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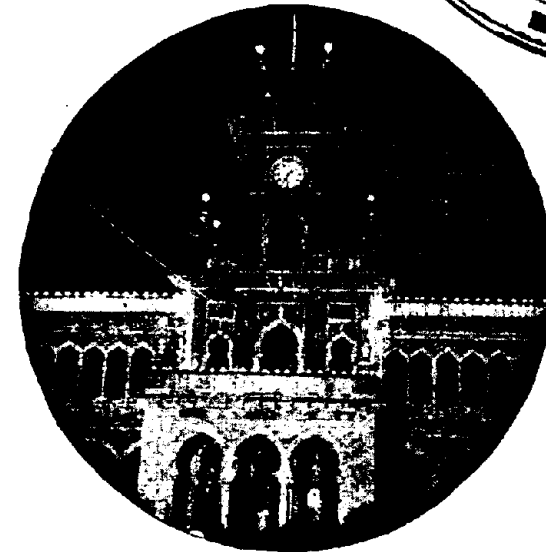
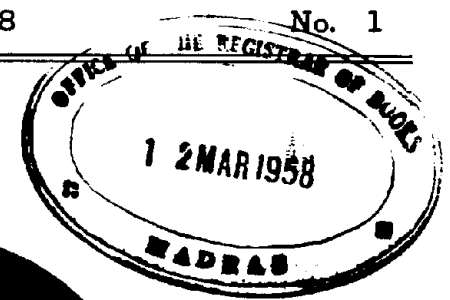
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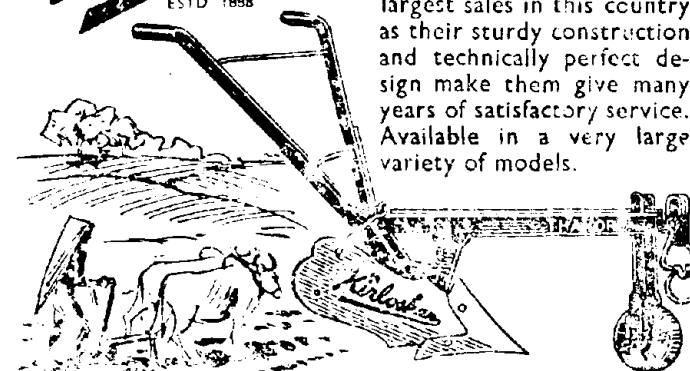
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Studies on the relative efficacies of a few chemical herbicides in the control of *Spergula arvensis*, L. and *Oxalis latifolia* HB&K., two important weeds of the Nilgiris

by

T. R. NARAYANAN, and D. MEENAKSHISUNDARAM,
Agricultural College and Research Institute, Coimbatore.

Introduction: *Spergula arvensis* L, commonly known as spurry and *Oxalis latifolia* HB&K, are the two major weeds of cultivated lands above 5,000 feet, on the Nilgiris. *Spergula arvensis* L, which was introduced from Europe in earlier years, is an annual, reproducing by seeds produced in abundance. *Oxalis latifolia* HB&K, a native of Mexico, has spread in many places of the Nilgiris as a troublesome weed. It is a perennial with underground bulbs, by means of which it is able to reproduce and persist in the field for a long time. These two species have now become the most predominant and pernicious of the weed population found in potato fields. Trials were conducted for the control of these weeds with chemical herbicides at the Agricultural Research Station, Nanjanad and the results are presented in this paper.

