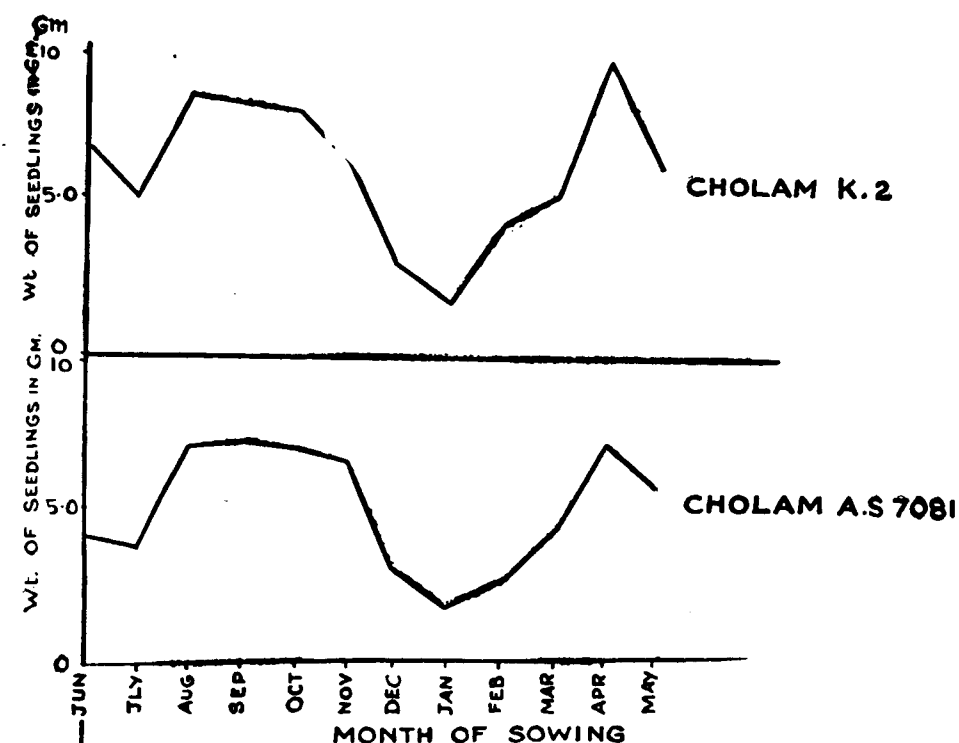
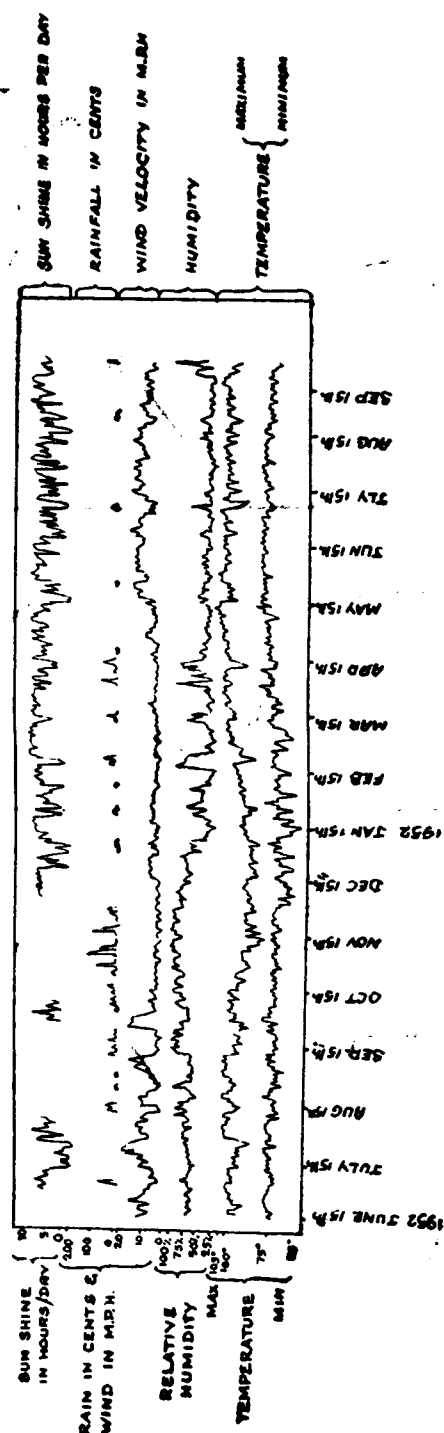


FIG 3
GRAPH REPRESENTING DAILY WEATHER CONDITIONS
PREVAILING DURING THE PERIOD UNDER DISCUSSION



(Cholam A. S. 7081) the crops sown from June to October show the maximum height, those sown in February coming next and those of March to May being further next. Both the types show minimum vegetative growth when sown in December and January when the growth period is subjected to very low temperatures (maximum below 95 deg. F and minimum far below 75 deg F). The maximum temperature during the growth period of the September sown crops is ranging from 90 deg. to 100 deg. F and the minimum temperature round about 75 deg. F. This seems to be the best for elongation in height for both the types of Cholam. The summer type is able to withstand a higher maximum temperature (95 deg. to 105 deg. F) and is able to attain the same height as that of the September crop; whereas the main season type requires high humidity above 60% and is not able to tolerate a maximum temperature above 100 deg. F. This is clear from the heights attained by both the crops when sown in April, that of Cholam K. 2 almost equalling the September-sown crop and that of Cholam A. S. 7081 being far low. Even the summer type prefers a low temperature during the early seedling stage as the May sown crop suffers a lot, due to both the maximum and minimum temperatures being very high during the early seedling stage 104 deg. F and 80 deg. F respectively. The growth of the summer sown (March to May) A. S. 7081 extends upto 110 days showing slow rate of growth. This late development may be attributed to the low humidity prevailing during the period. When the minimum temperature is highly fluctuating during the early seedling stage the height seems to be affected as exemplified by the crops sown in December, January, March and May also. The good height attained by the October sown crops of both the types inspite of the maximum temperature going down below 90 deg. F after the first few days after sowings shows that the temperature during the first 15 days itself is sufficient to lay a good foundation for the final height of the crop. The minimum temperature during this period is normal (round about 75 deg. F) and uniform.

A reasonable maximum height attained by the February crop of Cholam A. S. 7081 suggests that as this type has a longer duration, it is able to make up the height lost due to low maximum temperature during early seedling stage with the help of the gradual rise in temperature during its growth period. To begin with the temperature was near 95 deg. F. It went down to 85 deg. F in a week, then gradually rose up above 95 deg. F in March (15 days after sowing) and thereafter it continues to be like that throughout

the growing period. From the height graph also it can be seen that the rate of growth was slow in the beginning (20th to 40th day) but gains thereafter to make up a considerable maximum height on the 80th day.

In the summer type, this adaptability is lacking as the crop has a comparatively shorter life span, though there is a slight indication of the February crop growing faster after the 40th day to attain an equal height with the March crop. The proportional heights for the 40th day and 60th day are almost similar for the crops sown in the different months which shows that the height is more or less fixed by the conditions prevailing in the early stages of growth itself.

(b) *Duration*: In general the duration seems to be the combined effect of two factors viz., temperature and humidity. Very low temperature i. e., maximum below 95 deg. F and minimum below 75 deg. F during the growth period tends to extend the duration (December to January). High humidity above 80% seem to shorten the duration (e. g., October and November) a low humidity below 50% tending to lengthen it (e. g., April — May).

For the April sown *Cholam K. 2*. during the growth period the following conditions prevailed viz., maximum temperature round about 100 deg. F, minimum slightly above 75 deg. F (shortening factors), humidity ranging between 25% and 50% (lengthening factors). As both the shortening and lengthening factors are reacting, the duration of the April sown crop is medium.

Cholam A. S. 7081 more or less follows the same principle with high stress on the effect of relative humidity. This is clear from the duration of crops sown in April and May being unduly lengthened because of low humidity, though the temperature tends to shorten it. The normal duration is attained by the crop sown in July which is subjected to the following weather conditions, maximum temperature round about 100 deg. F, the minimum round about or slightly about 75 deg. F and the humidity ranging from 50 to 80%.

(c) *Yield Behaviour*: The exact principles involved in the yield performance is difficult to be explained in a detailed way though a general outline of the behaviour of the two types of Sorghums is possible. The low relative humidity during the life period of April sown *Cholam K. 2* is accompanied by high yield, and the high relative

humidity during the life of the *A. S. 7081* crop sown from June to September is attended by high yield. This indicates the importance of relative humidity in conditioning the yield behaviour of the two types of *Cholam* — *Cholam A. S. 7081* requiring high humidity and *Cholam K. 2* preferring a lower relative humidity.

That a good initiative (by way of enhanced vegetative vigour) helps in the production of grain yield inspite of the subsequent unfavourable factors for development (high relative humidity in the case of *Cholam K. 2*) is explained by the July to September sown *Cholam K. 2* giving moderate yields.

The crops sown from June to September experience a high windy weather and those sown in April receive light wind. It is possible that the differential response of the two types of *Cholam* to wind velocity may contribute to their distinctive yield behaviour.

Summary: A study of the behaviour of two distinct types of Sorghum in relation to weather conditions when sown in the different months of the year was taken up at the Agricultural Research Station, Kovilpatti. Both the types were found to be adversely affected when sown during the winter months of December and January — low vegetative vigour, late development, and very poor yield being the result. Among the other months, September and October seem to be very suitable for the vegetative growth of both the types. The summer cholam type is able to tolerate the April temperature and attain a good height equal to that of September crop whereas the main season type requires more moisture and cooler conditions and fails when sown in April. The duration of both the types of crop seems to be controlled by temperature and relative humidity, a low average in these factors delaying ripening; but *A. S. 7081* seems to show some preference to humidity for quicker development as compared to the other type. The net result of the reaction of all the weather factors on the distinctive behaviour of the two types is that a good crop of *Cholam K. 2*, is attained when sown in April 15th and a good crop of *A. S. 7081* when sown in the month of July to September.

The author's thanks are due to Sri B. W. X. Ponnaiya for his valuable guidance in conducting the experiments and to Sri L. Neelakantan, for guidance in preparing the paper. The author is also indebted to Sri B. Seshamani for helping him in recording the various data.

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TABLE I
Height of Crops Attained at Different Stages of Growth.
(In Centimeters)

Months of sowing	CHOLAM K. 2 (Age of the crop in No. of days)						CHOLAM A. S. 7081 (Age of the crop in No. of days)						
	13	20	40	60	80	100	13	20	40	60	80	100	120
June	6-30	..	61-23	130-60	132-45	..	4-78	..	30-28	70-30	162-55	204-53	208-15
July	5-40	9-58	72-85	..	176-20	..	4-59	9-90	49-15	..	264-95	204-45	..
August	9-49	12-48	116-45	171-20	..	..	9-94	13-70	58-50	168-25	259-05	206-10	..
September	9-62	9-30	114-90	201-00	..	..	9-42	12-45	92-20	278-25	320-15	..	..
October	8-42	11-90	106-20	186-75	193-60	..	9-68	15-43	113-08	265-10	283-50	239-55	..
November	6-97	9-95	71-00	129-40	130-20	..	9-04	12-30	47-85	169-80	172-25	182-25	..
December	4-40	6-18	8-53	35-85	92-65	107-85	5-58	7-00	11-45	40-50	132-15	169-00	..
January	3-52	6-10	20-80	85-00	121-05	..	4-08	6-10	19-15	60-70	146-25	189-45	..
February	5-62	7-53	46-65	130-45	132-05	132-85	5-86	8-13	29-60	122-55	249-50	..	..
March	5-79	8-03	60-15	128-00	129-10	..	5-16	8-83	46-35	105-20	132-65	213-70	227-70
April	6-36	7-40	85-65	184-45	194-25	..	8-45	8-75	54-70	115-45	172-10	216-75	244-05
May	6-25	7-95	55-10	154-10	141-10	..	6-01	8-23	37-00	84-25	112-35	172-12	208-75

TABLE II.
Duration and Yield Particulars.

