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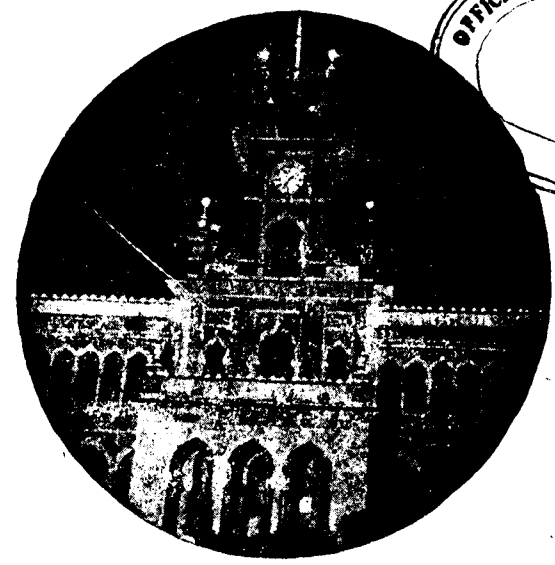

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NOTICE

The symposium on **"The Role of The Agricultural Department in Community Development and National Extension Services"** tentatively proposed to be conducted during the ensuing College Day and Conference, 1958 has been cancelled.

The Madras Agricultural Journal

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CONTENTS

JUBILEE SHIELD FOR CHEMISTRY

The Golden Jubilee rolling shield of the Chemistry Section to be awarded during the College Day and Conference to the best scientific workers in the field of Agricultural Chemistry.

Rules and conditions for the award:

(1) The shield will be awarded to the best scientific worker in the field of Agricultural Chemistry. All Scientific workers and Research Students of the Chemistry Section at the Agricultural College and Research Institute, Coimbatore as well as in the Department of Agriculture, Madras State will be eligible for the award.

(2) The shield is a rolling one and will be awarded at the time of the Annual College Day and Conference of the Agricultural College and Research Institute every year.

(3) A committee to adjudge the best worker for the award shall comprise.

(1) The Principal (Chairman — Ex-Officio)

(2) The Government Agricultural Chemist (Ex-Officio)

(3) A senior officer of the Research Council elected by Research Council.

(4) The award will be made to the worker adjudged as the best on the basis of the reports or papers containing either (i) an account of original research in which the author's share is the maximum or (ii) a critical discussion or analysis of any subject related to agricultural chemistry, throwing new light on or adding new knowledge to the subject.

(5) A certifiate will also be awarded to the winner of the rolling shield.

(6) The shield shall be returned to the Government Agricultural Chemist after the award for keeping in safe custody.

(7) The award will not be made more than once to the same person.

(8) The power to modify the rules to suit any situation that may arise at any time rests with the Government.

Papers and reports etc. for the award are invited on or before the 15th August 1958 by the undersigned.

Lawley Road P. O.

A. Mariakulandai,
Government Agricultural Chemist.

Madras agric. J., **45** : (7) 255—267, 1958

Studies on pre-treatment of seeds with chemicals

I. The effect of presoaking the seed in various chemicals on the growth and yields of paddy

by

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Introduction: A great deal of attention has been devoted in recent years, towards a more efficient utilisation of fertilizers in crop production. Various methods have been tried, starting from broadcasting, to placement of fertilizers right in the feeding zone of the root systems of crop plants, with the object of making available a larger quantity of nutrients to the growing plants. Amongst the various methods tried, coating the seeds with fertilizers was one; thus Gusev (1940) had claimed that by pretreating seeds with phosphates before sowing, either by moistening the seeds with an aqueous solution of phosphate fertilizer or by smearing the seeds with a mixture of starch paste and fertilizer, the plants were able to utilize as much as 70 – 80 percent of the phosphate supplied. This idea was taken a step further by Roach and Roberts (1949) in Great Britain, and subsequently other workers had also found there were practical possibilities in this method of seed pre-treatment with chemicals. In India, the Indian Council of Agricultural Research sponsored a research scheme in 1952 to investigate the scope and possibilities of this method, in improving the growth and yields of important crops. This scheme was worked in the Plant Physiology section of the Agricultural Research Institute at Coimbatore, and a number of crop plants was studied; the results obtained in rice (paddy) plants are presented in this paper.

Review of previous work: The earliest mention in published literature is by Toole and Drummond (1924), who found that presoaking of cotton seeds in water before sowing them was very helpful where the soil moisture was below the optimum required for prompt germination. Soaking the seeds in water and then partially drying them, to 50 percent of the original moisture was found helpful in improving the yield in cucumbers - by Eromolev, (1941). This increase was attributed partly to the earlier emergence of female flowers in the "presoaked" plants; about nine days earlier than in the controls. In Japan, better growth, taller plants, earlier

flowering and higher yields were noted in paddy by Yosiyasu (1942) as a result of presoaking the seed in different concentrations of β-indole-acetic acid and α-naphthalene-acetic acid and for periods ranging from 24 to 72 hours. The possibilities of this method of seed pretreatment were explored in oats and barley by Roach and Roberts (1949) in the United Kingdom. Presoaking in hormone chemicals was found helpful in mitigating the adverse effect of late planting in sugarcane, by Agarwal and Prasad (1954). Similar results have been reported for wheat, by Bharadwaj and Rao (1955). Coconut water, i. e. the liquid endosperm found in unripe coconuts, was also found helpful by Ramaswami and Gowda (1955) as a presoaking medium to hasten germination. In Ceylon, Rhind and his co-workers (1949) observed in rice that yield increases of 19 - 36 per cent were obtainable in the greenhouse trials, but the same response could not be secured in the field; here there was only an evanescent superiority in vegetative vigour in phosphate-presoaked plants. Narayanan and Gopalakrishnan (1949) found that presoaking paddy seeds in a 20 percent solution of tribasic potassium phosphate resulted in an increase in grain yield of nearly 40 percent over the untreated control. Presoaking the seeds in a 10 percent solution of the same salt gave a 21 percent increase over controls, while beneficial effects on grain yield were also noticeable after presoaking in β-indole-acetic acid. Presoaking in mere distilled water had no marked effect on grain yield if done once, but a repetition of the process showed an adverse effect upon paddy grain and straw yields. Ramiah and his co-workers in rice (1952) have also reported yield increases of 15 to 22 percent by pre-soaking treatments. More recently Sivtev (1956) has reported that presoaking maize seeds in potassium sulphate, potassium permanganate, boric acid, ammonium molybdate and zinc sulphate solutions in appropriate concentrations increased the yields; the highest increases being observed in the case of boron and zinc salts.

Materials and Methods: Since indications were obtained from the preliminary studies that for each crop there was a specific concentration of a specific chemical that was most helpful, a large number of salts of both macro and micro-nutrients was first tested to see which of them was most helpful for paddy. The actual method was rather simple; a known weight of paddy seeds was soaked in a known weight of the appropriate salt solution, keeping the ratio of seed to solution at 3:1 in order to ensure that the solution was all fully absorbed by the seeds, and to avoid the risk

of seed constituents being leached out by an excess of the solution. The period for which the seeds should be presoaked was also determined by earlier preliminary tests and 16 hours were found to be the optimum and in accordance with this, the presoaking in paddy was also limited to 16 hours. After presoaking the seeds were spread out and air-dried in the shade and then utilised for sowing in the usual way.

In the experiments carried out on rice, besides the dibasic and tribasic potassium phosphates, solutions of micro-nutrient salts like iron, manganese, copper and zinc were also tried in various combinations both amongst themselves and in conjunction with potassium phosphate solutions.