Review of Literature: Long (1938) describes *Spergula arvensis* L as one of the most troublesome weeds on light, sandy soils, where it too often occurs in overwhelming quantity. It is usually considered as typical of light soils and as an indication of the absence of lime. He states that a 5% solution of copper sulphate was fairly effective in certain experiments and that the weed in cereal crops may also be destroyed by spraying with a 7 to 10% solution of sulphuric acid. Templeman and Sexton (1946) studying the effects of synthetic plant growth-substances on seed germination and early growth of plant species, found that ethyl. β -naphthoxyacetic and 4-methyl-phenoxy-acetic acid seriously affected (at 200 ppm) the early growth of *Ranunculus arvensis*, *Chenopodium album* and *Spergula arvensis*. Long and Brenchley (1949) mention that spurry will be gradually reduced by applications of lime in some form, the effect of which will be progressive and up to a point dependent upon the size of the dressing. Describing the results of spraying Agroxone at the rate of 1.5 gallons per acre containing 1.7 lb. of active MCPA on many of the common British arable and pasture weeds, Holmes (1949) puts *Spergula arvensis* L as moderately resistant, while *Oxalis* species is brought under the list of resistant weeds on which the weedicide has

no appreciable effect. Thomas and Srinivasan (1949) observed that *Spergula* was killed in two weeks by 0.2% MCPA. Templeman and Halliday (1950) using dusts and sprays of MCPA at 1, 2 and 4 lb. acid equivalents per acre on some weeds found that seedlings of a few weeds including *Spergula arvensis* were effectively controlled by a spray application of the sodium salt of MCPA at 4 lb. acid equivalent in 100 gallons per acre. Saptharishi and Azariah (1952) found that spraying 1% solution of Extar 'A', fifty days after sowing *Samai*, effected a kill of nearly 80 of the weed population, mainly of *Spergula* and that the chemical did not have any deleterious effect on the *Samai* crop, which gave a better yield of grain and straw than the untreated plots. Describing the effect of spraying weeds in the young stage with 0.1% solutions of a number of substituted-phenoxy-butyric acids as their ethanolamine salts, Wain (1954) observed that 2:4-dichlorophenoxy-butyric, 4-chlorophenoxy-butyric and 2:3:4-trichlorophenoxy-butyric acids had only a slight effect on *Spergula* and concluded that further investigations were necessary at different stages of growth and with higher dosages of herbicide chemicals.

Though herbicides have been tried on a few species of the genus *Oxalis* by many workers, there appears to be no information on the chemical control of *Oxalis latifolia*. Winders (1948) describes *Oxalis corymbosa* as somewhat susceptible and *O. corniculata* as resistant to the hormone weedkiller 2, 4-D on weeds of New South Wales, and classifies *Oxalis cernua* and *O. corniculata* as resistant to these weedicides.

Materials and Methods: Five herbicidal treatments with the addition of a control made a six-plot layout and this was replicated four times, the treatments being randomised within each block. Each plot was 0.5 cent in area. The weedkillers were applied as sprays in a spray volume of 100 gallons per acre, using a 'Hyject' foot-operated sprayer on 13-6-1955. Spraying was done in the mornings when clear and bright weather prevailed. The plots were laid out in a fallow field in which good growth of the weeds was noticed. At the time of spraying, spurry plants had grown to a height of nearly six inches, while a few had also flowered. The following were the treatments tried on *Spergula arvensis*.

1. Control (untreated)
2. Extar 'A', @ 8 lb. per acre (Dinitro-ortho-cresol)
3. Triherbide NIX, @ 20 lb. per acre
4. Na 2, 4-D, @ 5 lb. per acre
5. MCPA (Agroxone 3), @ 5 lb. per acre
6. Na 2,4-D and MCPA, @ 5 lb. each per acre.

For *Oxalis latifolia*, the first five treatments were the same as given for spurry while the last treatment was butyl ester of 2,4-D @ 5 lb. acid equivalent per acre. Spraying was done on 14-6-1955 when the weeds were mostly in flowering phase, though young growths were also present. Teepol was used as a wetting agent in all the treatments. The effectiveness of the different treatments was assessed by taking weed counts within a 2 ft. square in each plot before spraying as well as at weekly intervals after spraying.

Observations: On spurry, Extar A and Triherbide NIX showed good scorching of foliage within 24 hours of application, while in the case of sodium 2,4-D, MCPA, and a combination of both at 5 lb. acid equivalent each per acre, slight scorching of foliage and pronounced epinasty were the effects observed in 48 hours. The mean mortality percentages obtained at weekly intervals for four weeks from the date of application of the herbicides are presented in the following table.