Months of Sowing	Date of Sowing	CHOLAM K. 2						CHOLAM A. S. 7081					
		Duration (Sowing to ripening)	Date of flowering	Wt. of ear-heads per acre in lb.	Wt. of dry grain per acre in lb.	Wt. of green straw per acre in lb.	Threshing %	Date of flowering	Duration (Sowing to ripening)	Wt. of ear-heads per acre in lb.	Wt. of dry grain per acre in lb.	Wt. of green straw per acre in lb.	Threshing %
June	15-6-1951	87	11-8-1951	1395	237	13583	15.2	26-9-1951	133	3630	2651	26550	75.1
July	15-7-1951	89	12-9-1951	2887	1379	17585	47.8	12-10-1951	119	4288	2522	32086	58.8
August	15-8-1951	86	10-10-1951	1670	759	21722	45.5	30-10-1951	106	4353	2651	30601	60.9
September	15-9-1951	87	11-11-1951	3663	1423	19998	33.8	20-11-1951	96	4396	2522	32691	57.4
October	15-10-1951	84	8-12-1951	1121	377	11378	33.7	17-12-1951	93	2094	362	16895	43.8
November	15-11-1951	83	7-1-1952	841	210	9352	25.0	12-1-1952	88	1629	927	13814	57.3
December	15-12-1951	105	28-2-1952	586	75	5775	13.0	4-3-1952	110	1379	797	8275	58.2
January	16-1-1952	100	26-3-1952	621	151	7586	24.1	26-3-1952	100	1508	474	14482	31.8
February	15-2-1952	89	14-4-1952	1078	366	9310	34.0	4-5-1952	109	1853	673	19309	36.3
March	15-3-1952	85	9-5-1952	562	215	6862	38.5	23-6-1952	130	948	350	27239	36.9
April	15-4-1952	91	14-6-1952	6864	3556	22067	51.8	14-8-1952	152	1542	366	44522	23.6
May	15-5-1952	93	17-7-1952	398	27	14783	6.9	2-9-1952	141	862	410	17369	46.9

Manuring Crops *

by
Dr. A. MARIKULANDAI
Agricultural Research Institute, Coimbatore

Use of Fertilisers: It was Dr. J. A. Voelcker, consulting Chemist, Royal Agricultural Society, who, in 1889, first recommended the use of fertilisers for India. At that time only ammonium sulphate, superphosphate and sodium nitrate were known. In 1909, the first permanent Manurial experiments in India were started at Coimbatore to compare the effects of N, P and K individually and in combination with Farm Yard Manure. Later when the Council of Agricultural Research in India got interested in fertiliser studies, a number of manurial trials were initiated. At that time results had shown that nitrogen and organic matter responded to their use while response to phosphorus and potash were varying and conflicting. Meanwhile, the science of Statistics came to be well established as an adjunct to agricultural investigations and subsequent experiments on manures and fertilisers were laid out according to the requirements of this science. Many short term experiments to compare the effect of different forms of fertilisers were laid out throughout the country, particularly for the major crops like paddy, wheat, cotton and sugarcane.

All these experiments were mostly laid out in Government farms or colleges. When Dr. A. B. Stewart came out in 1945 and reviewed the manurial position in India in his report to the I. C. A. R. he was of the opinion that though much data was available in the country on manurial values, very little was known about the responses in cultivators' fields and consequently in 1949, Stewart's manurial experiments in cultivators' fields were implemented by the I. C. A. R. and in 1951, Madras, West Bengal and Bihar tried out these simple manurial trials in cultivators' fields in one district only in each of these States and in Madras, Tanjore district was the venue of these experiments.

Based on the suggestions of Dr. F. W. Parker in 1952 under the Operational Agreement No. 4 "Project for the determination of soil fertility and fertiliser use" jointly by Technical Co-operation

* Abstract of the Lord Curzon Endowment Lecture, 1957. Delivered under the auspices of the University of Madras and kindly permitted to be published by the University of Madras.

Mission and Government of India, an overall project was implemented. A two fold approach was made to the manurial problem in India, viz. (1) to conduct complex replicated experiments at a few centres; and (2) to have many simple, unreplicated experiments on cultivators' fields. The planning of the experiments however was greatly influenced by the original report of Dr. A. B. Stewart in 1945. Simple experiments (with Control, N, N+P) were laid out by 1953 in about 40 locations covering the wide range of soil and climatic patterns in India. Half of the experiments were in Community Development Blocks and the rest in cultivators' fields. One such location for the erstwhile Madras State was in Mangalore for paddy with about 82 trials. The complex manurial trials were laid out in 15 acre plots in about 20 centres in India, and Aduthurai was one such centre in Madras State, wherein, levels of N and P with forms of fertilisers were tried out. Half of the centres in India were devoted to paddy and the other half to wheat.

In 1954, the free fertiliser demonstration scheme was launched on an All India basis by the Government of India with the main purpose of demonstrating the effectiveness of some of the important new commercial fertilisers, such as urea, ammonium-sulphate-nitrate etc. In Madras, over 1345 demonstrations were done in 1954-55 and with an equal number in 1955-56, under the Regional Fertiliser Officer. In the Second Five Year Plan large number of manurial experiments on a more intensive scale is planned. In Madras, the complex manurial experiments are being done in Aduthurai and Bhavanisagar on paddy, cotton and millets while the simple manurial experiments are scheduled to start off with a centre for every two districts. The free fertiliser demonstration trials are also to continue in a limited scale. Besides these experiments of all India coverage, there are not only numerous manurial experiments under way in Government farms but many manurial firms like the Potascheme are conducting demonstration experiments on their own. Thus, we are now living in an era of "fertilisers and manures" with all the commercial, agricultural and scientific minds being fully manure conscious.

Food Production: In the First Five Year Plan, the Agricultural production of the four principal crops grown in the Madras State shows an overall increase in production of 40% as will be seen from the following figures:—

	Production in 1951—52 Tons	Production in 1955—56 Tons	Increase
Rice	2,163,000	3,063,000	40%
Millets (of all kinds)	843,000	1,338,000	45%
Oilseeds	802,500	893,000	11%
Cotton	227,280 bales	284,000 bales	25%

Average production per acre.

	In 1951—52 lb.	In 1955—56 lb.	Increase lb.
Rice	800	1,033	233
Millets (of all kinds)	565	718	153
Oilseeds	855	1,036	181
Cotton	120	122	2

Our Targets of Food Production: More food will have to be produced if we are to feed the 50 million additional people who are expected to make up India's population in 1961. The Second Five Year Plan as programmed at present envisages a gross increase of 28% in Agricultural production. But the target to be aimed at is still higher according to the National Development Council and for Madras it is stated that if the consumption of cereals is to be maintained at the level of 18.3 oz. fixed by the Planning Commission, the present total production of 44 lakh tons should increase by 20% so that nearly 52.5 lakh of tons of cereals are available to feed the population of 38 millions. This increase of 20% is not going to be easy, particularly after the initial increase shown in the First Five Year Plan.

Importance of Fertilisers: Better seeds, more irrigation facilities, freedom from pests and diseases would all contribute a little towards this increase in production but the main solution lies in scientific manuring. Average rice yields of the State as a whole in comparison with the yields in Government farms is given below:—

State	Average yield of State as a whole lb./acre.	Average yield of experimen- tal stations lb./acre.
Assam	772	1644
Bihar	623	1194
Bombay	883	2138
Madras	1020	2025
Madhya Pradesh	580	1224
Mysore	682	1998
Orissa	600	1951
Uttar Pradesh	584	1151
West Bengal	841	2087

From this it is seen that the yields in the State as a whole can be reasonably doubled by adopting suitable manurial and agronomical practices as in the Government farms. By bringing more and more land under fertilisers, the consumption of fertilisers is also expected to go up as shown below in the Second Five Year Plan (From Dr. Ward, H. Sach, Fertiliser Consultant to the T. C. M. as per his report to the Government).

Targets for consumption of commercial plant foods

Year	Nitrogen	Phosphoric acid	Potash
1956-57	150,000	40,000	12,000
1957-58	190,000	50,000	15,000
1958-59	240,000	70,000	20,000
1959-60	300,000	90,000	25,000
1960-61	370,000	120,000	30,000

Towards this consumption of fertilisers, Government have taken steps to step up production of fertilisers through local production and by imports. But the more important problem is how best to utilise them to get the maximum benefit.

Scientific use of Fertilisers: We hear not only farmers but also the specialists in the different crops asking the question "How many pounds of N, P and K and in what form should one apply per acre". The answer is not easy to give as the soils vary; climate of the country is not uniform and crop requirements are different.

One and the same crop needs more food at one time than at another. Some crops are voracious in their feeding habits while some are frugal. However, factual information developed by the various experiments conducted in the country and in particular in Madras State will be presented here so that the farmers' requirements for N, P and K in relation to the main crops of the State could be broadly indicated for adoption.

A. Paddy: Manurial experiments on paddy have been conducted from very early days by the Madras Department of Agriculture but, as the modern field experimentation technique came to be adopted only after 1930, the experiments from that year to the present date is reviewed here. The experiments done under the auspices of the T. C. M. and I. C. A. R. since 1945 are also reviewed.

Chemical Fertilisers: Nitrogenous Manures: (i) *Ammonium Sulphate:* There has been an universal response to application of ammonium sulphate. The maximum response was at Pattambi (laterite soil) and the minimum response at Samalkot (heavy clay) in the erstwhile Madras State. The response was also at a minimum in Aduthurai (Cauvery alluvium) compared to Pattambi, when the fertiliser was applied singly. The response to increased doses of N as ammonium sulphate was low at Palur (Alluvium). The mixed black and red soils at Coimbatore indicated graded response up to 80 lb. N but on the light sandy soils of Tirurkuppam 20 lb. and 30 lb. N as Ammonium sulphate were on a par. In regard to the time of application, results indicate that one month after planting was suitable. The optimum dose would appear to be 30 lb. N.

(ii) *Ammonium nitrate:* Generally, on the same levels of N, it was equal to ammonium sulphate as the yields were on a par at Tirurkuppam, while at Palur and Aduthurai the results were not significant.

(iii) *Nitrate of Soda:* This fertiliser recorded lower yields than ammonium sulphate on Cauvery alluvium in Tanjore district, in the mixed black and red soils of Coimbatore and in the laterite soil of South Malabar.

Oil Cakes: Good response to oil cakes in general with the maximum at Maruteru (for 48 lb. N as groundnut cake) was noted. When the level of application was at 30 lb. N, the maximum yield was obtained at Pattambi. These results are similar to those obtained for ammonium sulphate. No consistent difference was

noticed between the different cakes at Aduthurai, Pattukottai, Tirurkuppam and Pattambi. But there was some indication to show that neem cake was more suited in seasons of drought than the other common oil cakes like groundnut cake and castor cake at Coimbatore. The levels of N tried in relation to crop response showed the yield to increase up to 60 lb. N in earlier experiments in almost all the places but in some centres the yields due to 60 lb. N and 40 lb. N as cakes were on a par. The experiments to study the time of application of oil cakes indicated that 4 weeks after planting in the case of long duration and 3 weeks after planting for short duration varieties was best at Maruteru, while at Pattambi, application at planting or 3 weeks after planting was the best. In the case of combined application of oil cakes and ammonium sulphate, application of the latter either at planting time in a single dose or in two doses (half at planting and the rest 2 months after planting) was best at Pattambi, while no difference was noticed at Coimbatore between the applications made 30 days and 45 days after planting. Experiments at Aduthurai on the other hand, indicated that groundnut cake or ammonium sulphate applied at planting or a month after planting to the first crop was the best. For the second crop at the same place, groundnut cake at first weeding or a week after planting and ammonium sulphate at second weeding or two months after planting appeared to be optimum.