Five different paddy strains were used in these trials, at four locations. The strains employed were GEB. 24 and Co. 1 at Coimbatore, ADT. 3 at the Agricultural Research Station, Aduthurai, in the deltaic Tanjore district, PTB. 2 at the Agricultural Research Station, Pattambi on the Kerala coast and TKM. 6 at the Rice Research Station, Tirurkuppam in Chingleput district. The experiments at Coimbatore were carried out both in the field and in pot cultures, while those in the other stations were confined to field experiments only. The treatments were replicated and laid out in recognised statistical fashion.

Records were maintained on germination, growth rates as reflected in plant height increases at fortnightly intervals and tillering, flowering earliness and yield of grain and straw. In the case of pot-culture studies, the root-weights were also recorded.

Results: In the nursery, marked differences were noticeable in one strain, GEB. 24, in shoot length, shoot weight and root length and root weight. It was however noticed that presoaking in water alone improved both shoot and root length but not their weights, indicating that the initial stimulation caused by presoaking is sufficient for elongation but not for increased dry weight accumulation, unless the seed was presoaked in chemicals as well (Table I, Appendix). A similar behaviour is reported in the case of seedlings grown after treatment with gibberellic acid. (Sarkar, 1957).

Effect on plant height: Both in the field and in pot-cultures, plants from presoaked seeds were taller than controls during the early stages of growth, but the differences got rather levelled off as

the plants grow older. (Table II). In some of the experiments, especially in pot-cultures, the height differences were statistically significant even at the adult stage, and of the order of 10 to 14 percent over the controls, but in general it may be said that the effects of pre-soaking treatments on plant height are not very marked.

Effect on tillering: The results of seven experiments go to show that there is no appreciable effect on tillering by any of the presoaking treatments or chemicals that were tried. In regard to flowering earliness too, that effect of presoaking was not very appreciable, but in grain yield and straw yields, distinct increases were noticeable as a result of presoaking in a number of instances. Of all the chemicals tried, tribasic potassium phosphate (K_3PO_4) appeared to be the best-suited for presoaking paddy. The strength of this chemical could be as much as molar (equivalent to 21·2 percent) but ordinarily, half-molar concentrations are effective and more convenient. Dipotassium hydrogen phosphate (K_2HPO_4) was also tested in several experiments at molar and half-molar strengths but this chemical was less helpful than the tribasic phosphate of potassium. The table below gives a good idea of the relative utility of the different salts for paddy.

TABLE VII

Effect of different phosphates on paddy.

Chemicals	Concentrations	Grain yield (per cent)	Straw yield (per cent)
K_3PO_4	... 10%	105·9	109·0
,,	... 20%	123·0	103·1
K_2HPO_4	... 10%	102·9	111·7
,,	... 20%	103·1	106·3
KH_2PO_4	... 10%	94·5	84·7
,,	... 20%	93·7	115·7
Control (not presoaked)		100·0	100·0

It would be noticed that K_3PO_4 at the higher concentration has induced the highest increase in grain yield, whereas the other two salts are less helpful in improving grain yield, although the straw yields are increased appreciably.

The responses to presoaking treatments were in general more pronounced in pot cultures than in the field, especially in grain yields. Thus the highest increase in grain yields under field conditions, as a result of presoaking in potassium phosphate was 17·9 percent, while it was 88·8 percent in pot cultures. In straw, the maximum increase of the order of 28.7 percent in the field and 90·0 percent in pot cultures. (Table III to VI, Appendix)

Between different varieties of paddy, the responses to presoaking treatments show a fairly wide range of variations as would be evident from the table below.

TABLE VIII

Varietal response to presoaking treatments in paddy.

	Strain number	Duration (Days) (seed to harvest)	Highest percentage in increase recorded (in field trials) (on control = 100 percent).	
			Grain.	Straw.
Short duration group.	ADT. 3.	95	114·9	147·6
	CO. 13.	110	138·8	110·4 (in pot-cultures only)
	TKM. 6.	110	101·0	112·5
	CO. 10.	120	107·3	104·8
	PTB. 20.	120	114·9	119·0
	PTB. 2.	135	108·3	110·3
Medium duration group.	CO. 1.	155	97·1	123·6
	GEB. 24.	150	107·9	110·6 (field)
	GEB. 24.	150	127·5	124·2 (pots)
Long duration group.	CO. 25.	195 days.	115·6	117·2

It would be noted that in all the varieties, except TKM. 6 and CO. 1 there is a fair response in grain yield ranging from 7 to 27·5 percent under field conditions and upto 38.8 percent in the greenhouse. In straw yields, the range is from 48 to 47·6 percent increase over untreated controls.

Discussion: From the results observed in the various experiments on paddy it is evident that tribasic potassium phosphate is perhaps the most useful chemical for presoaking paddy seeds. The use of growth-hormone chemicals and micro-nutrients such as sulphates of iron, manganese, copper or zinc, was also helpful, but not always, nor was a combination of several salts, in conjunction with potassium phosphate solution, superior to presoaking in the phosphate alone.

The lower degree of response in field trials as compared to pot cultures is in line with what was noted by Rhind and co-workers in 1949. The utility of these presoaking treatments in improving drought resistance was not tested in the course of the studies, although a certain degree of drought-resistance was claimed by some workers (Uttaman, 1944) by repeated soaking and drying of paddy seeds. Presoaking in mere distilled water had no marked effect on grain yield if done once, but a repetition of the process showed an adverse effect upon grain and straw yieds. Ariyanayagam (1952, 1953) has however reported that presoaked seeds showed accelerated growth and better resistance to drought, besides showing higher yields of 20 to 46·5 percent over the controls. It is therefore clear that there is both a need and scope for considerable further work on this question of presoaking effects on crop plants.

With regard to the economics of the results achieved, it is obvious that the method of presoaking is inexpensive as well as convenient. Thus for paddy, taking the grain yield at a very low figure of 1500 lb. per acre and straw at 2000 lb. and the average increases by presoaking treatment at another low figure of 8 percent only for grain and 6 percent for straw, the increased monetary return works out to Rs. 18·75 plus 1·75 i. e. Rs. 20·50 against a cost of Rs. 6·42 per pound of the potassium sulphate that is needed for the presoaking treatment.

This method of supplying plant nutrients by soaking is definitely more efficient than supplying them through the soil and roots. For instance when oats were presoaked in K_3PO_4 solution, it was calculated (Roberts 1948) that 6 lb. of P_2O_5 were added, of which nearly three-fourths was utilised by the seedlings, whereas to get the same increase in yield from soil applications it would have been necessary to add 2 cwts. of superphosphate per acre. Presoaking is thus an economical method for supplying an initial part of the plants' nutrient requirements and has the further advantage that the remainder can be supplied at reduced rates by normal manuring or by foliar sprays.

Summary and conclusions: An account is given of studies carried out on paddy, to assess the possibilities of presoaking the seed in nutrient salt solutions, for improving growth and yields.

Potassium phosphate (tribasic) solution at 10 or 20 percent concentrations induced the most consistent increases in grain yield.

The method is both convenient and inexpensive and seems capable of giving with reasonable certainty a return by way of increased yield that is 4 to 6 times the cost of treatment, but further work is needed to ensure that this increased return is secured under all the varied conditions of soil and other environmental factors.

Acknowledgment: The authors wish to acknowledge the financial aid rendered by the Indian Council of Agricultural Research in carrying out these studies and to the Superintendents of the Agricultural Research Stations at Aduthurai, Pattambi and Tirurkuppam, as well as the Central Farm, Coimbatore for all the facilities provided by them for the conduct of field experiments.