Mean mortality percentages of Spurry

Treatments	Weeks			
	I	II	III	IV
1 Control	Nil	Nil	Nil	Nil
2 Extar A, @ 8 lb. per acre	92.9	93.8	95.8	97.0
3 Triherbide NIX, @ 20 lb. per acre	99.4	100.0	100.0	100.0
4 Sodium 2,4-D, @ 5 lb. per acre	0.9	1.9	10.5	10.7
5 MCPA, @ 5 lb. per acre	12.1	13.2	75.8	96.9
6 Sodium 2,4-D and MCPA, @ 5 lb. per acre	35.9	51.8	79.1	98.3
General mean	48.3	52.1	72.2	80.6
Standard error	8.81	9.89	5.64	1.73
Critical difference, (P = 0.05)	27.14	30.40	17.38	5.31
Conclusion	3,2,6,5,4	3,2,6,5,4	3,2,6,5,4	3,6,2,5,4

In the case of *Oxalis latifolia*, observations recorded 24 hours after treatment, revealed good scorching of the leaves in the case of Extar A, Triherbide NIX and Butyl ester of 2,4-D. In the case of sodium 2,4-D and MCPA, slight scorching of the foliage and marked epinasty were the effects noticed. Mortality counts were taken a week after treatment in all the plots. These counts could not be continued further as there were regrowths in all the plots afterwards. Fresh growths were counted in all the treatments after four weeks of treatment, and the counts of fresh growths



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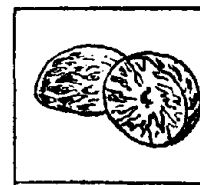
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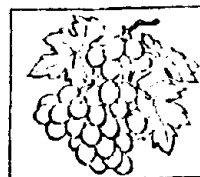
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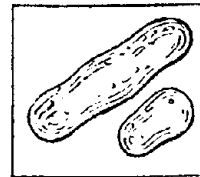
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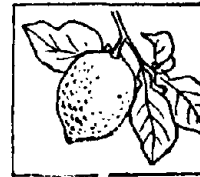
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expressed as percent over the population that existed before treatment, for statistical scrutiny. These data have thrown some light on the differential efficacies of the various herbicidal treatments in suppressing fresh growths from the underground bulbs of this weed. The data are presented in the following table.

Mortality in Oxalis latifolia

Treatments	Mean % kill a week after spraying	Mean % regrowth 4 weeks after
1. Control	Nil.	120.9
2. Extra 'A' @ 8 lb./acre	71.5	233.2
3. Triherbide NIX @ 20 lb./acre	98.7	158.5
4. Sodium 2,4-D @ 5 lb./acre	62.9	61.9
5. MCPA, @ 5 lb./acre	64.7	40.1
6. Butyl ester of 2,4-D, @ 5 lb./acre	99.1	126.7
General mean	79.6	123.6
Standard error	5.65	23.53
Critical difference (P - 0.05)	17.42	70.87
Conclusion	6, 3, 2, 5, 4	2, 3, 6, 1, 4, 5

Discussion : On *Spergula arvensis*, sodium 2,4-D at 5 lb. acre did not prove effective while the other treatments were found to be statistically equal in effect so far as the extent of kill brought about a month after spraying, is concerned. But the quickness with which the kill was effected is marked in the case of Extar A and Triherbide Nix, which destroyed the weeds to the extent of 92% and 99.4% respectively in the first week itself and these were significantly higher than other treatments, while MCPA and a mixture of Na, 2,4-D and MCPA took four weeks to effect a kill of 96.9% and 98.3% respectively. The most effective chemical was Triherbide NIX, which gave a cent percent kill within a fortnight of applying the sprays, though later on it was on a par with Extar 'A'. Extar 'A' and Triherbide NIX are quick in their effect because of their contact herbicidal action. Formulations of 2,4-D and MCPA, though possessing some contact action, have got to be absorbed and translocated to the different parts of the plant from the seat of application to effect a kill and hence the delayed effect. Further, the morphological features of *Spergula arvensis*, a low herbaceous annual especially the jointed, cordlike,

slender and much-branched stems with small thread-like leaves arranged in whorls, offer only a limited surface for the hormone sprays and the chances for the herbicidal spray to remain on the surface of the plant body for a sufficiently long time to get absorbed by the tissues are also limited.