Green Manures: Trials with green manure showed that at Coimbatore (mixed black and red soils) 4000 lb. was the best in the ranges tried from 2000 to 12,000 lb. At Pattambi (laterite soil) progressive increase in the yield up to 8000 lb. were obtained, when green manure from 2000 to 10,000 lb. were applied along with bone meal. At Pattambi (laterite soil) the optimum dose was 5000 lb. while in Palur (Alluvium) 6000 lb. (for *Kar*) and 9000 lb. (for *Samba*) appeared to be suitable. Between the different forms of green manure tried, there was no marked difference in general but the common weed *Croton sparsiflorus* was inferior to pungam leaves on equal weight basis. No advantage was seen by the use of processed leaf over green leaf. Nor was any cumulative effect found by continuous green manuring for 20 years in Anakapalle. In Pattambi, for broadcast paddy and for semi-dry paddy in Tirurkuppam, green manuring was profitable. In Aduthurai, a combination of 200 lb. of groundnut cake, 100 lb. ammonium sulphate and 4000 lb. of green leaf gave the best yield in one year and 4000 lb. leaf plus 100 lb. ammonium sulphate in another year.

Different forms of N: (both artificial and organic manures) Ammonium sulphate gave the best response at Buchireddipalayam while the differences were not consistent at Aduthurai.

Phosphatic Manures: Early experiments did not give consistent results as the increase in the dosage of P_2O_5 did not show higher yields. In the later experiments no significant difference was noticed between calcined bone, bone meal and superphosphate at the Pad by Breeding Station, Coimbatore, Ambasamudram and Buchireddipalayam. Similarly, there was no difference between calcined and raw bone meal at Aduthurai, Pattukottai and Palur. It can be said in general that response to phosphatic manures was good at Maruteru, while it was absent at Samalkot, Aduthurai, Pattambi, Tirurkuppam and Ambasamudram.

Forms of Phosphates: Among the different forms, Ammonium phosphate gave the maximum yield followed by bonesuper at Aduthurai and Pattukottai. On the laterite soils of Mangalore, bone meal was superior to super and fused phosphate was superior to bone meal. No special benefit due to other forms like hyperphosphate etc. was noticed.

Time and method of application: As regards the optimum time of application, consistent results were not obtained at Coimbatore but application before planting appeared to be suitable. No advantage with reference to grain yield was noticed by the indirect application of phosphate to paddy (through application to green manure) at Palur, Tirurkuppam and Pattambi, even though increased yields of green manure were got at Palur and Pattambi. It was only at Maruteru that 10% more grain was obtained due to indirect application of phosphate.

Ash: Ash by itself gave a good response at Pattambi, while combinations of wood ash either with groundnut cake or green leaf gave the maximum yield.

Lime: A dose of 1500 lb. of lime at Ambasamudram (alluvial soil deficient in lime) did not give significant increase in yield. Lime was found beneficial at Pattambi (3000 lb. per acre) and Mangalore (1000 to 3000 lb.).

Optimum dosage experiment: A combination of 5000 lb. leaf, 250 lb. of groundnut cake and 100 lb. ammonium sulphate and 25 lb. of P_2O_5 was the best at Pattukottai. Groundnut cake and

ammonium sulphate in the ratio of 2:1 N to give a total of 60 lb. N over a basal dressing of green manure (2000 lb.) appeared to be the best at Aduthurai. The balanced manure experiment at Ambasamudram did not indicate the utility of K_2O . Groundnut cake (48 lb. N.) gave the maximum yield.

Maximum Potentiality Experiment: At Maruteru, growth was proportional to N but the yields at 60 and 90 lb. N were on a par and 30 lb. P_2O_5 seemed to be the optimum. The influence of K_2O was not felt. At Buchireddypalayam N up to 60 lbs. increased the yield, combination of smaller P_2O_5 doses of N upto 60 lbs. with P_2O_5 and K_2O contributed to increase the yield. At Tirurkuppam, all the three primary nutrients contributed to the yield. 90 lb. N appeared to be optimum. Application of K_2O at the rate of 60 lb. depressed the yield. At Palur, a combination of 30 lb. N, 10 lb. P_2O_5 and 20 lb. K_2O appeared to be optimum and increase in the dosages of manures lowered the yield. At Aduthurai, N contributed to the yield and K_2O and P_2O_5 did not increase the yield even though a combination of 120 lb. N and 30 lb. P_2O_5 over the basal dressing of leaf gave the maximum yield in one year. At Pattukottai K_2O did not increase the yield and only slight increase was got with 30 lb. P_2O_5 . Progressive increase in yield for application of N up to 60 lb. was obtained. At Coimbatore P_2O_5 and K_2O at any level did not materially increase the yield even though combinations of 120 lb. N and 30 lb. P_2O_5 in one year and 60 lb. N, 30 lb. P_2O_5 and 60 lb. K_2O in another year gave maximum yields. The addition of K_2O to N at higher doses somewhat depressed the yield. At Pattambi also N was the only element that contributed to increase in yield. The favourable influence of K_2O was felt in the absence of leaf only.

Thus, even though the high dose of 120 lb. N in combination with other nutrients gave the highest yield at Coimbatore, Aduthurai and Pattukottai, generally the yields of treatments 60, 90 and 120 lb. N have been on a par. The higher dosage of N (120 lb.) resulted also in lodging of the crop indicating that 60 lb. N is the highest that can be profitably adopted.

Placement of Fertilisers: Experiments conducted after 1950 indicated that ammonium sulphate at the rate of 45 lb. and 30 lb. per acre deeply placed in 2 doses two-thirds at planting and one-third a month later with 10"×10" spacing was better than broadcast application, while, with 6"×6" spacing, placement of 45 lb. N gave better yields than broadcast application. No significant difference was noticed in the case of phosphate application.

Stewart's Manurial Experiments in Tanjore District: Manurial experiments were conducted in various parts of Tanjore District (1952-'55) on farmers' lands to find out the effect of application of 5000 lb. of green leaf, 30 lb. N as ammonium sulphate and 30 lb. P_2O_5 as superphosphate. The ryots method gave on the average 2027 lb. while the green manure (5000 lb.) gave 2183 lb. The increase in yield per lb. of N over the basal application of green manure was 7.4 lb. The application of P_2O_5 resulted in 7.2 lb. per lb. of P_2O_5 over that of N application indicating the need for both P_2O_5 and N for Tanjore soils in farmers lands, though the experiments conducted at the Research Station at Aduthurai and Pattukottai do not bring out the same.

Free Fertiliser Demonstration Trials (1954-'55) Farmers' fields: The response per lb. of N when applied as ammonium sulphate at 30 lb. N level over the ryots method was 20.1 lb. at Chingleput (coastal alluvium), 7.5 lb. at South Arcot (red loam), 12.4 lb. in Tanjore and 15.4 lb. at Coimbatore (mixed black and red soil). The average for the whole state was 13.8 lb. per lb. of N (Cauvery and coastal alluvium). The difference in response between urea and ammonium sulphate was small, being only 0.8 lb. in favour of urea. In the case of phosphorus, the response was smaller than for N. The average for the whole state was 7 to 8 lb. per lb. of P_2O_5 per acre. But the variation between the districts was larger. Responses were poor in Chingleput, Tanjore, Madurai and Malabar.

Agronomical trials at Aduthurai (1954-'55): In experiments conducted over a basal dressing of 3000 lb. to 4000 lb. leaf response per lb. of N was 6.5 lb. (at 20 lb. N level) and 4.8 lb. (at 40 lb. N level) when N was applied as ammonium sulphate. Response to P_2O_5 when applied at 40 lb. per acre at different levels of N per lb. of P_2O_5 were, 11.66 lb. at the rate of 20 lb. N. level, 13.2 lb. at the rate of 40 lb. N. level, 10.8 lb. at the rate of 60 lb. N. level. Response to P_2O_5 at different levels was at 20 lb. P_2O_5 level - 7.2 lb. per lb. of P_2O_5 , and 3.7 lb. per lb. at 40 lb. level.

Experiments conducted by Potascheme (1955-'56): Application of 40 lb. K_2O (as KCl) along with 40 lb. N and 40 lb. P_2O_5 resulted in an extra yield of 266 lb. of paddy due to K_2O per acre. The highest response to K_2O was 437 lb. in Tiruchirapalli for the second crop paddy.

Conclusions: From all this factual presentation of the manurial experiments done on paddy it is clear that one uniform recommendation is not possible but one may however draw the following conclusions:

1. Manuring of seed bed alone is not sufficient. The transplanted field also should be properly manured.
2. Green manure in any form is useful and progressive yields up to 8000 lb. can be obtained even though the optimum quantity ranged round about 4000 lb. to 5000 lb. Green manure was the cheapest form of N.
3. Oil cakes are as good as artificials as suppliers of N.
4. Bulky organic manure like cattle manure, compost, synthetic farm yard manure, sheep manure, fish manure and night soil were equal in effect and similar to green manure, the optimum dose being 30 to 40 lb. N.
5. Ammonium sulphate was the best among the artificial manures. 30 lb. N as ammonium sulphate over 4000 lb. green manure was the optimum.
6. Best time to apply N fertilisers is 30 to 60 days after transplanting depending on the duration of the crop.
7. At least 2000 lb. of green leaf should be used as basal dressing for paddy in addition to top dressing with ammonium sulphate to give a total of 60 lb. N.
8. As regards phosphatic fertilisers no marked effect was noticeable but on the whole the trend seems to be in favour of a mixture of 4000-5000 lb. of green leaf and some form of phosphatic manure to supply 25 to 30 lb. P_2O_5 . The best time of application is at the time of planting.
9. In regard to potassic manures, there was no apparent need in all the Research Stations tried, whereas a depressing effect was seen in Tirurkuppam and Coimbatore.
10. Lime was useful in the laterite soils of Pattambi and Mangalore. The residual effect was seen in the succeeding crop also.
11. Ammonium sulphate deeply placed in two doses two-thirds at planting and one-third a month later, was better than broadcasting.
12. No significant difference due to placement of phosphate manure was noticed.

[To be Continued

A Note on the Tapioca Scale (*Aonidomytilus albus*, Cockerell)

by

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Introduction: Tapioca (*Manihot utilissima*) is an important root crop grown extensively in Kerala and Andhra States and in parts of South Arcot, Salem, Coimbatore, Chingelput and Tanjore districts of Madras State. Though widely grown in this State, there is no record of any insect pest damaging the crop. Fletcher (1917) and Subbiah Mudaliar (1951) have mentioned that this crop is free from any insect attack. But recently a scale-insect *Aonidomytilus albus*, Ckll., was noted attacking the crop in a severe form in parts of Salem, Pattukottai and Coimbatore. This scale is a pest of plants belonging to the genus *Manihot* in foreign countries viz. Africa, Florida, West Indies, Mexico, Formosa, Argentina, Brazil, etc. and is known there popularly as Cassava scale. The report on the first occurrence of this insect in pest form was received from Salem in the year 1951 and later reports of such occurrence are from Coimbatore, Tanjore, and South Arcot. At present the infestation is getting widespread throughout the State, wherever Tapioca is grown.