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APPENDIX

TABLE I

Presoaking effect on seedling growth in paddy (GEB. 24)

(Mean of 100 seedlings — examined when 45 days old)

Treatments	Seedlings			
	Mean length of shoots (cms.)	Mean length of roots (cms.)	Dry weight shoots (gms.)	Dry weight roots (gms.)
1. Presoaked in water alone (3 times)	42·4	13·0	14·0	5·5
2. Presoaked in K_3PO_4 (M/2) twice	33·2	12·2	15·5	4·0
3. Presoaked in KNO_3 (M/2) twice	31·6	13·8	20·5	7·0
4. Presoaked in $(NH4)\ H_2PO_4$ (M/2) twice	40·8	13·8	31·5	9·0
5. Presoaked in Knop's solution (M/2) twice	42·4	11·9	25·0	8·0
6. Presoaked in K_3PO_4 and Fe, 50 p.p.m.	35·8	15·5	24·5	6·0
7. Presoaked in K_3PO_4 and Mn, 20 p.p.m.	30·7	10·8	17·5	5·0
8. Presoaked in K_3PO_4 and Cu, 20 p.p.m.	34·9	12·7	17·5	4·5
9. Presoaked in K_3PO_4 and Cu, and Mn.	34·9	9·4	20·5	6·5
10. Presoaked in K_3PO_4 and all trace elements salts, Cu, Mn, Fe.	37·4	12·4	22·5	7·5
11. Urea spray 15 lb. per acre at preflowering stage	32·5	12·2	17·0	5·5
12. Control (not soaked)	22·9	8·8	9·0	3·5

TABLE II

Effect of Presoaking Treatments on Plant heights on Paddy

Treatments : Six

Replications : Six

Variety. GEB. 24.

	Field – Central Farm Wetlands. Sown on 13—7—54.										Pot cultures. Sown on 11—10—54.									
	3rd Oct. Mean height (cm.)	%	13th Oct. Mean height (cm.)	%	23rd Oct. Mean height (cm.)	%	3rd Nov. Mean height (cm.)	%	13th Nov. Mean height (cm.)	%	1st Nov. Mean height (cm.)	%	11th Nov. Mean height (cm.)	%	22nd Nov. Mean height (cm.)	%	8th Dec. Mean height (cm.)	%	23rd Dec. 1954 Mean height (cm.)	%
1. Control (Not soaked)	37·4	100 0	52·5	100·0	64·3	100·0	74·3	100·0	96·8	100·0	14·5	100·0	34·9	100 0	44·3	100·0	60·8	100 0	67·3	100·0
2. Presoaked in K_3PO_4 (M/2) and Mn 10 ppm., twice	40·4	108 0	54·7	104·2	65·2	101·3	75·2	101·3	97 7	101·0	16·7	115·0	37·3	106·9	43·9	99·2	56·0	92·1	62·5	92·9
3. Presoaked in K_3PO_4 (M/2) and Cu & Mn. 10 ppm. each, twice	41·6	111·1	54 6	104 0	64·5	100·2	77·1	103·1	98·7	102·1	22·0	151·9	37·5	107·4	41·9	94·7	51·1	84·1	68 9	102·3
4. Presoaked in K_3PO_4 (M/2) and all trace elements salts, twice	41·3	110·4	52·9	100 9	63·8	99·2	78·1	105·1	98·8	102·1	23·5	162·1	36·3	104·0	40·3	91·0	48·4	79 7	69 0	102·6
5. Urea 0·25%, twice	40·7	108·7	53·2	101·4	63·5	98·6	73·3	98·7	100·4	103·8	27·7	191·2	40·3	115·3	45·3	102·3	59·6	97·2	61·2	90·0
6. Urea 0·25% & trace elements salts, twice	38·0	101·6	53·2	101·4	62·3	96·9	74·4	100·2	96·9	100·1	28·9	199·8	39·3	112·6	42·4	95·8	51·6	84·9	61·9	93·0
Whether differences are significant or not.	Yes. at 5%		No.		No.		No.		Yes at 5%		Yes at 1%		Yes.		No.		No.		Yes	
Critical difference at 5% level	2·6% cm.								5·51 cm.		1·94 cm.		1·94 cm.						2·86	

TABLE III.

Effect of Presoaking in Nutrient Salts on Paddy Yields.

1953—Grain and Straw Yields

Venue	: Coimbatore	Variety	: GEB. 24
Sown	: 13th July, 1953	Treatments	: 12
Transplanted	: 25th August, 1953	Replications	: 4
Harvested	: 8 & 9th December, 1953	Layout	: In randomised plots of 0·72 cents gross and 0·70 cents nett area, in field trial.

Treatments	Central Farm, Coimbatore				Pot cultures			
	Grain		Straw		Grain		Straw	
	lb./acre	% on control = 100	Mean yield lb./acre	% on control = 100	Mean yield gm./pot	% on control = 100	Mean yield gm./pot	% on control = 100
1. Presoaked in water alone (3 times and air-dried)	4,054	100·2	9,429	100·0	6·95	95·2	8·23	99·4
2. Presoaked in K_3PO_4 (M/2) - twice	4,197	103·8	10,429	110·6	8·33	114·2	10·02	121·4
3. ,, KNO_3 - (M/2) ,,	4,009	97·4	9,214	97 7	8·80	120·6	9·30	112·3
4. ,, $(NH_4)\ H_2PO_4$ - (M/2) twice	4,286	105·9	9,786	103·8	8·45	105·5	9·08	109·6
5. ,, Knops solution M/2 twice	4,269	105·5	9,400	99·8	13·75	188·8	15·73	190·0
6. ,, (2) plus $FeSO_4$ Fe - 50 ppm. twice	4,233	104·7	9,757	103·4	9 30	127·5	10·13	122·3
7. ,, (2) plus Mn 20 ppm.	4,313	106·6	9,786	103·8	8·98	123·0	10·28	124·2
8. ,, (2) plus Cu. 20 ppm.	3,866	93·8	9,400	99 8	9·18	125·7	10·75	129·8
9. ,, (2) plus Cu. and Mn.	4,366	107·9	9,216	108·8	8·08	110·7	9·35	112 9
10. ,, (2) plus all trace elements salts	4,187	103·5	11,714	124 3	7·75	106·2	4·98	60·2
11. Spray with Urea 15 lbs. per acre at pre - flowering stage	4,297	106·1	10,500	111·4	7·68	105·2	8 73	150·2
12. Control (not soaked)	4,044	99·9	9,429	100·0	7·30	100·0	8·28	100·0
Whether differences are significant are not	No.		No.		Yes.		Yes.	
Critical difference, at 5% level					3·43 gms.		2·15 gms.	

TABLE IV.

Effect of Presoaking in Nutrient Salts on Paddy yields.

1954 - Grain and Straw.

Venue	Central Farm, Wetlands.	Variety	GEB. 24
Sown	13th July, 1954	Treatments	Six:
Transplanted	3rd September, 1954	Replications	Six.
Harvested	20th December, 1954.	Layout	in randomised plots of 1·2 cents gross and 1·0 nett.

Treatments.	Sheaves (fresh weight)		Grain		Straw	
	lb/acre.	% on control = 100	lb/acre.	% on control = 100	lb/acre.	% on control = 100
1. Control (not soaked).	10,670	100·00	2959	100·0	7340	100·0
2. K_3PO_4 (M/2), plus Mn 10 ppm. presoaked twice 8 hours.	10,450	97·92	2980	101·0	7120	97·0
3. ,, plus Mn plus Cu. 10 ppm. do.	10,740	100·70	3080	104·4	7150	97 4
4. ,, plus trace elements Fe, Cu, Mn, Zn twice.	10,140	95·01	2960	100·3	6830	93·1
5. Urea 0·25% presoaked, twice.	10,930	102·40	3080	104·4	7490	102·3
6. Urea 0·25% plus trace elements, twice.	11,060	103·60	3140	106·4	7530	102·6
Whether differences are significant or not.	Yes. at 5 % level		No.		No.	
Critical difference 5 % level.	20·5 lb.	0·67				
Ranking	6, 5, 3, 1, 2, 4					

TABLE V.