The main difficulty in the control of spurry is the peculiar seeding habit of the plant. Seeds are produced in abundance and they are so minute, being lens-shaped with a winged margin that they are easily dispersed by wind. Because of this, even a field in which the weeds are killed by spraying herbicides, gets easily contaminated by wind-borne seeds of this species. This is more so in the hills, where the fields are at different levels, especially on terraced slopes. Hence complete control is possible only by using herbicides over a very wide area so as to destroy all the spurry over that tract, in the preflowering stage itself and prevent reinfestation by wind-borne seeds.

In the case of *Oxalis latifolia* which is a perennial weed, the aerial portions were killed within a week of application of Triherbide NIX at 20 lb. and butyl ester of 2,4-D at 5 lb. per acre to the extent of 98.7% and 99.1% respectively, being significantly better in effect than the other three treatments which were more or less equal in effect. The appearance of abundant regrowths in the plots sprayed with Extar A and Triherbide NIX within a month indicated that these two chemicals were effective only in killing the aerial portions by their contact herbicidal action. They are not translocated to other parts and hence fresh growths arise from the bulbs which remain unaffected, while in the case of 2,4-D and MCPA formulations, the regrowths were considerably less. This shows that these have suppressed the regeneration of the weed to a certain extent. Though the hormone herbicides get translocated to various parts of the weed, they are unable to bring about a complete suppression of regrowths, because the buds in the bulbs are effectively protected by fibrous scales. Further, when once the aerial portions are destroyed the buds of the lower scales develop and give rise to short branches, each one bearing at the distal end a 'clove' capable of developing into a new plant. Another noteworthy feature in favour of this weed is the presence of a main tuberous root which is thick and fleshy, due to accumulation of reserve food material and water and this helps in the perennating activity of the bulbs. Weeds which have reserve foodstuffs in the lower stems and roots should absorb the weed killer which should be translocated down to the roots also before kill can be assured. It is well known that 2,4-D compounds

have a variety of herbicidal actions. They kill the foliage of plants by contact, at the same time getting into the underground parts such as roots, stolons, bulbs etc., in perennial plants. It is also said to be easily absorbed by the roots if present in the soil. Perhaps, in the control of this weed soil application of 2,4-D or a suitable soil sterilant may prove useful and a trial in this direction is worthy undertaking.

Summary: The results of trials with a few chemical herbicides on the control of two major exotic weeds of cultivated lands in the Nilgiris, namely *Spergula arvensis* and *Oxalis latifolia* are briefly outlined. Extar A at 8 lb. and Triherbide NIX at 20 lb. per acre proved definitely better in effect than others on *Spergula arvensis*. These two chemicals were also quick in their action, while MCPA at 5 lb. and a mixture of sodium 2,4-D at 5 lb. per acre proved to be ineffective against this weed.

In the case of *Oxalis latifolia*, the butyl ester of 2,4-D at 5 lb and Triherbide NIX at 20 lb. per acre proved to be the most effective in killing the aerial portions, while sodium 2,4-D and MCPA at a 5 lb. dose had a better retarding effect on the regeneration of the weeds from the underground bulbs.

The morphological features of the two weeds are also briefly discussed, with reference to the differential effects of the herbicides tried.