The Scale, its Life-history and Habits: Swaine (1950) has worked out in detail the biology of the scale, at Tankanyika. The adult female is bag-shaped and reddish-purple in colour without wings and legs. It is covered dorsally with a silvery white scale of a waxy nature and shaped like a mussel shell. The male is of the same colour but is provided with well developed wings and legs. The eggs are laid by the female at the posterior end of the body and deposited between the upper scale covering and the lower cottony secretion. As the eggs are laid, the female gradually shrinks in length and finally shrivels up. The eggs are light pink in colour and hatch in four days. The nymphs that come out of eggs are oval in shape and have a depressed, pale pink body with two conspicuous black eye spots anteriorly. They are capable of active movement and are known as crawlers. They become adults in 20 to 25 days. The crawlers settle at one place on the host without moving and gradually lose their legs, and later on produce posteriorly a crescent of fine white threads which spread forwards to cover the upper surface of the body before becoming the adult female. The female begins to lay eggs in about

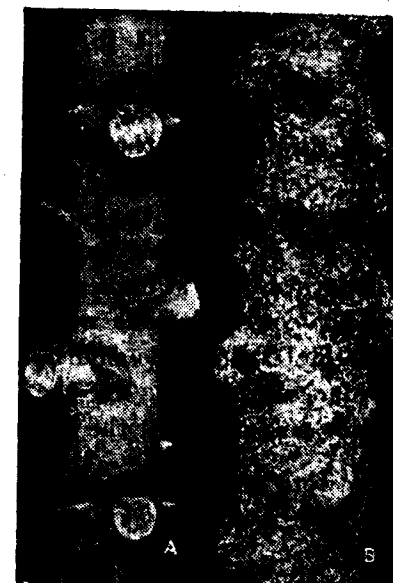
two days after reaching the adult stage. Those that become males move for sometime and finally after settling pupate, from which the males emerge out with three pair of legs and a pair of wings.

Nature of Damage: The scales are generally found on the stem of the tapioca plant and occasionally on petioles. They settle in large numbers on the stem and suck up the sap with the help of their long, threadlike proboscis. The damage depends upon the population of the scale built up during the early stages of the growth of the plant or later on when the plant has become well established. In the early stages of the crop the leaves lose their chlorophyll and gradually dry up, and the plants also will look stunted. In heavy infestation the drying up of leaves is followed by a complete desiccation of the stem and ultimate death of the plant. The grown-up plants which manage to withstand the attack generally develop poor roots. An infested plant can be easily detected by the stunted growth and pale yellow leaves. A close observation will reveal the presence of millions of the mussel-shaped scale remaining attached to the stem portion. The pest gets dispersed from plant to plant and field to field by active migration of the crawlers over the ground and by the passage of the crawlers from infested to clean materials when the cuttings are bundled prior to planting.

Control Measures: Swain (1950) recommends selection of clean planting material before planting and removal of infested cassava plants remaining in the field at the time of planting of new cuttings and burning them. The same author says that DDT oil emulsion gives some appreciable control of the scale. Mechanical methods like removal of infested plants as and when they occur tried in the localities where this scale was noted causing serious damage did not seem to control this scale satisfactorily. In the year 1951 the first report on a large scale outbreak of this scale was received from Salem by the Entomology Section, Coimbatore. The places were inspected and the pest was found in a very serious form in some of the riots' fields in Sooramangalam and Kannankuruchi tracts. The incidence of the scale in such a form was an experience by itself and opportunity was availed of to try some of the recent synthetic insecticides.

Experiments and Results: Investigations were first initiated in April 1951 by conducting two sets of large scale trials one at Sooramangalam and the other at Kannankuruchi with some of the new chemicals then available. The variants tried consisted

PLATE I



Tapioca stem
A. Healthy
B. Infested with scale

PLATE II



Showing a badly scale infested tapioca plant with stunted growth and dried up leaves and a healthy plant nearby.

of sprays of Parathion (Ekatox 20) at 1 oz. in $2\frac{1}{2}$ and 5 galls, DDT kerosene emulsion at 1 oz. in $\frac{1}{2}$ and 1 gall, BHC 50% wettable powder at 1 lb. in $6\frac{1}{2}$ gallons, chlordane at 1 lb. in $6\frac{1}{2}$ gallons, HETP (Hexaethyl tetraphosphate) at 1 oz. in 3 gallons and Fish Oil Rosin Soap at 1 lb. in 6 gallons. Each chemical was tried on 20 cents area. The potentialities of the different chemicals were assessed by recording the adult population before and after one week and fifteen days of treatments on six cuttings of three inches length taken at random in each plot and working out the percentage of dead scales. The details are furnished in statements I and II. In these trials Parathion at both the concentrations was found to cause more than 95% kill of the scales. DDT kerosene emulsion and HETP sprays were found next in order of efficacy. In the case of the former scorching of the leaves was noted even at the lower concentration.

The investigations were resumed during 1954 at Central Farm Coimbatore where the tapioca crop was found infested with the same scale in a serious form. In this trial only Parathion and HETP were selected from those insecticides tried at Salem deleting others and along with these two chemicals, some more new insecticides were tested including some of the systemic poisons. The variants tried were Parathion (Folidol E 605) at 1 oz. in $12\frac{1}{2}$ gallons, Systox at 1 oz. in 4 gallons, Pestox 1 oz. in 4 gallons, HETP at 1 oz. in 3 gallons, TEPP (Tetraethyl pyrophosphate) at 1 oz. in 3 gallons, Malathion at 1 oz. in 3 gallons, and Toxaphene emulsion 1 oz. in $6\frac{1}{2}$ gallons. The results were assessed in the same way as the previous trial. The data is furnished in table III. In this trial also parathion was found best giving the highest kill of the scale. Next in order of efficacy was Systox. Other chemicals were not found very effective on this scale.

Conclusion: It can be seen from the data gathered in the above trials that among the various insecticides tried Parathion, Systox and DDT kerosene emulsion were found to give some appreciable kill of the scale. Among the above three products Parathion seems to be the best. DDT emulsion causes scorching of leaves even at the low concentration and hence cannot be recommended. Systox is still in the experimental stage and hence Parathion in the form of Folidol E 605, which is already in popular use for control of certain other pests is recommended. The cost of spraying of this chemical works out to rupees ten only per acre. Since this chemical is poisonous, care should be taken in handling this and it is preferable to stop its use a month before harvest of the produce.

Lastly it should be remembered that the pest can to a certain extent be checked by using healthy sets for planting and also removing infested plants at the early stages of the infestation. The use of the insecticide is recommended only when the pest occurs suddenly in a severe form when the mechanical methods are not feasible. In serious outbreaks one or two rounds of sprayings with Folidol will minimise damage by this pest.

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TABLE I

Trials at Sooramangalam (Salem District.)

Population of scales on six cuttings taken at random before and after treatments.

No.	Treatments	Before treatment			After one week of treatment			After 15 days of treatment		
		Total No. of scales	No. of dead scales	% of dead scales	Total No. of scales	No. of dead scales	% of dead scales	Total No. of scales	No. of dead scales	% of dead scales
		1	2	3	1	2	3	1	2	3
1.	Parathion (Ekatox 20) 1 oz. in $2\frac{1}{2}$ gallons	550	..	..	428	382	89.2	352	353	99.4
2.	Parathion (Ekatox 20) 1 oz. in 5 gallons	667	..	..	510	472	92.5	318	310	97.4
3.	DDT kerosene emulsion 1 oz. in $\frac{1}{2}$ gallon	674	..	..	413	322	77.9	313	266	84.9
4.	DDT kerosene emulsion 1 oz. in 1 gallon	506	..	..	521	321	61.6	422	307	72.7
5.	BHC 50% w. p. 1 lb. in $6\frac{1}{2}$ gallons	414	..	..	612	218	35.6	314	112	35.7
6.	Chloradane w. p. 11 lb. in $6\frac{1}{2}$ gallons	431	4	0.93	413	112	27.1	513	114	22.2
7.	HETP 1 oz. in 3 gallons	363	..	..	428	228	53.3	429	208	71.6
8.	Fish Oil Rosin soap 1 lb. in 6 gallons	523	..	..	513	27	5.2	515	51	11.2
9.	No treatment	635	..	..	562	..	..	472	..	..

TABLE II
Trials at Kannankurichi, (Salem District.)

No.	Treatments	Population of scales before and after treatments								
		Before treatment			After one week of treatment			After 15 days of treatment		
		1	2	3	1	2	3	1	2	3
1.	Parathion (Ekatox 20) 1 oz. in 2½ gallons	514	12	2.3	419	311	74.2	319	314	98.4
2.	-do- 1 oz. in 5 gallons	419	..	..	529	326	61.6	328	313	95.4
3.	DDT Kerosene emulsion 1 oz. in ½ gallons	616	18	2.9	329	184	55.9	418	298	71.3
4.	-do- 1 oz. in 1 gallons	521	27	5.2	514	228	55.1	427	284	66.8
5.	BHC 1 lb. in 6½ gallons	721	..	..	428	121	28.5	437	129	29.5
6.	Chlordane 1 lb. in 6½ galls.	419	..	..	519	119	22.9	514	114	22.2
7.	HETP 1 oz. in 3 gallons	513	8	1.5	617	279	45.2	611	428	70.1
8.	Fish oil Rosin soap 1 lb. in 6 gallons	478	19	3.9	410	22	5.4	524	74	12.2
9.	No treatment	594	7	1.2	511	11	2.1	618	13	2.1

TABLE III
Trials at Central Farm, Coimbatore.

No.	Treatments	Population of scales before and after treatments								
		Before treatment			After one week of treatment			After 15 days of treatment		
		1	2	3	1	2	3	1	2	3
1.	Parathion (Folidol E. 605) 1 oz. in 12½ gallons	204	..	..	261	144	55.2	268	261	97.4
2.	Systox 1 oz. in 4 gallons	282	4	1.4	199	165	82.9	214	209	97.7
3.	Pestox 1 oz. in 4 gallons	110	..	..	188	32	17.0	234	168	71.3
4.	HETP 1 oz. in 3 gallons	354	..	..	438	270	61.5	330	242	73.3
5.	TEPP 1 oz. in 3 gallons	359	3	1.0	477	241	50.5	301	199	66.1
6.	Malathion 1 oz. in 3 galls.	333	..	..	237	129	54.5	366	289	78.9
7.	Toxaphene emulsion 1 oz. in 6½ gallons	337	..	..	222	47	21.2	269	88	32.7
8.	No treatment	393	4	1.3	453	7	1.5	383	17	4.4

A Note on Some Tropical Green Manure Plants for the West Coast

by
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The beneficial effects of the application of green leaves to paddy are well known. This system of enriching the soil and making it more productive is economical and efficacious. The usual method of green manuring is either by collecting the material from perennial trees or by growing a crop *in situ*. Quick growing herbaceous plants with succulent leaves and soft stems are generally selected for the latter method. Notwithstanding the abundance of vegetation on the West Coast, the availability of green leaves in adequate quantities has been a problem in the coastal belt where the major paddy area is located.

Annual green manure crops like Kolinji (*Tephrosia purpurea*) Sunnhemp (*Crotalaria 'juncea*), Daincha (*Sesbania aculeata*) were commonly recommended for wet lands and in recent years *Sesbania speciosa* has also been found suitable. But each of these has got its own limitations, e.g. Kolinji though a hardy and highly drought resistant plant, gives low tonnage, is unable to withstand water logged conditions and seed setting is very low, necessitating the import of large quantities of seeds every year from outside. The problem of import of seeds annually exists for Sunnhemp also which comes up well under limited conditions. *Sesbania speciosa*, which has many points in its favour, does not come up well under low moisture conditions.

So, there exists an evident need for a leguminous green manure plant which (1) can come up under low moisture conditions (2) is capable of withstanding water logged conditions (3) gives high tonnage of green matter and (4) produces adequate quantities of seeds for individual requirements. With these in view 34 species of different leguminous plants were tried at the Paddy Breeding Station Mangalore, during 1954 and 1955 to find out their suitability to this tract. The preliminary observations recorded on six of the species found promising are furnished below.

Phaseolus semirectus: This is an erect, herbaceous, annual plant with terminal portions showing twining tendency. It is also reported to be a good fodder with high nutritive value. The roots possess

nodules in a much higher proportion than any other variety of Cowpea. The plants grow to a height of about 5½' and flower when about three months old. It recorded an acre yield of 21,000 lb. of green matter. Seed setting was moderate. The plants were found to come up well under water logged conditions in the wet land. It has the capacity of self regeneration and is also capable of withstanding drought to a certain extent. This species appears to be promising and is worth further trial.