Effect of Presoaking in Nutrient Salts on Paddy Yields

1955 — '56, Summary of results on grain and straw yields - from five experiments carried out at four locations, using five paddy strains and involving two levels of fertility. The fertility level differences are not presented in these summary tables.

Treatments.	Central Farm Coimbatore (CO. 1)				Agricultural Research Station, Tirukuppam (TKM. 6)				Agricultural Research Station, Aduthurai (ADT. 3)				Agricultural Research Station, Pattambi (PTB. 2)				Agricultural Research Station, Pattambi (PTB. 20)			
	Grain		Straw		Grain		Straw		Grain		Straw		Grain		Straw		Grain		Straw	
	lb./ acre	%	lb./ acre	%	lb./ acre	%	lb./ acre	%	lb./ acre	%	lb./ acre	%	lb./ acre	%	lb./ acre	%	lb./ acre	%	lb./ acre	%
1. Control (not soaked).	1390	100·0	2784	100·0	3055	100·0	5110	100 0	2816	100·0	2326	100·0	2822	100·0	5380	100·0	1150	100·0	5895	100.0
2. Presoaked. K_2HPO_4 (M/2)	1350	97·1	3436	123·4	3027	99·0	5181	101·3	2756	97·9	2624	112·8	2910	103·1	5411	105·8	1181	102·7	5835	98.9
3. (2) plus Mn	1305	93·9	2892	103·9	2977	90·0	5479	107 2	2695	95·8	2472	106·3	2881	102·1	5285	98·2	1281	111·4	5737	97.3
4. (4) plus Mn plus Cu & Fe	1320	94·9	3173	113·9	3040	99·2	5380	105·3	2816	100·0	2996	128·7	2882	102·1	4989	92·7	1179	102·5	5396	91·5
5. (2) plus all trace elements as spray	1350	92·1	2556	91·7	3009	98·4	5522	108·0	2866	101·8	2503	107·6	2404	85·2	4191	77·9	1088	94·9	4884	82.9
6. Presoaked in $Zn SO_4$ 10 ppm.																	1300	113·0	5142	87·2
7. Presoaked in K_3PO_4 & Zn 10 ppm.																	1245	108·2	5606	95·1
8. Presoaked in K_3PO_4 & Cu. 10 ppm.																	1215	105·6	5499	93·3
Whether differences are significant or not	No.		Yes.		No.		Yes.		No.		Yes.		Yes.		Yes.		Yes.		Yes.	
Critical difference at 5% level.			694 lb.				308 lb.				339 lb.		261 lb.		864 lb.		120 lb.		476 lb.	

TABLE VI

Effect of Presoaking in Nutrient Salts - on Paddy yields.

1956—57 Summary of results on grain and straw yields, from three experiments in three locations

Layout — Simple randomised plots

Treatments — Nine

Replications — Four

Treatments	Central Farm. Coimbatore Co. 25				Agricultural Research Station, Pattambi PTB. 2				Agricultural Research Station, Tirurkuppam TKM. 6			
	Grain		Straw		Grain		Straw		Grain		Straw	
	lb./ acre	% on Control =100	lb./ acre	% on Control =100	lb./ acre	% on Control =100	lb./ acre	% on Control =100	lb./ acre	% on Control =100	lb./ acre	% on Control =100
1. Control (not soaked)	4425	100·0	11,137	100·0	3141	100·0	7921	100·0	3608	100·0	5334	100·0
2. Water - soaked (16 hours)	4650		11,590	104·1	3042	97·4	7527	94·9	3348	93·1	4576	85·8
3. Presoaked in K_3PO_4 (M/2)	4575		13,015	116·6	3173	101·0	8286	104·6	3576	99·4	5169	66·9
4. Presoked in β indolyl - acetic acid	4475		13,030	116·9	3053	97·2	7849	99·1	3618	100·2	4329	81·2
5. Presoaked in naphthalene - acetic acid 50 ppm.	4400		10,517	94·4	3274	104·2	8213	103·7	3439	95·3	3807	71·4
6. (3) plus (4)	4525		10,062	90·3	3168	100·9	7703	97·2	3563	98·8	5727	107·9
7. (3) plus (5)	4325		10,525	94·5	3289	104·7	8548	107·9	3511	97·3	5232	98·1
8. Spray with β indolyl - acetic acid 100 ppm.	3600		12,587	113·0	3273	104·2	8254	104·6	3381	93·7	5458	102:2
9. (3) plus (8)	3575		13,057	117·2	3325	105·8	8248	104·1	3477	96·4	5533	103·7
Whether differences are significant or not		Yes.	Yes.		No.		Yes.		No.		Yes.	
Critical difference, at 5% level	592 lb.		3,015 lb.				698 lb.				919 lb.	

Madras agric. J., 45 : (7) 268—272, 1958

Horticulture in India

by

M. S. RANDHAWA, D.SC., F.N.I., I.C.S.,
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Horticulture, a term under which I include cultivation of fruits and vegetables as well as ornamental flowering and foliage trees and shrubs as well as flower gardening, is as old in India as the people themselves. Our ancestors, the Aryans of the Vedic times, were great lovers of nature. The very name they gave to flowers - *Sumanasa* that which pleases the mind reveals their aesthetic sensibility. In the Buddhist sculptures at Sanchi and Bharhut we find a variety of ornamental trees sculptured in stone. Some of these sculptures are as old as two thousand years. The favourite trees of the Buddhist monks were the peepul *(Ficus religiosa)*, the Bodhi tree under which the Buddha obtained enlightenment, the Asoka *(Saraca indica)* - the beautiful tree which bears clusters of orange red flowers under which Gautama is said to have been born to Maya, and the Nag - Kesar tree *(Mesua ferrea)*. Of the fruit trees, mango was their favourite and we find a number of mango trees on the gateways of Sanchi with cheerful groups of monkeys gamboling in their branches. In Kushan Mathura we find beautiful sculptures of Yakshis, the Woodnymps, in which we find ornamental trees associated with women. *Asoka, Kadamba* and *Champak* were their favourite trees. In the Hindu caves at Ellora there is a beautiful representation of Indra and his queen sitting under the shade of a mango tree laden with luscious fruits. After the ancient Buddhists and Hindus it were the Moghuls who laid out a number of gardens of extraordinary beauty in Kashmir, Lahore, Delhi and Agra. The garden architecture of the Moghuls is of surpassing beauty; running water marble or stone chutes with shell and wave designs, octagon or star parterres and terraces and *Baradiris* were their main features. The British gave us turf and the herbaceous border of annual flowering plants. Our parents were only familiar with such flowers as marigolds and vincas and it was the English official and his garden-loving wife who introduced phloxes, verbenas and antirrhinums and so many other annuals which beautify our gardens.

Under the First Five Year Plan Horticulture did not receive the recognition it deserved under the mistaken notion that cereals are more important than fruits and fruits are not foods. Apart from

the health-giving vitamin C in which a number of fruits are so rich, in terms of bulk and calorific values, fruits like grapes, banana, papaya and pine-apple produce more food than many farm crops per unit area of land. Hence increase in food production means not only adequate provision for protective food but also of total food. I am glad that Horticulture has found due recognition in the Second Five Year Plan. A scheme for establishment of two Horticulture Plant Introduction stations, one at Saharanpur in Uttar Pradesh and the other at Hassanghatta in Mysore, with the main station at the Indian Agricultural Research Institute, in Delhi, have been sanctioned by the Indian Council of Agricultural Research. A full-fledged Division of Horticulture is being established at the Indian Agricultural Research Institute at a total cost of Rs. 11,29,000/- which includes the cost of construction of an up-to-date laboratory and office building at a cost of Rs. 2 lakhs. This Division at I. A. R. I. will conduct research work on the improvement of fruits and vegetables and impart post-graduate training in Horticulture. In addition to the Research Station at I. A. R. I. there will be Regional Stations on six important fruits crops, such as mango, citrus, grapes, guava, pine-apple and apple. Each Regional Station will cost a sum of Rs. 5 lakhs on equipment, farm and personnel, the total cost being Rs. 30 lakhs for the Plan period. Apart from this, provision has been made for production and supply of plant material of reliable parentage, supply of manures and fertilizers on deferred payment basis and establishment of 6 training schools for *malis*. An efficient advisory service will be established at the central and State levels. The total expenditure on research and development of horticulture is estimated to be Rs. 13 crores. This is an ambitious programme which has provided great scope for horticultural development, and it is now for the research workers and the horticulturists of India to rise to the occasion to fulfil their obligations.