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Guar or Clusterbean (*Cyamopsis tetragonoloba*) and its Scope as a Short Duration Green Manure Crop.

by
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Introduction: Guar or cluster bean (*cyamopsis tetragonoloba*) is a common member of the kitchen and small gardens. Though in many parts of this country it is grown on an extensive scale to serve both as a vegetable and fodder, it is, however, not much known outside India. This plant appears to be a native of this country, brought into cultivation at a very early period. Tall and robust wild forms are found growing in the northern parts of India. The crop is drought resistant and yields well even with moderate irrigations, being particularly suited to light sandy loams.

Though it was known that Guar (cluster bean) which belongs to the family *Leguminosae* may be well suited as a green manure crop, no experiment has been conducted so far to ascertain this useful aspect. If Guar proves to be a dual purpose crop which yields not only a heavy tonnage of green matter but also a sizeable quantity of marketable vegetable within a short period, it would be a welcome recommendation to the farmers, who are reluctant to grow green manure in preference to an economic crop.

Materials and methods: To find out the utility of Guar as a green manure crop, a replicated and randomised trial was conducted at Millets Breeding Station, Coimbatore during 1957 summer season under irrigation. Guar C. P. 78 was compared with the popular green manure crops like *Sesbania speciosa* (Sesbania), *Crotalaria juncea* (Sunn hemp) and *Phaseolus trilobus* (Pillipesara), using the following seed rates :

(1) Guar	...	30 lb. per acre.
(2) Pillipesara	...	40 lb. per acre.
(3) Sunnhemp	...	40 lb. per acre.
(4) Sesbania	...	60 lb. per acre.

The three green manure crops along with Guar were sown during the month of April, replicated twelve times and four replications in each crop were harvested at the end of 30 days, 60 days and 90 days of sowings and the estimation of green matter was done, so as to assess the productive capacity of each variant at the different stages of growth.

Results and discussion : The yield of green matter obtained from each of the four crops, in pounds per acre with relevant critical differences is furnished below :

Table of means with relevant critical difference

Name of crop	Period in days			Mean	Critical difference at 5% for green manure means
	30 days	60 days	90 days		
	(Green matter in lb. per acre)				
1 Sunnhemp	7,333	17,722	14,556	13,204	1406.6
2 Guar	4,112	20,000	22,333	15,482	
3 Sesbania	4,250	18,694	24,333	15,759	
4 Pillipesara	1,694	20,277	23,222	15,064	
Mean	4,347	19,173	21,111		
Critical difference at 5% for period means					— 1213.3
Critical difference at 5% for interaction means					— 2442.2

From a statistical scrutiny of the yield data, the indications which become clear are :

(a) At 60 days cutting Guar is the second best in the output of green matter, with an acre yield of 20,000 lb. which is, however, statistically on a par with the yield of Sesbania and Pillipesara.

(b) Even at 90 days level Guar is on a par with Sesbania and Pillipesara in the yield of green matter.

(c) In the case of Guar, no significant difference in yield exists between 60 and 90 days and as such cutting at 60 days is more economical than cutting at 90 days level.

An additional economic advantage, which is exclusively found in Guar is, that in addition to the green matter, it produces an average acre yield of 592 lb. of tender pods within 60 days, the money value of the vegetable being Rs. 37/- calculated at the market rate of an anna per pound.

The results of the chemical analysis of the four crops prove that Guar possesses the highest percentage of nitrogen namely 3.86 percent and hence eminently suited as manure. The results are as follows :

Name of crop	Guar	Pillipesara	Sunnhemp	Sesbania
Percentage of nitrogen (on dry basis)	3.86	2.90	2.63	2.36

Another interesting observation, a point in favour of Guar is, that 60 days old Guar plants are quite succulent and hence easily decomposable when applied to the fields as green manure.

Judging from the above findings, it can be concluded that in lighter soils, under gardenland conditions where a green manure crop is to be raised within 60 days, Guar is best suited. The ease with which this crop can be grown offers considerable scope for its introduction as a new green manure crop for the garden lands.