Tephrosia noctiflora: This is an erect annual shrub which grows to a height of about 4'. It recorded an acre yield of 18,000 lb. of green matter only which when compared to others is low. But it has got other points in its favour. It was found to be highly drought resistant and at the same time capable of withstanding water logging when grown under wet land conditions. The plants flowered when three months old and seed setting was found to be good. As compared to *Kolinji* this is better in respect of the capacity to withstand water logging to some extent and good seed production. From the trials conducted so far, this appears to be suitable for the tract.

Indigofera hirsuta: This is a sub-erect annual producing heavy foliage. Besides green manure it also yields good quality forage which can be used for hay making. The plants grow to a height of about 7' and flower when they are about six months old. Seed setting is profuse. The plants were found to withstand to some extent water logged conditions in the wetlands. An average acre yield of 24,000 lb. of green matter was recorded by the plants. The variety may be suitable for the tract.

Cassia leschenaultiana: This is a perennial, under-shrub which comes up in both plains as well as in hills upto 6,000' with dense, coppery-green, feather like foliage. On the station it was found to grow upto a height of about 5½' recording 36,000 lb. of green matter per acre. When tried under wet land conditions it was found to withstand water logging. The plants flowered when they were 4 to 4½ months old and set seeds profusely. The germination of seeds also has been found to be very good. The plant has got high regenerating capacity which is an important point in its favour. From the preliminary trials conducted this is found to be promising.

Crotalaria anagyroides: Being a perennial, tall growing shrub, this leguminous plant is being used in some places as a temporary shade to some of the plantation crops besides being used as a green

manure. The plants grew to a height of about 9' without much branching and gave about 44,000 lb. of green matter per acre. The plant has been found to be incapable of withstanding water stagnation and hence is unsuitable for growing under wetland conditions. The plants flower when 4 to 4½ months old and seed setting is moderate. This variety is likely to prove useful for garden and dry lands.

Crotalaria gorgensis: This is an annual shrub with moderate branching and grows to a height of about 6'. It recorded 28,000, lb. of green matter per acre. When sown under wet land conditions the plant has been found not to tolerate water logging and hence is unsuitable for growing in wetlands. The plants flower when they are 4½ to 5 months old and seed setting is profuse. For garden and dry lands this appears to be a suitable green manure.

Paddy Strains for the East Coast Districts

by

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There are four seasons in which paddy is cultivated in the East Coast districts and these are (1) *Sornavari* or *Kuruvai* Season: from middle of May to end of September (2) *Samba* Season— from middle of July to end of January (3) *Thaladi* or *Second Crop* season— from end of September to end of February and (4) *Navarai* Season commencing from January and ending in May.

Even from as early as 1907—'08, i. e., a couple of years after the opening of the Palur Agricultural Station, improvements were attempted in all the important aspects of rice culture, namely, varietal, manurial and cultural. This paper embodies the results of the varietal aspects of the investigations conducted during recent years.

Previous Work: The two important rice seasons are *Kar* or *Kuruvai* season and *Samba* season. The varieties grown in these seasons were *Sornavari* and *Garudan Samba*. To find out if better varieties could be substituted for the local *Sornavari*, a short

duration variety grown in the *Kar* season, a large number of varieties were obtained, *Rascadam* from Madhya Pradesh and *Chitrakali* from Tirunelveli District being a few of them. With the object of finding out higher yielding substitutes to the local *Vadan Samba* for the *Samba* season, varieties such as *Sadai Samba* from Coimbatore, *Poombalai*, *Anaikomban* and *Jeeragasamba* from Tirunelveli *Thuyamalli Samba* from Tiruchirapalli and *Red Sirumani*, *Vellai Sirumani*, *Vellai Samba* and *Molagu Samba* from Tanjore were compared with the local varieties *Garudan Samba* and *Ramagarudan Samba*. By 1915-'16 selections made by the Government Economic Botanist became available and these were tried since then. Improved selections made at the Aduthurai Station were also included in the trials from 1922-'23. Efforts were also made to find out the possibility of mixing a short duration variety *Chitrakali* with a long duration variety *Ottadan* and raising it as an "Udu" crop as is being done in the tail end of the Cauvery delta in Tanjore. But the trials conducted for six seasons from 1916-'22 showed that two transplant crops gave larger yields than one *Udu* crop.

Semi-dry rice varieties like *Pisini*, *Sembalai*, *Mosanam*, *Mottakar*, *Vellaikar* and *Vadan Samba* were grown under dry conditions in the south west monsoon period and later on irrigated from rainfed tanks. A trial to compare these varieties under conditions similar to those of ryots was undertaken in the station from 1922-'23 and continued upto 1935-'36.

In the year 1934-'35 trials were first conducted to find out whether any of the *Kar* strains would prove useful in the *Navarai* season. It was also felt desirable to find out suitable strains for the different seasons viz. *Kar* or *Kuruvai* season, the early *Samba*, the late *Samba*, *Thaladi* and the *Navarai* seasons. Breeding work, however, was started only from 1938-'39. It is for this purpose that a very large number of strains were obtained from other stations and tried in the several seasons. By pure line selection, one long duration strain PLR. 1 from the local *Garudan Samba* bulk was evolved and distributed and one short duration strain PLR. 2 *Chitrakali* was next evolved from the station and its seed is under distribution. The trial with the *Sornavari* selections from local bulk resulted in the release of SW. 7 which yielded higher than all the other cultures. Reselection from SW. 7 was done from 1946-47 and this resulted in the isolation of a superior culture SW. 1251 in 1950. Varietal tests, though not in a systematic form, were also undertaken from 1939 to 1953.

Experimental Work: Yield tests were conducted in randomised replicated plots in all the four seasons in which paddy is grown in this district. Short duration strains evolved at other stations were tried in the *Kuruvai* seasons along with the *Sornavari* strains of the station. In the *Samba* season long duration strains were under yield tests along with the local strain PLR. 1, *Garudan Samba* GEB. 24, MTU. 19 and BAM. 3. The medium duration strains included in the long duration series during 1952-'53 and 1953-'54 were however excluded from the series of long duration strains. In the *Thaladi* season, to find out a better yielding strain than Co. 2, yield tests were conducted with ASD. 5 in 1950-'51 season. In subsequent years other hybrid cultures like 5101, *Curmatia* cross strains and ADT. 25 were also included. For the *Navarai* season commencing from January a large number of short duration strains were under yield tests.

The yield data obtained from the several tests were subjected to statistical analysis and the results are presented in the appended tabular forms.

Discussion and Summary of Results: (1) *Sornavari* or *Kuruvai* Season (middle of May to end of September). Taking the results of all the four years into consideration, it would appear that the strains suitable for the *Sornavari* season are PLR. 2, SW. 1251, TKM. 6 and A. S. D. 1. The results are presented in table I.

(2) *Samba* Season: (July to January) The results of the trials conducted so far indicate that the strains Co. 19, Co. 25 and PLR. 1 are the most suitable strains for the *Samba* season. The results are presented in Table II.

(3) *Thaladi* Season: (October to February) The results of the trials conducted in this season for a period of four years are summarised and presented in Table III. Strain ASD. 5 is found to be the most suitable strain for this season.

(4) *Navarai* Season: (January to May) Since 1950 varietal trials were conducted in the *Navarai* season and the results are summarised in Table IV. Judged from the results of the five seasons, it is found that SW. 1251, TKM. 6, Co. 18, ADT. 18, and PLR. 2 are the strains best suited for *Navarai* season.

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TABLE I
Performance of Sornavari Strains - Kar Seasons

Year	Particulars	PLR. 2	SW. 1251	SW. 7	Co. 13	Co. 18	ASD. 1	TKM. 3	TKM. 6	ADT. 16	ADT. 20	ADT. 23	General Mean	't' test satisfied or not	Standard error	Critical difference P = .05
1952-53	Acre yield in lb.	..	..	3233	..	..	..	4286	..	..	..	..	4095			
	% on standard	..	..	100.0	..	..	..	133.0	..	..	..	..	130.8	Yes	5.0	14.3
1953-54	Acre yield in lb.	3258	4465	..	..	3591	4354	2955	..	3103	3495	2644	3483			
	% on standard	100.0	137.1	..	..	110.3	133.7	90.7	..	95.2	107.3	81.2	106.9	Yes	8.1	23.7
1954-55	Acre yield in lb.	2870	3062	..	2642	..	2103	1704	4270	2155	1602	..	2551			
	% on standard	100.0	106.7	..	92.0	..	73.3	59.4	144.8	75.1	55.8	..	88.9	Yes	11.1	32.6
1955-56	Acre yield in lb.	4421	4070	..	3100	..	3315	2223	3475	3013	2847	1716	3131			
	% on standard	100.0	92.1	..	70.1	..	75.0	50.3	78.6	68.2	64.4	36.8	70.8	Yes	9.6	28.5

Conclusion:

1952-53 TKM. 3 SW. 7

1953-54

SW. 1251, ASD. 1 Co. 18 ADT. 20 PLR. 2 (Std) ADT. 16 TKM. 3 ADT. 23

1954-55

TKM. 6 SW. 1251 PLR. 2 Co. 13 ADT. 16 ASD. 1 TKM. 3 ADT. 20

1955-56

PLR. 2 SW. 1251 TKM. 6 ASD. 1 Co. 13 ADT. 16 ADT. 20 TKM. 3 ADT. 23

TABLE II
Samba Season — Varietal yield trial.

Year	Particulars	PLR. 1	Co. 25	Co. 26	Co. 19	Co. ADT. 26	PTB. 16	2092	BAM. 3	GEB. 24	MTU. 19	GM.	SE.	posi- tive to 1952 PLR.	posi- tive to 1953 PLR.	posi- tive to 1954 PLR.
1952-53	Acre yield	5241	4938	4012	4118	..	3572	..	1038	1114	1639	3228	248	Yes	Yes	723
	% on Standard	100.0	94.2	78.9	78.6	..	68.1	..	20.8	32.7	31.8	61.6	4.6	..	..	15.1
1953-54	Acre yield	3000	4659	3292	3799	..	2650	..	580	1198	1597	2666	330.5	Yes	Yes	964.5
	% on Standard	100.0	131.1	92.6	106.8	..	74.5	..	16.3	33.7	44.9	74.9	9.29	..	..	27.1
1954-55	Acre yield	3874	3135	4028	4257	2641	2288	3364	..	..	..	3370	136.5	Yes	Yes	405.3
	% on Standard	100.0	81.0	104.0	109.9	68.2	59.1	86.9	..	..	..	87.0	3.52	..	..	10.47

Conclusion:

1952-'53

PLR. 1 Co. 25 Co. 19 Co. 26 PTB. 16 MTU. 19 GEB. 24 BAM. 3.

1953-'54

Co. 25 Co. 19 PLR. 1 Co. 26 PTB. 16 MTU. 19 GEB. 24 BAM. 3.

1954-'55

Co. 19 Co. 26 PLR. 1 2092 Co. 25 ADT. 25 PTB. 15.

TABLE III
Thaladi Season — Varietal Yield trial.

Year	Particulars	5108	ASD. 5	Co. 2	3345	Gur- matia.	General Mean.	S. E.	'F' Test Satisfied or not.	C. D. P=0.05.
1950-51	Acre yield in lb.	..	1400	1487	1389	..	1419	..	..	..
	% on Standard (Co. 2)	..	94.0	100.0	92.1	..	95.4	5.7	No	16.1
1952-53	Acre yield in lb.	3174	4043	..	..	..	3609	..	..	..
	% on Standard	100.0	127.4	..	..	..	113.7	5.9	Yes	14.7
1953-54	Acre yield in lb.	3605	3295	2930	..	..	3276.7	..	..	..
	% on Standard	123.0	112.5	100.0	..	..	111.8	2.69	Yes	8.19
1954-55	Acre yield in lb.	2433	3628	2950	..	1231	2561	..	..	..
	% on Standard	83.1	123.0	100.0	..	41.7	86.8	5.8	Yes	17.0

Conclusion:

1952-53 ASD. 5, 5108.