Plant introduction provides great scope for introducing new fruit plants in the country. The United States of America and U. S. S. R. have greatly benefited from efficient Plant Introduction Services which they have established in their respective countries. Apart from introducing wild plants which the geneticist and the plant-breeder can use, there is also a possibility of introducing new plants which should be fully exploited.

It is the plant breeder who has made the greatest contribution to human prosperity by developing improved varieties of plants. By the use of drugs such as colchicine and X-rays, mutations can be

artificially produced. The use of atomic energy has opened out new vistas. By the use of cobalt–66 plants are irradiated and mutations occur. This is a type of technique which deserves to be fully exploited in relation to fruit plants. Polyploidy is a fruitful source of new varieties of domosticated plants. Garden plants which are reproduced by means of bulbs, corms, tubers or cuttings provide an unusual opportunity of perpetuating the new varieties which are artificially produced. This is an aspect of horticultural work which deserves very close attention by the research workers. It should be possible to evolve seedless fruits, fruits of bigger size with a better flavour, higher vitamin content, earlier or late naturity and resistant to diseases and insects. The cytology of the fruit and vegetable crops should be worked out by a team of workers and fullest use of this knowledge should be made in producing new plants.

This soil chemist should be a closer ally of a horticultural worker in working out the nutrient needs and particularly the effect of minor or trace elements on the food value and vitamin content of fruits and vegetables and to evolve methods of increasing soil productivity. Optimum irrigation is another factor which would give heavier yields, higher quality products and prevent crop losses and thus give added profits. Another innovation in horticultural research is regional co-operation. It constitutes a long step forward in evaluating varieties and in both the application and adaptation of experimental findings.

I am glad to note that Horticulture has found greater recognition under the Community Project and National Extension Scheme. Steps are being taken to give a more intensive training to the village level workers at the training centres. They would also be provided with complete sets of gardening tools and implements during their training period and when they go out in the field, they would be given spraying equipment as well as insecticides and fungicides. I hope the State Horticulturists would extend their fullest co-operation in promoting the cultivation of fruits and vegetables in the villages in the National Extension Scheme. Wherever irrigation is available, fruit trees should be grown. In every farmer's home there should be grown at least three trees; the *Nimbu*, Papaya and *Kathal*, the trio, whom I regard as the most useful fruit trees which should have the widest popularity.

Here I would also like to make a mention of the Garden Colony Scheme of Panjab under which an area of 20,000 acres in 27 garden colonies is being brought under Horticulture. Apart from being an Horticultural scheme, it is a great social experiment in which the advantages of co-operation side by side with individual cultivation have been fully co-ordinated. While nurseries, cold storage and marketing of fruits would be co-operatively run, fruit production in the individual plots would be the concern of the owners. This is a type of experiment which deserves to be extended in other parts of India as well.

Last year a group of Delhi girls were camping in some village in Faridabad community projects under the Youth Camp Scheme of the Bharat Sewak Samaj. This camp was visited by a correspondent of a monthly magazine from Delhi. One of the criticisms made by that correspondent was that the town girls asked the villagers: "why don't you eat fruits?" While I would not advocate purchase of fruits by the villagers which they themselves do not grow, there is no reason why they should not raise their own fruits. Fruit eating has so far been the prerogative of the middle-classes of the towns only and it is only recently that apart from mangoes, the cultivation of other fruit trees is finding recognition in villages. I would say that our villager should include fruits and vegetables in his dietary. At present the diet of our farmer is proverbially unbalanced. There is a general lack of pretective foods. In some areas it is the millets which form the staple diet of the farmer. Dullness and monotony in diet is possibly the cause of low intelligence. Now that opportunity is being given to all the citizens of India to fully develop their personalities, and benefits of development are being extended to the rural population also under the National Extension Scheme it is very necessary that we should pay all our attention to the encouragement of cultivation of fruits and vegetables in the rural area. It is mainly the lack of facility of seed which has been standing in the way of vegetable cultivation. Now provision has been made for supplying vegetable seeds in the form of packets from the vegetable stations in Kulu and Kashmir Valleys. This is a type of work which deserves the fullest attention on the part of the extension workers in Horticulture.

Apart from providing a health-giving diet to the people, it is the aesthetic and spiritual side of Horticulture which deserve as much attention. People who follow the art of fruit and vegetable raising not only make a living and earn more from land and labour

than other methods of farming, but also derive much benefit that cannot be measured in terms of money. Observation of plants from their childhood to maturity gives us much pleasure, their blossoms provide an endless source of enjoyment. In our horticultural programmes we should also give a due place to the flowering annual. Our public parks and gardens deserve a good deal more of attention. There is need of introducing improved flowering annuals. I am glad that the Government of India have agreed to the import of seeds of flowering annuals from countries of the West where a good deal of intensive work has been done and a large number of new varieties of flowering annuals have been evolved. While we should make the fullest use of the plants evolved in the West, we should also contribute our share to this great venture in the service of beauty.

Special Announcement

The Governor of Madras during the visit to the Agricultural College and Research Institute, Coimbatore on 19th June 1958, graciously announced the institution of a Rolling Shield to be presented to the student who does the best in practical work in the field allotted to him each year. The rules for the award will be announced shortly.

Madras agric. J., 45 : (7) 273—275, 1958

Research Notes

The Rice leaf roller - *Cnaphalocrocis medinalis* Gr. and its Control

Introduction : Among the several pests of rice, the leaf roller, *Cnaphalocrocis medinalis* Gr (Pyralidae) is generally reckoned as a minor one, but capable of becoming sporadically serious. Ramakrishna Ayyar (1932, 1933 and 1940) mentions the occurrence of the insect in a serious form chiefly from Ganjam and the west coast tracts in South India. He suggests the early clipping off and destruction of infested leaf tips for its control. The insect has been noted to assume prominence on rice, successively in recent years in parts of the Madras State, particularly in the Tanjore delta. The observations made by the author on the pest with special reference to its control during 1955—'56 at the Agricultural Research Station, Aduthurai are recorded in this note.

Habits of the pest and nature of damage : Round, small, whitish eggs are laid singly on the tender leaf blade by the small yellowish winged adult. The caterpillar, that hatches out, rolls the tender leaf tip and remains inside, scraping and feeding on the tender green tissues. Due to this activity, the leaves turn whitish and whole field present a very unsightly appearance. This type of damage affects the growth of the plants considerably. It is generally the 'Thaladi' crop of paddy in Tanjore delta that is severely affected, the period of occurrence of the pest being from October to December - January. The caterpillar, when full grown, pupates inside the leaf roll. The life cycle of the pest was found to last for 35 to 40 days, the egg stage lasting for 6 to 7 days, the larval period for 24 to 27 days and the pupal stage for 5 to 6 days.