Summary : Guar was compared with three other popular green manure crops. viz., (1) Sesbania, (2) Sunnhemp and (3) Pillipesara, during 1957 summer season. At 60 days of growth, Guar produces an economical acre yield of 20,000 lb. of easily decomposable green matter rich in nitrogen. Besides the green matter, it yields 592 lb. of saleable vegetable per acre. Based on these findings, it can be concluded that Guar is an economical short term green manure *cum* vegetable crop suitable for the gardenlands, where the interval from crop to crop is short.

Acknowledgment : The help given by Shri. B. W. X. Ponniah, B. Sc. (Ag.), M. Sc., Millets and Pulses Specialist, Coimbatore and the Statistical Section, Agricultural College and Research Institute, Coimbatore, in the preparation of this paper is gratefully acknowledged.

Influence of Different Insecticidal Seed Treatments on Wheat

by
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During seed treatment studies of cereals (Srivastava, 1955) at Kansas Agricultural Experiment Station, Manhattan, U. S. A. some interesting results were observed with wheat which are recorded below.

Insecticides and insecticide-fungicide formulations were applied at different rates as seed treatment on wheat to determine the effect of each on germination and subsequent plant growth. The insecticides used were wettable powders of 25% lindane, 75% aldrin, and 50% heptachlor. Insecticide-fungicide combinations used included Seed Guard, a commercial wettable powder formulation, and liquid Panogen PA-1 and Panogen PA-2. A given quantity of certified Pawnee wheat was weighed and treated with different dosages of chemicals in a motordriven rotary mixer on the basis of fluid or avoirdupois ounces per 100 pounds of seed. Treated and untreated samples were then placed in individual cotton sacks and stored in a dry room to simulate farm storage conditions.

Periodically 110 seeds were removed from each sample and sent to the State seed laboratory, Topeka U. S. A., for standard tests. Identical samples were simultaneously planted in silt loam soil in metal flats placed on tables out of doors. Counts were taken of the germination rates of each sample and observations made on the initial growth of the seedlings. When the plants became stationary in height, the flats were washed, the plants removed free from the soil and oven dried at 100°C for 48 hours. The ratio of top to root was determined on the basis of weight. After keeping the values of tops constant in all treatments it was possible to compare the amount of root development in different treatments.

The statistical analyses of the results were made as followed by Srivastava and Bryson (1956), and are summarised in Tables I and II.

It is apparent from Table I that Panogen PL-1 produced an adverse effect on the germination in flats as well as in the standard tests where total germination was much lowered. All its three

dosages significantly reduced the emergence and brought about a noticeable delay in germination. Seed Guard induced early emergence of the seedlings and produced a vigorous stand as compared to the other treatments. Lindane and Seed Guard slightly lowered the total emergence in standard tests which was, however, not observed in flats.

It is further evident that all the three dosages of Panogen PA-2 were satisfactory in storage for one and a half months, but later the two higher dosages 7.0 and 8.0 fluid ounces per 100 pounds of seed, produced a significant reduction in germination. Lindane injured the total germination at each period of testing. Panogen PL-1 was similar to lindane and injured the germination after four months. Seed Guard which showed a slight reduction in total emergence in the test made immediately after treatment produced further adverse effects on germination after four months.

The data in Table II show that Panogen PL-1 gave a highly significant lower root-top ratio than all other treatments, with median and highest dosages i. e. 2.5 and 3.5 fluid ounces per 100 pounds of seed, each significantly low. No other differences observed were significant although Seed Guard apparently showed more development of roots than the normal.

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TABLE I

Effect of Insecticides on germination and rate of emergence of wheat seedlings.

Chemical and Concentration	Ounces per 100 lbs. of seed	Seeds planted in flats immediately after treatment		% Germination in standard tests (after treatment)		
		Mean emergence in days	% Germination	Immediately	1½ Month	4 Months
Aldrin 75% W. P.	2.5	5.34	92	95	98	97
	4.5	5.30	94	88	94	98
	5.5	5.32	92	97	97	97
Panogen, PA-2 (Fluid)	6.0	5.31	90	94	90	95
	7.0	5.37	89	96	93	86
	8.0	5.36	94	94	93	88

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TABLE I (Contd.)