1953-54 5108, ASD. 5, Co. 2.

1954-55 ASD. 5, Co. 2, 5108, Gurmatia.

TABLE II
Samba Season — Varietal yield trial.

Year	Particulars	PLR. 1	Co. 25	Co. 26	Co. 19	Co. ADT. 25	PTB. 15	2092	BAM. 3	GEB. 24	MTU. 19	GM.	SE.	1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 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3490 3491 3492 3493 3494 3495 3496 3497 3498 3499 3500 3501 3502 3503 3504 3505 3506 3507 3508 3509 3510 3511 3512 3513 3514 3515 3516 3517 3518 3519 3520 3521 3522 3523 3524 3525 3526 3527 3528 3529 3530 3531 3532 3533 3534 3535 3536 3537 3538 3539 3540 3541 3542 3543 3544 3545 3546 3547 3548 3549 3550 3551 3552 3553 3554 3555 3556 3557 3558 3559 3560 3561 3562 3563 3564 3565 3566 3567 3568 3569 3570 3571 3572 3573 3574 3575 3576 3577 3578 3579 3580 3581 3582 3583 3584 3585 3586 3587 3588 3589 3590 3591 3592 3593 3594 3595 3596 3597 3598 3599 3600 3601 3602 3603 3604 3605 3606 3607 3608 3609 3610 3611 3612 3613 3614 3615 3616 3617 3618 3619 3620 3621 3622 3623 3624 3625 3626 3627 3628 3629 3630 3631 3632 3633 3634 3635 3636 3637 3638 3639 3640 3641 3642 3643 3644 3645 3646 3647 3648 3649 3650 3651 3652 3653 3654 3655 3656 3657 3658 3659 3660 3661 3662 3663 3664 3665 3666 3667 3668 3669 3670 3671 3672 3673 3674 3675 3676 3677 3678 3679 3680 3681 3682 3683 3684 3685 3686 3687 3688 3689 3690 3691 3692 3693 3694 3695 3696 3697 3698 3699 3700 3701 3702 3703 3704 3705 3706 3707 3708
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TABLE III
Thaladi Season—Varietal Yield trial.

Year	Particulars	5108	ASD. 5	Co. 2	3345	Gur- matia.	General Mean.	S. E.	'F' Test Satisfied or not.	C. D. P=0.05.
1950-51	Acre yield in lb.	..	1400	1487	1369	..	1419	..	..	..
	% on Standard (Co. 2)	..	94.0	100.0	92.1	..	95.4	5.7	No	16.1
1952-53	Acre yield in lb.	3174	4043	..	..	..	3609	..	..	..
	% on Standard	100.0	127.4	..	..	..	113.7	5.9	Yes	14.7
1953-54	Acre yield in lb.	3605	3295	2930	..	..	3276.7	..	..	..
	% on Standard	123.0	112.5	100.0	..	..	111.8	2.69	Yes	8.19
1954-55	Acre yield in lb.	2433	3628	2950	..	1231	2561	..	..	..
	% on Standard	83.1	123.0	100.0	..	41.7	86.8	5.8	Yes	17.0

Conclusion:

1952-53 ASD. 5, 5108.

1953-54 5108, ASD. 5, Co. 2.

1954-55 ASD. 5, Co. 2, 5108, Gurnatia.

TABLE IV
Navarai Season Varietal Yield Trials

Particulars	1950-51		1951-52		1952-53		1953-54	
	Acre yield (lb.)	% on standard SW. 1251	Acre yield (lb.)	% on standard SW. 1251	Acre yield (lb.)	% on standard SW. 1251	Acre yield (lb.)	% on standard SW. 1251
SW. 1251	2031	100.0	3115	100.0	2272	100.0	2791	100.0
SW. 7	3007	148.0	2983	95.7	..	..	..	..
PLR. 2	2900	142.8	2783	89.3	2116	93.2	2310	82.7
TKM. 3	..	..	1784	57.3	1475	64.9	590	21.1
TKM. 6	..	..	..	..	2604	114.7	2378	85.2
Co. 13	2828	139.2	2792	89.6	1099	48.4	1431	51.3
Co. 18	..	..	..	..	2316	102.0	2713	97.2
Co. 20	..	..	..	..	428	18.8	1287	46.1
Co. 22	3100	152.6	..	..	1807	79.5	..	..
Co. 22	..	..	..	..	2161	95.1	2545	91.2
CEB. 24	..	..	..	..	2072	91.2	2955	104.8
ADT. 3	..	..	..	..	..	..	608	21.8
ADT. 16	..	..	690	22.2	809	35.6	80	3.0
ADT. 18	..	..	..	..	2397	105.5	2515	90.1
ADT. 20	1969	97.0	1108	35.5	428	18.8	477	17.0
ADT. 22	..	..	..	..	..	..	1482	53.1
ADT. 23	..	..	..	..	2146	94.5	2432	87.1
Standard error	..	5.7	76	..	157	6.8	375	13.1
'F' test satisfied or not	..	Yes	Yes	..	Yes	Yes	Yes	Yes
Critical difference (P: 0.05)	..	15.7	344	..	357	15.5	1079	37.8

Conclusion:

1950-51 Co. 22, SW. 7, PLR. 2, Co. 13; SW. 1251, ADT. 20.

1951-52 1251, SW. 7, Co. 13, PLR. 2, TKM. 3, ADT. 20, ADT. 16,

1952-53 TKM. 6, ADT. 18, Co. 18, 1251, Co. 23, ADT. 23, PLR. 2, GEB. 24,
Co. 22, TKM. 3, Co. 13, ADT. 16, ADT. 20.

Research Notes

Preliminary Observations on the Incidence of *Alternaria* Leaf Spot in Cotton in relation to Microclimate

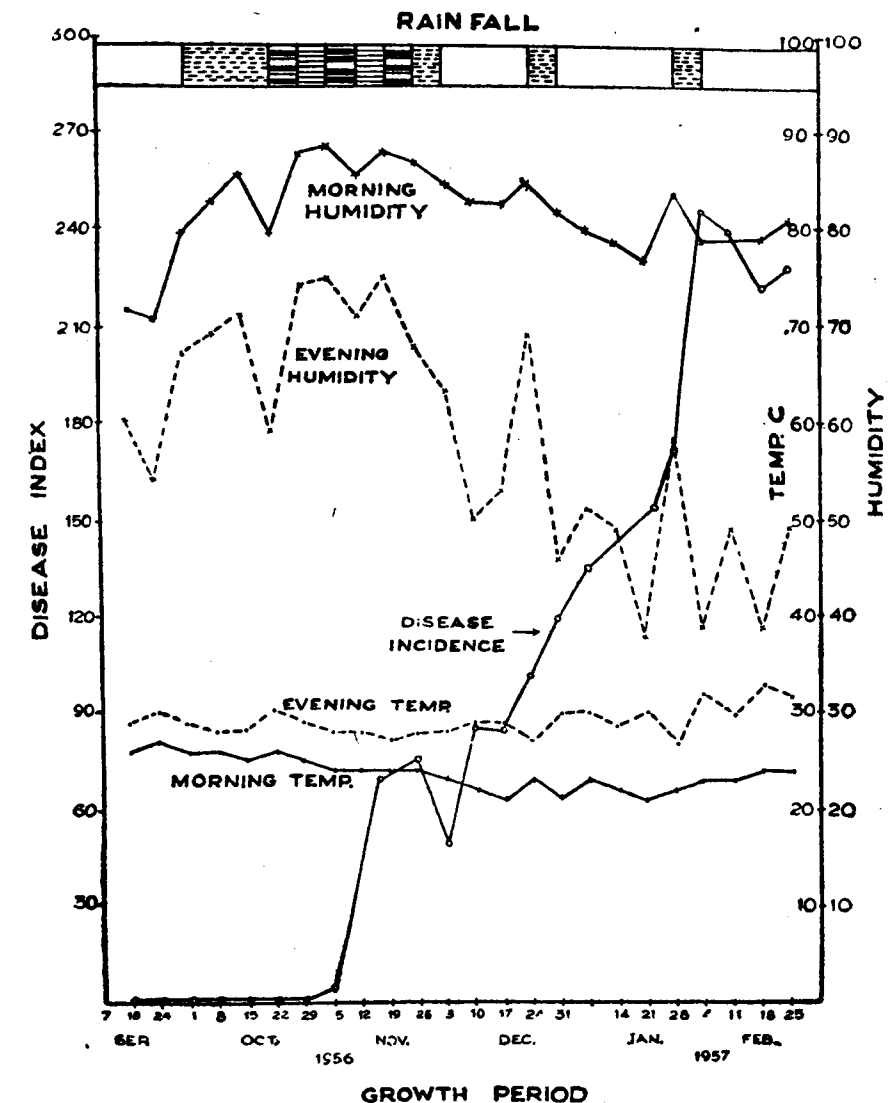
It is well known that favourable climatic factors are essential for the onset and spread of plant diseases. Of the several climatic factors involved atmospheric humidity and temperature have been found to exert greatest influence on the disease. Extensive studies of the factors carried out in other countries have helped to accurately forecast the disease incidence. In Madras state observations on the incidence of diseases of some of the important crops in relation to microclimate have been in progress since 1954. During 1956-57 there was a severe incidence of *Alternaria* leaf spot on cotton crop in the field under microclimatic observations at the Agricultural College and Research Institute, Coimbatore, and the results on the correlation of microclimate with the disease are reported herein.

The leaf spot disease of cotton caused by *Alternaria macrospora* Zimm. is one of the important diseases of the crop in Madras State. The disease manifests itself as small dark violaceous red spots with regular margin and in advanced stages several spots coalesce causing defoliation and reduction in the yield of kapas.

The field was prepared in the usual manner and MCU 1 cotton sown. The crop was on the field from September 7, 1956 to March 3, 1957. During this period microclimatic observations were recorded daily at 08:25 and 15:25 hours to assess the temperature and relative humidity at four feet level amidst the crop. The incidence of *Alternaria* leaf spot was recorded at weekly intervals. The intensity of the disease was recorded as O: no infection, E: <10%, D: 10-30%, C: 30-50%, B: 50-75%, and A: > 75% and the aggregate disease index for the crop calculated by assigning the category values of 0 to 5 for the intensities from O to A, respectively. The weekly averages of the aggregate disease index, rainfall, humidity, and temperature were plotted on the graph (Fig. 1) and correlation studied.

Under the conditions of the experiment, the morning and evening temperature did not seem to have played a great role in the onset and spread of the disease. The temperature range that prevailed throughout the crop period, however, was quite conducive for the growth of the pathogen. During the first five weeks of the crop the atmospheric humidity was rather low which probably was unfavourable for the disease to set in. With the commencement of the North-East Monsoon by the first week of October and the subsequent high humidity that prevailed for several hours in a day there existed most favourable conditions for the rapid multiplication of the inoculum and the onset of the disease, symptoms of which could be observed after an interval of one to two weeks. When once established, the disease was found to spread steadily with the help of the short periods of high humidity that prevailed in the morning hours only.

It is thus indicated that under the conditions of the experiment that existed at Coimbatore during the crop season in 1956-57, the humidity percentage played a decisive role in the onset and spread of



Alternaria leaf spot of cotton. Further continued studies in this line are necessary to confirm these findings and to develop a method of forecasting the disease.

We are thankful to the Agronomist and Professor of Agriculture and the Government Mycologist, Agricultural College and Research Institute, Coimbatore, for providing the facilities and for their interest in these studies.

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G. RANGASWAMY,
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M. V. JAYARAMAN.

Bicarpellary Pistils in *Cassia auriculata* Linn.