Control : The clipping of infested leaves may serve to arrest the spread of the pest to some extent. But the method is very tedious when the pest is widespread in occurrence. Further, severe infestations coinciding with the shot-blade stage of the crop are often noted and at this stage, mechanical disturbance may affect the bearing of the crop. Hence, with a view to evolving a suitable insecticidal method of control, some of the recent synthetic pesticides such as parathion (Folidol) 0·025%, endrin 0·02% and BHC 0·05% sprays and BHC 10% dust were tried in infested fields in a bulk scale, taking a field of about 40 cents for each treatment. The insecticides were tried on varieties Co. 25 and ADT. 25. The insecticidal efficacy was assessed by taking counts of tenanted leaf

rolls and living and dead larval population from 24 random two feet square samples in a treatment, 72 hours after applying the insecticides. The data gathered are furnished in the statement below :

	Variety : Co. 25.		*ADT. 25.*	
	Treated on 17—12—1955		Treated on 19—12—1955	
	Counts taken on 20—12—1955		Counts take on 22—12—1955	
Treatments	Percentage of tenanted leaf rolls	Percentage of dead larvae	Percentage of tenanted leaf rolls	Percentage of dead larvae
(1)	(2)	(3)	(4)	(5)
1. BHC 0·05% (1 lb of 50% w. p. in 13 gallons)	24·5	66·9	19·5	62·9
2. Endrin 0·02% (1 oz. of of 19·5% emulsifiable concentrate in 6¼ galls.)	17·0	68·6	12·3	69·0
3. Parathion 0·025 (1 oz. of Folidol E. 605 in 12½ galls.)	16·5	74·4	12·0	72·0
4. BHC 10% dust	26·7	33·3	26·1	39·1
5. Control (No treatment)	36·6	Nil	42·7	1·2

Results : As judged from the percentage of tenanted leaf rolls and mortality of caterpillars, sprays of parathion (Folidol) 0·025% and endrin 0·02% followed by BHC. 0·05% brought about a good control of the pest. BHC. 10% dust did not prove to be efficacious to the desired degree.

When examined after a fortnight, it was found that the sprayed fields had improved considerably as could be noted from the healthy appearance of the crop.

Cost of treatments : The cost of the chemical for treating one acre approximates to Rs. 12·00, Rs. 7·00 and Rs. 7·00 in the case of parathion (Folidol), endrin and BHC. respectively. About 80 to 100 gallons of the spray fluid are required to treat one acre.

Summary and conclusions : The leaf roller - *Cnaphlocrocis medinalis* is a serious pest on rice. The Thaladi crop gets the worst attack by the pest. Sprays of parathion (Folidol) and endrin were found to be highly effective in dealing with the pest. BHC spray also caused a satisfactory control of the pest. Insecticidal applications in the form of sprays is to be preferred to dust forms for ensuring adequate control. Treatments may be given in the early stage of appearance of the pest.

Acknowledgment : The author's thanks are due to Sri V. Srinivasan, Superintendent, Agricultural Research Station, Aduthurai, for providing adequate facilities for conducting the observations.

E. V. ABRAHAM.

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RESEARCH DEGREE

Sri S. Kanakaraj David, B. Sc. (Ag.), M. Sc., Lecturer in Entomology, Agricultural College and Research Institute, has been awarded the degree of *Doctor of Philosophy* for his thesis on **"Studies in South Indian Aphids"** by the Madras University.

Our congratulations to him!

Madras agric. J., 45 : (7) 276—277, 1958

A note on the Ovicidal Action of a Few Organophosphoric Pesticides *

Susceptibility to insecticides has been noted to vary with different stages of the life-history of insects. It is often possible to take active measures against a pest in the egg stage itself, by applying ovicidal material of high penetrating power. Experimenting on the recent organic pesticides, Smith and Foulton (1950) have observed that contact extending over a period of two to six days would cause the mortality of insect eggs, deposited on the surface treated with parathion. Krishnaswamy (1951) has recorded that DDT in solution penetrates the chorion easily with the solvent up to the vitelline membrane. The embryos have been noted to develop normally but failed to emerge from the chorion in both the cases.

The action of parathion in the form of Folidol E605 (Diethyl paranitrophenyl thiophosphate 46·6%), Systox (Diethoxy thiophosphoric ester of 2-ethylmercapto ethanol) and Pestox 3H (Bis dimethyl amino phosphonous anhydride 66%) against the eggs of *Euproctis fraterna* F. and *Corcyra cephalonica* L. has been studied by the author and the results are reported in this note.

Details of the Experiment: The ovicidal action of the three formulations mentioned above were studied against the test insects under laboratory conditions. Eggs of the former species are usually laid in clusters covered by fluffy silken fibres secreted by the adult moth. The eggs of the latter are greyish yellow in colour and are laid singly. Three days old eggs, twenty five in number, were collected and glued to filter paper strips. Each set of observation was replicated four times. The filter paper strips were kept in petri dishes and sprayed using 3 cc. of the three chemicals, at two concentrations, with the help of an atomiser. After the treatment, the dishes containing the eggs were kept open for half an hour to drain away the moisture. A small quantity of the appropriate food material was then placed inside the petri dishes and closed with another dish. Suitable controls were also maintained.

Observations were made daily at 10 A. M. for a week and the number of caterpillars hatched out of the eggs was recorded. The data gathered are presented below. The average maximum and minimum temperatures and relative humidity under laboratory conditions were 87·7°F, 78·6°F and 81·1% respectively.

(*) Formed part of the thesis for the award of the M.Sc. degree of the University of Madras.

Treatment	Total number of eggs under study	Number of eggs hatched in the course of one week — *Euproctis* eggs					Number of eggs hatched in the course of one week — *Corcyra* eggs				
		24 hrs.	48 hrs.	72 hrs.	98 hrs.	120 hrs.	24 hrs.	48 hrs.	72 hrs.	98 hrs.	120 hrs.
Pestox at 0·075%	100	..	..	..	5	..	..	..	6	8	..
Pestox at 0·15%	100	..	..	..	7	..	..	..	..	4	..
Systox at 0·075%	100	..	..	..	4	6	..	..	4	6	..
Systox at 0·15%	100	..	..	2	5	7	..	..	2	4	..
Folidol at 0·075%	100	..	..	..	5	9	..	..	3	5	..
Folidol at 0·15%	100	..	..	..	6	8	..	..	5	7	..
Control	100	..	..	56	72	85	..	27	58	86	92

Note: (i) There were no emergences either in the treated or control, in the course of the observations made at 144 hours and 168 hours after the treatment.

(ii) The caterpillars that managed to come out of the egg shell in the case of treatments with Pestox, Systox and Folidol were noted dead.

Summary of Observations: From the foregoing experiment, it is clear that even though the embryoric development is not affected as may be evident from the stray emergences recorded under the treated lots, the majority of the larvae could not even nibble the chorion and come out, but perished in the attempt as a result of the toxic action of the chemicals. The information now presented on the ovicidal action of the three organophosphorous compounds will be particularly interesting for exploiting the problem of tissue borers.

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K. R. NAGARAJA RAO.

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Weather Review — For June, 1958.