The flowers of Caesalpinioideae have normally monocarpellary pistils but exceptions to this general feature have been recorded in various genera by several workers. In *Delonix regia* Raf. two to four carpels have been recorded by Joshi (1932). In the genus *Cassia*, multicarpellary apocarpous condition has been observed in different species. In *Cassia fistula* Linn. two to three carpels have been observed by Sawhney (1932) and as many as seven carpels by Raghavan and Venkatasubban (1934). Sunanda Rao (1953) has observed three free carpels in *Cassia renigera* Wall. Bicarpellary apocarpous condition has been recorded in *Cassia javanica* Linn. by Bansal and Nathawat (1956) and in *Cassia kleinii* W. & A. by Daniel and Tulsidas (1957).

An examination of several flowers of *Cassia auriculata* Linn. collected for study showed that a good number of them had two carpels (Photo shows three flowers with two carpels each). The short stalks of the apocarpous ovaries i.e., the gynophores are fused together but the carpels remain free from one another. In all the abnormal flowers examined, it was found that the ovaries are unequal in length, one of them always longer than the other. No reasonable explanation can be given for this abnormality. It is certain that it was not due to any pathological condition because the same plant showed both normal monocarpellary and the abnormal bicarpellary types of flowers. It was also not due to suppression and modification of any other whorl because sepals, petals and stamens were all present as in a normal flower.



Bicarpellary pistils in three flowers of *Cassia auriculata* Linn.

It is of interest to note that in the family Leguminosae, which is characterised by the presence of monocarpellary ovary, there are several species in which bicarpellary or multicarpellary condition has been observed. In the sub-family Papilionoideae, bicarpellary apocarpous condition has been recorded in *Crotalaria laburnifolia* Linn. (Rao, 1954), *Vigna sinensis* Savi (Dutta, 1956), *Sesbania grandiflora* Pers. (Krishnamoorthy, 1934), and *Phaseolus multiflorus* Willd. (Worsdell, 1916) and the occurrence of two to three carpels has been recorded in *Trifolium repens* Linn. (Worsdell, 1916). In the sub-family Mimosoideae, five carpels have been observed in *Mimosa* sp. (Worsdell, 1916). These instances in addition to those already mentioned under Caesalpinioideae suggest that the family Leguminosae may probably have a phylogenetic relationship with the Rosaceae in which the gynoecium is apocarpous and polycarpellary. The case recorded now seems to be an additional evidence of Rosalean affinity of Leguminosae.

Thanks are due to Sri D. Daniel Sundararaj, Lecturer in Botany, for help and guidance in the preparation of this note. Thanks are also due to Srimathi Sunanda S. Rao and Sri V. Ramakrishnan.

Botany Section,
Agricultural College,
20th May, 1957.

G. TULSIDAS.

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First record of *Neanastatus proximus*, Ferriere (Eupelmidae) in India.

The author published a note¹ on the Hymenopterous parasites reared from inside the stem galls caused on wild indigo *Tephrosia purpurea*, Pers. by the caterpillars of *Dactylethra candida*, Myr. (Gelechiidae). *Neanastatus proximus*, (Ferriere Eupelmidae) was also included among them and this form is interesting in many respects.

In 1938 Charles Ferriere now of Geneva Museum described a single female of *N. proximus* as a new species.¹ The species he studied was from Palestine and it was caught and not bred from any host. Literature shows no second record of *N. proximus*, Ferr. since then from any part of the globe, except that observed by the author in the note² mentioned above.

In his recent studies on the gall fauna of *T. purpurea*, Pers. the author has quite commonly reared *N. proximus*, Ferr. The specimens were identified in the Commonwealth Institute of Entomology, London. Verification reveals complete correspondence between this form and Ferriere's description in French of the species from Palestine. It may be noted that though this form has been recorded from inside the stem galls formed by *D. candida*, it has been more commonly and definitely reared as parasites of an unidentified Cecidomyid which causes pod galls on *T. purpurea*, and attempts to identify which are also being made. The author reports the midge-galls from Kolingi for the first time³. This midge is a serious pest of wild indigo for it prevents seed formation by attacking considerable number of young pods which consequently swell into galls. *N. proximus*, Ferr. is a natural remedy to this pest as it exerts biological control by parasitising the midge in great abundance. Therefore extensive studies on *N. proximus* may yield useful results from the standpoint of control.

Further study is in progress.

Acknowledgements: I am deeply indebted to Dr. S. Krishnamurthi, Professor and Head of the Department of Agriculture, Annamalai University, for his guidance and encouragement in the preparation of this account. My thanks are due to Dr. C. Ferriere of Geneva Museum for valuable information and suggestion.

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N. P. KALYANAM.

REFERENCE

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Students' Corner

The College reopened on 18th July 1957 for the First Year B. Sc. Ag. class. The senior students welcomed the freshers with plenty of merrymaking. The ragging of the first years culminated with a 'ducking' function on the 20th morning along with a grand welcome dinner at night. The freshers certainly took the jokes in a very sporty spirit.

The Club activities for the year started with an inaugural address by Dr. F. W. Parker, Chief Agriculturist, Indo-American Technical Co-operation Mission on the 23rd of the month. The Principal, Dr. K. C. Naik presided. The learned lecturer in his speech on the Agricultural Plan and the 'student', Stressed on the opportunities open to students in the fast changing economy of India and their role in building up the Nation.

The Games Section started with a friendly hockey match played against the P. S. G. College of Technology on the 24th. Our College won by a solitary goal.

We record with deep regret the sudden demise of Sri A. Mokshanandam, second year student of the College.

Book Review

Tree injuries - H. L. Edlin and M. Nimmo. (1956); pp. 168+vi. Orient Longmans (Private Ltd.), Madras; Thames and Hudson, London. Price 21 sh.

Everyone who cares for trees would be interested in knowing the hazards they face from injuries inflicted by various agencies. This book which deals about tree injuries is the first and pioneering contribution to a knowledge of injuries to trees. The text describes over 77 different causes of injury in very simple terms and they are excellently illustrated with very beautiful photographs. The increasing importance of timber supplies in our national economy focuses the need for closer attention to be given to the value of trees and their proper preservation. The book is a very useful guide to foresters and farmers alike who have the care of trees at heart.



Weather Review — For June, 1957

RAINFALL DATA (IN INCHES)

Division	Station	Total rainfall for the month	Departure from normal	Total since 1st January 1957
North	Madras (Meenambakkam)	2.4	+ 0.6	2.8
	Tirurkuppam*	2.3	+ 1.3	4.0
	Vellore	4.6	+ 1.8	7.9
	Gudiyatham*	9.0	+ 6.2	16.8
East Coast	Palur*	2.8	+ 0.3	3.4
	Tindivanam*	3.2	+ 1.7	4.0
	Cuddalore	1.4	J. N.	3.0
	Nagapattinam	1.1	— 0.1	3.5
	Aduthurai*	0.7	— 0.6	3.0
	Pattukottai*	2.6	+ 1.4	5.0
Central	Salem	2.4	— 0.7	6.3
	Coimbatore (A. M. O.)*	1.4	— 0.1	6.6
	Coimbatore	1.4	— 0.1	5.7
	Tiruchirapalli	0.2	— 1.6	4.5
South	Madurai	0.8	— 0.8	3.9
	Pamban	Nil	— 0.2	2.4
	Koilpatti*	0.5	— 0.1	3.7
	Palayamcottai	1.1	+ 0.7	8.7
	Ambasamudram*	1.7	+ 0.5	5.8
	Nagarcoil	9.4	+ 4.4	27.7
Hills	Kodaikanal	1.9	— 2.3	15.3
	Coonoor*	6.3	+ 4.1	32.7
	Ootacamund*	6.0	+ 0.9	36.1
	Nanjanad*	6.9	— 1.2	28.2

Note:— 1. * Meteorological Stations of the Madras Agricultural Department.
2. J. N. = Just Normal.

The month commenced with the apparent setting in of the South West monsoon over South Kerala, the effect of which was felt in the Madras State as local rain or thundershowers in the first two days of the month. As the monsoon continued to be active in Kerala and Rayalaseema, localised showers were received in Madras State on 3-6-57 and 4-6-57. On 5-6-57, the monsoon extended in Coastal Mysore and consequently, North Madras received localised showers for two days from 5-6-57. The monsoon was very active in the West Coast for two days from 7-6-57 with the result that Madras State had localised showers on 7-6-57 and 8-6-57. Due to the temporary weakening of the monsoon over Kerala, the weather was mainly dry over Madras State on 9-6-57 and 10-6-57. On 11-6-57, the monsoon was slightly active over Kerala, and hence interior Madras received a few showers on that day. For three days from 12-6-57, though the monsoon was inactive over Kerala, localised showers were received in Madras State during this period. The monsoon became active on 15-6-57 and Madras State had localised rains or thundershowers for three days from this date. For 4 days from 18-6-57, the weather was mainly dry in Tamil Nad. On 21-6-57, the Bay Branch of the monsoon advanced into Assam. For 4 days from 22-6-57,

a few places in Tamil Nad had some localised showers. The weather was mainly dry on 26-6-57. On 27-6-57 and 28-6-57, Madras State received rains at a few places due to the monsoon being active in Kerala and Telangana. The weather became dry again on 29-6-57. On the last day of the month, certain regions in interior Madras had some localised rains.

Regarding the fluctuations of the day temperatures, they were practically mild in Tamil Nad throughout the month under report.

Rainfall: The note-worthy rainfall and the Zonal rainfall for the month are furnished below:

Noteworthy Rainfalls for the month

S. No.	Date	Name of place	Rainfall in inches
1.	1-6-57	Pattukottai	1.20
2.	1-6-57	Vellore	1.50
3.	8-6-57	Nanjanad	1.97
4.	10-6-57	Coonoor	3.50
5.	11-6-57	Ootacamund	1.28

Zonal Rainfall for the month in inches

Name of Zone	Rainfall for the month	Departure from Normal	Remarks
North	4.8	+ 2.5	Above normal
East Coast	2.0	+ 0.5	Above normal
Central	1.4	— 0.6	Below normal
South	2.3	+ 0.8	Above normal
Hills	5.3	+ 0.4	Above normal

Agricultural Meteorology Section,
Lawley Road P. O.,
Coimbatore, 11-7-1957

C. B. M., & M. S. D.

Departmental Notifications

Gazetted Officers—Postings and Transfers.

Name and present post	Posted as
Raju, S., Agricultural Eng., Supervisor, Coimbatore.	Asst. Agrl. Engineer (Inspection), Coimbatore.
Raman Moosad, C., Administrative Officer, Coimbatore.	Secretary of the Market Committee, Tirupur.
Subramaniam, C. R., A. A. E. (on leave)	Asst. Agrl. Engineer (River Pumping Scheme), Madras.
Rayappa Pillai, M., Supdt., A. R. S., Bhavanisagar (on leave)	Supdt., A. R. S., Bhavanisagar.
Krishnan, R. H., Supdt., A. R. S., Bhavanisagar.	S. D. O. (Paddy) Madras Vice Dorairaj, K.
Palanivelu, T. S., A. A. E. (M),	A. A. E. (Tractor Workshop), Coimbatore.
Natarajan, K., A. A. E. (Tractor Work Shop), Coimbatore.	Deputed for Training in Soil Conservation at Dehra-Dun.
Anantharaman, S. E., A. A. E. (M),	A. A. E. Central Agrl. Engg. Store, Saidapet vice Sri C. S. Sridharan.
Krishnan, L., A. M. O., Cuddalore.	Deputed to Foreign Service as Lecturer in the Regional Co-operative Trading Centre, Madras.
Narayanan, K. T., A. A. E. (R), Coimbatore.	A. A. E. (Groundnut Scheme), Coimbatore.
Raman, K. R., Asst. in Fruits, Periakulam.	A. F. S., Coonoor.
Thirumalacharya, N. C., Spl. D. A. O. (Crop Sampling), Vellore.	Spl. D. A. O. (Crop Sampling), Madras.
Muthuswamy, S., Acting D. A. O. (on leave)	Special D. A. O. (Crop Sampling), Vellore.
Moorthy, P. A., Agrl. Eng. Supervisor, (on leave)	Asst. Agrl. Engineer (Soil Conservation), Kadambuliur.
Neelakantan, L., Oil Seeds Specialist, Coimbatore.	Cotton Specialist, Coimbatore.
Krishna Shetty, T. Junior Accounts Officer, Office of the D. A., Madras.	Accounts Officer, Central Office, A. C. & R. I., Coimbatore vice Mohamed Athaullah.
Daniel, F. L., Asst. Agrl. Chemist, Coimbatore.	Compost Development Officer, Madras.
Venkataramana Rao, V. G. Acting D. A. O.	Assistant Marketing Officer, Cuddalore.
Varadachary, K., D. D. A., Coimbatore.	Joined Director of Agriculture Vice Sri P. A. Venkateswara Iyer, Retiring from service,

Upper-Subordinate Officers

Name and present post	Posted as
Mohamed Habeeb, S. B., A. D., Manachanallur.	Farm Supervisor, Rural Extension Training Centra, Bhavanisagar.
Rajamanickam, D.,	Appointed as Coconut Nursery Assistant, Muthupet.
Soundararajan, V. V., Oil Seeds Dev. Asst., Trichy.	A. D. Perambalur.
Srinivasan, S., A. D., Perambalur.	Farm Manager, State Seed Farm, Sivakasi.
Govindaswami, T. M., A. D., Tirukoilure.	A. D., Ulundupet.

DISTRICTS

SOUTH ARCOT, NORTH ARCOT
COIMBATORE
RAMANATHAPURAM
TIRUNELVELI



CROPS
GROUNDNUT, GINGELLY
COTTON
&
TOBACCO

Review of the Market Conditions of Commercial Crops in the Areas of Market Committees for the Month of May, 1957.

Cotton: (In this section Candy = 784 lb.
Pothi = 280 lb.)

Tirupur: There was a rainfall of 4.45" during the month with the early setting in south-west monsoon and this was beneficial to the second crop of cotton. Greater demand for cambodia and karunganni cottons from the trade and textile mills was noticed. The market started with an opening lint stock of 7,600 candies of cambodia and 472 candies of karunganni. The total arrivals into the market amounted to 11,538 candies of cambodia and 585 candies of karunganni lint which included 3,432 and 348 candies of cambodia and karunganni lint respectively locally ginned. Despatches from Tirupur came to 8,896 candies of cambodia and 431 candies of karunganni lint inclusive of 3,437 candies of lint sent to Mysore, Kerala, Madurai, Tinnelveli, Bombay, Madras, Trichy and Ahmedabad leaving a closing balance of 10,242 candies of cambodia and 626 candies of karunganni lint.

In the kapas market the stock with the trade at the beginning of the month was 29,773 pothis of cambodia and 3,727 pothis of karunganni kapas with which 38,493 pothis of cambodia and 4,603 pothis of karunganni were added by way of arrivals, while the closing stock stood at 35,493 and 1,430 pothis of cambodia and karunganni respectively after a disposal of 32,773 pothis of cambodia and 6,900 pothis of karunganni. The prices of kapas stood steady around Rs. 138/- per pothi of 280 lb. for cambodia and Rs. 119 per pothi for karunganni while that of cambodia lint were Rs. 982/- per candy of 784 lb. and Rs. 871/- per candy of karunganni lint.

Ramanathapuram District: Widespread rains were received throughout the district during the latter part of the month and were beneficial to the second crop of karunganni in late sown areas as well as to the standing

crop of Uganda cotton. The three markets of Sattur, Rajapalayam and Virudhunagar put together opened with a stock of 650 pothis of kapas and 1,070 candies of lint at the beginning of the month. Receipts and disposals accounted for 30,500 pothies of kapas and 3,230 candies of lint. The closing stock left at the end of the month was 650 pothis of kapas and 870 candies of lint.

The karunganni lint market during the month was active while the uganda cotton market was only moderately active. The cambodia cotton market eased during the last week of the month in sympathy with the karunganni cotton market. The opening and closing prices are given below :

		Opening.	Closing.
	per pothi of 280 lb.		
Karunganni kapas	do	108— 113	106— 110
Tinny Karunganni	do	102— 106	90— 105
Tinny	do	93— 100	90— 98
Cambodia	do	105— 120	105— 180
Karunganni Lint	per candy of 784 lb.	140— 866	840— 860
Karunganni Tinny	do	826— 836	825— 835
Tinny	do	811— 825	100— 820
M. U. 2 Uganda	do		1140 — 1160
M. U. 1 Uganda	do	1080— ...	
Uncertified Uganda	do	950— ...	
Cambodia	do	800— 950	800— 900
Karunganni Cotton seed	per maund	11-00—11-62	10-66—11-50
Tinny seeds	do	12-31—12-50	12-00— ...
Cambodia seeds	do	8-50— 8-00	8-00— 8-50

South Arcot District: There was an opening stock of 38 pothis of cotton kapas at the beginning of the month. 104 pothis were received during the month while despatches to Tiruppur accounted for 103 pothis. The closing stock left over at the end of the period was 39 pothis. The average price that ranged at Villipuram market was Rs. 74—75 during the month under report.

Groundnut: (In this section Candy = Kernels of 531 lb.)

North Arcot District: Moderate showers were received in many parts of the district during the latter part of the month and ploughing operations for winter groundnut were undertaken. Dull trading prevailed in the groundnut market and arrivals as well as offtakes were poor. Despite the removal of cut in the supply of electricity, big millers were not able to operate because of the imposition of fresh cess on oil. They could not compete with the small scale crushers being exempted from the cess. Arrivals into the markets were not much on account of the lean season, Vellore alone attracted some arrivals.

The following is the stock position of groundnuts in the district.

	Opening balance	Arrivals	Disposals	Closing balance
		(In Tons)		
Groundnut pods	1770	354	1723	401
Groundnut kernels	362	884	1099	217

No marked change was noticed in the price of groundnuts during the month under review but that of oil spurted up by Rs. 15 to 20 per candy. Groundnut kernels were sold at Rs. 150 to 156 while oil ruled at Rs. 330 to 340 per candy. The rates quoted for pods were Rs. 15 to 18 per bag of 80 lb. while that of oil cake around Rs. 8 to 9-25 per standard maund. For the same period during the previous year kernels were sold at Rs. 155 to 169 while oil was at Rs. 300 to 320 per candy; pod sat Rs. 15 to 19 per bag of 80 lb. and oilcake at Rs. 7 to 8 per Imperial maund.

South Arcot District: The trade opened with a stock of 2,292 tons of kernels and had a receipt of 2,597 tons by way of local arrivals. The arrivals to the markets improved as a result of better harvests of summer crop. Receipts from Tanjore, Tiruchirapalli and North Arcot districts etc. accounted for 1,683 tons. Imports from Andhra State amounted to 41 tons. A quantity of 3,705 tons and 464 tons were consumed by the oil mills and country chekkus respectively for conversion into oil. Despatches to other districts like Salem, Tanjore, Coimbatore and Madras totalled 480 tons while exports to Pondichery State amounted to 38 tons. Wastages were calculated at 226 tons and the month closed with a stock balance of 1,700 tons.

The announcement of levy of increased excise duty on oil in the middle of the month created a fall in the prices of groundnut kernels and a rise in the prices of oil. But by the end of the month prices of kernels also firmed up. The average prices in the several markets ranged from Rs. 139 to 155 per candy of 531 lb. according to quality.

Ramanathapuram District: During the month arrivals of kernels from local crop were poor while the imports of kernels from Tanjore district were only moderate. The Virudhunagar market opened with a stock of 40 tons of pods and 700 candies of kernels. Arrivals during the period accounted for 295 tons of pods and 3,600 candies of kernels. Disposals were placed at 255 tons of pods and 3,240 candies of kernels, leaving a closing stock of 80 tons pods and 1,060 candies of kernels at the close of the month. Both the drying operations of kernels and crushing of oil were affected in view of the inclement weather conditions that prevailed during the second fortnight of the month.

The prices of groundnut pods, kernels, oil and oilcakes that ruled in Virudhunagar market during the month are given below :

		Opening.	Closing.
Groundnut pods	per maund of 82·2/7 lb.	16 to 18	15 to 18
Groundnut kernels	per candy of 531 lb.	168 to 175	165 to 170
Groundnut oil	per tin of 35 lb.	22·75 to 23·00	23·00
Groundnut oilcake	per maund	8·62 to 10·35	8·50 to 9·83

Gingelly: *South Arcot District:* The markets in the district started with an opening stock of 600 bags at the commencement of the period with which 581 bags were added by way of arrivals while receipts from Tiruchirapalli district and imports amounted to 203 bags and 65 bags respectively. 92 bags were crushed in rotaries and 640 bags in country chekkus. Despatches to other districts such as Tanjore and Salem came to 224 bags. The stock left at the close of the month stood at 493 bags. The prices of gingelly and oil increased as the result of a rise in the prices of groundnut oil. The average prices worked out to Rs. 73/- at Tindivanam and Rs. 76/- at Vridhachalam per bag of 168 lb.

Tobacco: *Coimbatore District:* Harvesting of tobacco has been completed. The enhanced excise duty imposed from the middle of the month adversely affected the sentiment and as a result of this the buyers were reluctant to make any further commitments.

There was an opening stock of 7,985 candies of chewing and 390 candies of cheroot tobacco. About 2,700 candies of chewing and 250 candies of cheroot tobacco were exported to Salem, Tanjore, Trichi, Ramnad and Tirunelveli districts of Madras State and Andhra, Bombay and Kerala States, while 300 candies of cheroot tobacco from Salem were reported to have arrived into the district. At the end of the month under report a stock of 11,050 candies of chewing and 340 candies of cheroot tobacco were left with the trade. The chewing tobacco market continued to be dull. The prices of Meenampalayam and pit cured varieties declined further, while the prices of cheroot and other varieties remained at the level of previous month.

The prices ranged as follows :

Variety	(Prices in Rs. per candy of 500 lb.)		
	I Grade	II Grade	III Grade
1. Chewing tobacco — Sun-cured :			
a) Meenampalayam	225—260	175—220	100—165
b) Other varieties	180—220	115—160	70—96
2. Cheroot varieties :			
Sun-cured (grown in Erode & Bhavani taluks)	260—400	200—250	100—160
3. Chewing varieties :			
Pit-cured (grown in Palladam & Salem areas)	150—200	100—150	50—75

Review of Administrative Activities of Market Committees for May, 1957.

General: Except Coimbatore Market Committee and South Arcot Market Committee all other Market Committees are functioning under 6-A of the Act under their revenue heads of the districts concerned. The impediments in the case of Tirunelveli Market Committee and Ramanathapuram Market Committee are yet to be cleared. The elected Committee of North Arcot Market has not yet been constituted.

Enforcement: The following are the progress of licensing by the Market Committees during the month under report.

	Section 5 (1)		Section 5 (3)		Weighmen	
	A	B	A	B	A	B
North Arcot Market Committee	83	640	54	561	40	425
South Arcot Market Committee	112	1142	76	904	69	843
Coimbatore Market Committee	402	...	362	...	60	373

A: During the month.

B: Upto end of the month from January 1957.

Meetings: A meeting of the South Arcot Market Committee was held when all the 12 members attended the meeting besides the State Marketing Officer and the Assistant Marketing officer in-charge of Cuddalore and several subjects were disposed off at the meeting.

Quality Analysis: During the month 44 samples were analysed at Virudhachalam market. Out of these 41 samples contained total common refraction below 4% and the rest between 4% to 8%. The quality of the crop marketed in this market was good as usual.

Quality Competition: The Committee has decided not to continue the scheme for the present.

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