RAINFALL DATA (IN INCHES)

Division	Station	Total rainfall for the month	Departure from normal	Total since 1st January 1958
North	Madras (Meenambakkam)	1·5	— 0·4	4·7
	Tirurkuppam*	0·5	— 1·7	4·9
	Vellore	2·4	— 0·4	9·1
	Gudiyatham*	3·9	— 5·1	8·9
East Coast	Palur*	0·6	— 2·1	4·7
	Tindivanam*	0·7	— 0·9	5·9
	Cuddalore	1·1	— 0·3	5·1
	Nagapattinam	0·3	— 0·9	2·4
	Aduthurai*	Nil	— 1·3	6·0
	Pattukkottai*	0·8	— 0·5	8·5
Central	Salem	0·4	— 2·7	8·0
	Coimbatore (A. M. O.)* ..	0·7	— 1·4	6·5
	Coimbatore	0·4	— 1·1	7·9
	Tiruchirapalli	0·1	— 1·7	6·0
South	Mathurai	0·3	— 0·3	7·9
	Pamban	Nil	— 0·2	9·3
	Koilpatti*	0·1	— 0·5	7·4
	Palayamcottai	Nil	— 0·4	9·5
	Ambasamudram*	0·6	— 0·5	16·9
	Nagercoil*	3·2	— 2·1	14·9
Hills	Kodaikanal	2·1	— 2·1	24·8
	Coonoor*	0·4	— 2·2	31·7
	Ootacamund*	3·0	— 2·5	18·5
	Nanjanad*	3·6	— 3·6	17·9

Note:— * Meteorological Stations of the Madras Agricultural Department.

Due to the apparent advance of the south-west monsoon towards the southern Peninsula, scattered rains or thundershowers alternated with dry weather in Madras State during the month of June.

On 1—6—1958, thundershowers occurred at a few places in interior Madras, while weather was dry elsewhere in the region. The monsoon was strengthening in the Andaman Sea and the south-east Bay of Bengal on 2—6—1958, when weather was dry in Madras State. As conditions became favourable for an advance of the monsoon into the Comorin-Maldives area on 3—6—1958, scattered rains or thundershowers occurred in Tamilnad. On 4—6—1958, mainly dry weather was prevalent in the State. Interior Madras received thundershowers at a few places on 5—6—1958, and weather was dry throughout the State on 6—6—1958. On 7—6—1958, rains or thundershowers occurred at a few places in interior Madras. The partition between dry and relatively moist air in south Peninsula was running from Honavar to Cuddalore on 8—6—1958, when dry weather prevailed in the State. On 9—6—1958, the monsoon was moderate in the Andaman Sea, and south-east and east-central Bay of Bengal and was advancing into the south-west and north-east Bay. Scattered thundershowers were received in Madras State on that day. Mainly dry weather prevailed in the State on 10—6—1958. For two days from 11—6—1958, thundershowers were scattered in Tamilnad. On 13-6-1958, a trough of low pressure developed in the east Arabian Sea, off the Malabar and Kanara coasts, when weather was dry in Madras State. In association with the trough of low pressure, the monsoon advanced into Kerala and south coastal Mysore on 14—6—1958, when the Bay branch of the monsoon advanced into the northeast Bay of Bengal. Under its influence, rains or thundershowers occurred at a few places in Madras State on that day. On 15—6—1958, the trough was lying off the Kanara-south Konkan coast, and the monsoon was establishing itself along the west coast to the south of latitude 15°N, when interior Madras received scattered thundershowers.

As the trough of low pressure in the east Arabian Sea shifted towards the north Kanara and the Konkan coast, rains or thundershowers occurred at a few places in north Madras on 16—6—1958. Due to the movement of the trough northwards and the extension of the monsoon towards Konkan, for seven days from 17—6—1958, weather was dry in Madras State. On 24—6—1958, conditions were unsettled in the head of the Bay of Bengal and Madras State received scattered rain. As the unsettled condition became unimportant, mainly dry weather was prevalent in the State for two days from 25—6—1958. Monsoon had been active in Kerala and Arabian Sea Island on 27—6—1958, when rains were received at a few places in Tamilnad. Weather was dry in the State on 28—6—1958. During the last two days of the month, Madras State received scattered rains.

The day temperatures were generally above normal throughout the State during the period under report.

Rainfall: The noteworthy rainfalls and the zonal rainfalls for the month are furnished below:

Noteworthy Rainfalls

S. No.	Date	Name of place	Rainfall in inches
1.	1—6—1958	Ootacamund	1·70
2.	3—6—1958	Vellore	1·52
3.	30—6—1958	Nanjanad	1·06

Zonal Rainfall (in inches)

Name of Zone	Rainfall for June, 1958	Departure from Normal	Remarks.
North	2·1	— 1·9	Below normal
East Coast	0·9	— 1·5	Far below normal
Central	0·4	— 1·7	do
South	0·7	— 0·7	Below normal
Hills	2·3	— 2·6	Far below normal

Agricultural Meteorology Section,
Lawley Road Post, Coimbatore-3.
12th July, 1958.

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

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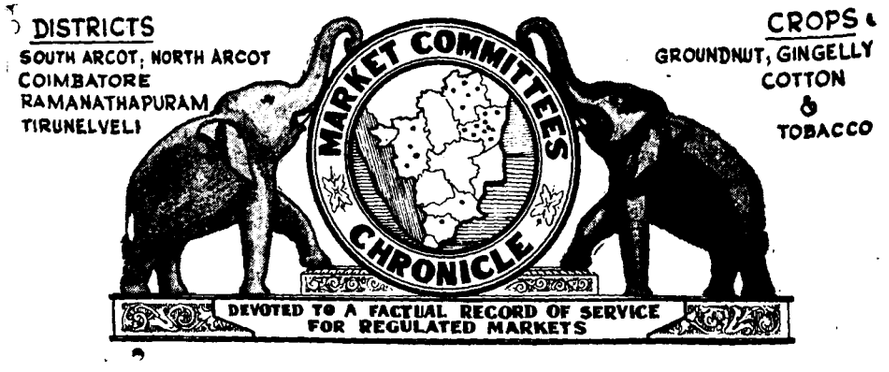

Review of Market Conditions of Commercial Crops in the Notified Areas for the Month of June, 1958.

Cotton: In this section lint : Candy of 784 lbs.
Kapas : Pothi of 280 lbs.

Season: Coimbatore District: During the month the market started with an opening balance of 12312 candies of Cambodia and 826 candies of Karunganni lint. The total receipt in the market were 10214 candies of Cambodia and 1094 candies of Karunganni lint which included 2738 candies of Cambodia and 271 candies of Karunganni locally ginned. Despatches from Tirupur accounted for 9105 candies of Cambodia and 583 candies of Karunganni to Tanjore, Salem, Dindigul and Madras in Madras State and Bombay and places in Kerala and Andhra Pradesh States. The month closed with a stock of 13421 candies of Cambodia and 1331 candies of Karunganni lint.

Kapas: The kapas market in Tirupur started with an opening balance of 37245 pothis of Cambodia, 5751 pothis of Karunganni. Arrivals during the month accounted to 34070 pothis and 6131 pothis of Cambodia and Karunganni kapas respectively. A quantity of 40741 pothis of Cambodia 5308 pothis of Karunganni kapas were disposed of after leaving a balance of 30574 pothis of Cambodia and 6574 pothis of Karunganni kapas.

Prices: Good demand continued for superior varieties of cotton and the lower types were not in good demand and as such the stocks of these types have accumulated in the market to some extent.

	Lint per candy of 784 lbs.
Cambodia superior quality	Rs. 900—981
,, average ,,	Rs. 800—860
Karunganni superior ,,	Rs. 871

	Kapas per pothi of 280 lbs.
Cambodia superior quality	Rs. 130—140
,, average ,,	Rs. 100—120
Karunganni superior ,,	Rs. 118

Ramanathapuram District: The second crop Karunganni yields were reported to have been affected due to the unfavourable seasonal conditions that prevailed during the month.

The following were the arrivals and disposals of kapas and lint in the important markets of the district during the month of June 1958.

Kapas in pothis of 280 lbs. and lint in candy of 784 lbs.

Name of market	Opening stock	Receipts	Total	Disposals	Closing stock
Kapas Market:					
Virudhunagar	3000	15500	18500	15500	3000
Sattur	500	8500	9000	8500	500
Rajapalayam	—	7250	7250	7250	—
Total	3500	31250	34750	31250	3500
Lint Market:					
Virudhunagar	265	1600	1865	1400	465
Sattur	150	800	950	800	150
Rajapalayam	280	475	755	525	230
Total	695	2875	3570	2725	845

The kapas and lint prices ruled firm during the month.

The following were the closing prices of kapas and lint in the above markets during the month.

	Kapas in pothis of 280 lbs.
Karunganni	Rs. 86 to 92
Tinny/Karunganni	Rs. 84 to 86
Second crop	Rs. 75 to 80
Tinny	Rs. 63 to 65
Uganda kapas	Rs. 112 to 125
	Lint in candy of 784 lbs.
Karunganni	Rs. 760 to 815
Karunganni average	Rs. 710 to 745
Tinny Karunganni	Rs. 640 to 691
Tinny	Rs. 590 to 640
Uganda	Rs. 1060 to 1115
	Seed in maunds of 82 2/7 lbs.
Karunganni	Rs. 8 to 9.50
Tinny	Rs. 9 to 10.33
Uganda	Rs. 8.33 to 8.50

South Arcot District: The arrivals into the market came to 95 pothis and despatches to 120 pothis. The stock at the end of the month was 12 pothis. The average price per pothi of 280 lb. was Rs. 60.10 at Villupuram market.

Groundnut: *South Arcot District:* Arrivals of summer crop were on the increase. The market started with an opening balance of 1665 tons and the arrivals from the district produce amounted to 5411 tons; while receipt from other districts like North Arcot, Tiruchirapalli, Madurai etc., came to 1098 tons. There were no imports from other States. The offtake by Oil mills and country chekkus was 2441 tons and 333 tons respectively. Despatches to other districts like Madras, Chingleput, North Arcot, Salem, Tiruchirapalli, Tanjore etc., amounted to 2211 tons and exports to Pondichery amounted to 58 tons. The stock with the trade at the end of the month stood at 3131 tons.

The average prices in the several markets ranged from Rs. 136.26 to 152.69 per candy of 531 lbs according to quality.

North Arcot District: The following were the stocks, arrivals, disposals and prices of groundnut at North Arcot markets during June, 1958.

Kind of commercial crops.	Opening balance.	Arrivals.	Disposals.	Closing balance.
	Quantity in tons.			
Groundnut kernels	120	592	603	109
Groundnut pods	379	466	722	123

Price trend: The prices of groundnut kernels in North Arcot district have not greatly changed during the month. Prices were quoted for groundnut kernels at Rs. 140—165 per candy of 531 lbs, oil at Rs. 295—320 per candy of 500 lbs. whlle at the same period of last year it stood around Rs. 155—162 for groundnuts candy of 531 lb. and 320—330 for oil candy of 500 lbs.

Ramanathapuram District: The markets of Ramanathapuram started with an opening balance of 735 candies of kernels alone with which 1200 tons of pods and 700 candies of kernels were added. Disposals amounted to 850 tons of pods and 550 candies of kernels leaving a closing balance of 350 tons of pods and 885 candies of kernels.

The opening and closing prices of groundnut, pods, kernels, oils and cake during the month were as follows:

Kernels (candy of 531 lbs.)	Rs. 135—155
Pods (maunds of 82—2/7 lbs.)	Rs. 14—18
Oil (candy of 500 lbs.)	Rs. 285—310

Gingelly: (In this Sectien per bag = 168 lbs.)

South Arcot District: Arrivals into the market of South Arcot amounted to 513 bags besider 352 bags held as closing balance of last month. Receipts from neighbouring districts totalled 163 bags; 350 bags were from district produce. Imports from other States came to 32 bags. The mills and chekkus consumed respectively 39 bags and 358 bags. Despatches to other Districts were 19 bags. The stock with the trade at the end of the month stood at 481 bags.

Prices: The prices of Gingelly per bag of 168 lbs. worked out to Rs. 57—91 at Vriddhachalam Market.

Tobacco: *Coimbatore District:* At the end of the month under report there was a stock of 10540 candies of chewing and 230 candies of cheroot tobacco. About 1944 candies of chewing and 375 candies of cheroot tobacco were exported to Nilgiris, Salem, North Arcot, South Arcot, Tiruchirapalli and Tanjore districts of Madras State and to places of Mysore, Kerala, Andhra Pradesh and Bombay.

The tobacco market continued to be dull with only scattered demand.

Prices in Rs. per candy of 500 lbs.

Variety	I Grade	II Grade	III Grade
1. *Chewing tobacco (Sun-cured):*			
(a) Meenampalayam	275—340	200—260	100—190
(b) Other varieties	200—300	160—190	80—140
2. *Cheroot varieties:*			
Sun-cured grown in Erode and Bhavani Taluks	210—260	160—200	80—130
3. *Chewing tobacco:*			
Pit cured grown in Palladam and Sulur areas.	220—280	150—200	75—100

Cardamom: Arrivals of Cardamom in the different market centres in Madurai district during June 1958 were poor due to the main season being over.

The market continued to be steady till the end of the month.

The estimated stock position of cardamom during June, 1958.

Name of centres.	Quantity in lbs. Arrivals.	Despatches.	Closing balance.
1. Bodinaickanoor ...	82,000	95,000	20,000
2. Thevaram ...	500	3,000	1,000
3. Pannaipuram ...	Nil.	10,000	Nil.
4. Kombai ...	500	2,500	Nil.
5. Uthamapalayam ...	Nil.	3,000	Nil.
6. Cumbum ...	Nil.	4,000	11,000
7. Gudaloor ...	Nil.	Nil.	Nil.
8. Pattiveerampatti ...	10,600	12,000	Nil.
9. Virudhunagar ...	25,000	35,000	10,000
	1,18,600	1,64,500	42,000

The minimum and maximum prices that prevailed during June, 1958 for different trade qualities were given below :

Prices in Rs. per lb.

Bodinaickanoor, Thevaram, Cumbum etc.,

(1) Green ...	8.25	to 9.25
(2) Extra green ...	10	to 10.25
(3) Shipment ...	7.50	to 8.00
(4) Seeds ...	11	to 11.25

Virudhunagar :

Green ...	8.50	to 9.50
Extra green ...	10	to 10.25
Shipment ...	7.50	to 8.50
Seeds ...	11	to 11.25

Pattiveeranpatti :

(1) Sundried ...	9.04	to 9.68
,, inferior ...	7.41	to 8.95
(2) Store green ...	9.06	to 10.40
,, inferior ...	7.40	to 9.02
(3) Seeds ...	8	to 10.80
,, inferior ...	4	to 6.42
(4) Splits ...	5.12	to 7.52
(5) Lights ...	3	to 4.80

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Review of Administrative Activities of Market Committees during June, 1958.

General: The Market Committees of South Arcot, North Arcot and Coimbatore continued to function during the month. The Market Committees of Ramnad and Tirunelvely could not function due to the cases pending with the Supreme Court.

Enforcement: The following progress was made by the Market Committees in the issue of licences under the provisions of the Madras Commercial Crops Markets Act.

Name of the Market Committees	Section 5 (1) A	Section 5 (1) B	Section 5 (3) A	Section 5 (3) B	Weighmen A	Weighmen B
South Arcot Market Committee	98	1484	69	1045	50	966
North Arcot Market Committee	Not reported.					
Coimbatore Market Committee	105	866	72	706	39	495

A = During the month.

B = Upto the end of the month from January.

Meetings: No meetings were held in all the Market Committees during the month under report.

Quality Analysis: Nil.

Quality Competition: Nil.

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....."I have been reading through a very excellent volume of **Memoirs of the Department of Agriculture, Madras,** No. 30 of 1954. I find it most useful. I understand.....that you are mainly responsible for its compilation. It is one of the most useful and informative books which I have seen".....

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