Chemical and Concentration	Ounces per 100 lbs. of seed	Seeds planted in flats immediately after treatment		% Germination in standard tests after treatment		
		Mean emergence in days	% Germination	Immediately	1½ month	4 months
Lindane 25%, W. P.	3.0	5.33	93	88	84	77
	4.0	5.34	94	92	88	79
	5.0	5.32	95	91	90	77
Panogen, PL-1 (Fluid)	2.0	7.02	83	79	63	54
	2.5	7.39	79	75	46	85
	3.5	7.36	44	3	12	44
Seed Guard	2.7	5.06	95	91	95	86
	4.0	5.35	92	97	93	96
	5.0	5.30	91	96	97	94
Heptachlor 50% W. P.	6.0	4.33	95	94	94	94
	0.0	5.38	93	97	96	97
	...	...	16-97	92-99	90-99	92-99

TABLE II

*Means of the proportional development of roots compared to tops as influenced by the Seed Treatment with various Insecticidal Dosages **

Insecticides	Initial dosage	Median dosage	Highest dosage	All dosages
Aldrin	141.5	141.5	142.0	141.27
Panogen PA-2	142.0	142.0	141.5	141.8
Lindane	143.0	141.0	141.5	141.8
Panogen PL-1	94.0	88.0	69.0	83.7
Heptachlor	141.5	141.5	142.5	141.8
All treatments	132.5	130.8	127.3	130.2
Seed Guard	...	...	...	143.5
Check	...	...	...	139.5

Analysis of Variance

Sources of Variation	df.	MS.
Treatments	6	2781.1
Concentrations	2	68.0
T x C	8	69.7
Error	17	3.6
Total	33	

* Concentration and dosages used are the same as in Table I

Monsoons in Coimbatore

by

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Introduction: The locality where the Agricultural College and Research Institute is situated is within ten miles from the "Palghat gap", which is about forty miles from the Arabian sea. It is purely an inland area with mountains on the north, west and southern sides. The Vellingiri hills on the west, within a distance of about twelve miles, function as a rampart against the South-west monsoon.

The daily rainfall data collected in the observatory, attached to the Agricultural College and Research Institute, for a period of fifty years from 1907 have been critically examined to assess the probable dates of the onset, duration of activity and the nature of pattern of rainfall during the south-west, and the north-east, monsoon periods of June to September and October to December respectively. With the details collected regarding the dates of onset of the monsoons, an onset diagram was prepared to bring out the probable periods of the onset of these two monsoons. The cyclic nature of the performance of these two monsoons has been assessed by adopting the 'Centre Shift Average Method' for periods of one, two, three etc. up to eighteen years. In addition, the relationship between the patterns of rainfall in these two monsoons and their individual relationship with the annual pattern of rainfall were also worked out. Incidentally the nature of the break periods between the two monsoons has also been examined.

Discussion: (i) The data presented in Table I will indicate that during the period of north-east monsoon, which is otherwise known as 'Retreating Monsoon', nearly half the quantity of the total annual precipitation is received, whereas it is even less than one third of the total annual precipitation in the south-west monsoon period, which is the main monsoon period. In regard to distribution of rainfall it works out to four and six days per month on an average respectively for the south-west, and north-east monsoon periods. As regards the activity of the two monsoons, October and November are the rainiest months at Coimbatore, giving practically 45.9% of the total annual rainfall, indicating thereby that only during the north-east monsoon period heavy showers are likely to occur and not in the south-west monsoon period, which as already stated above, records only 30.1% of the annual rainfall in a period of four months.

Range of variation of the duration of the south-west monsoon is less compact than that of the north-east monsoon. But it is evident that sporadic heavy downpours may occur in both the monsoons.

(ii) An examination of the onset diagram may reveal the probable periods of onset of these two monsoons. With reference to the south-west monsoon it looks as though that it is likely to set in on any day from 10th May and the setting may even be as late as July, 15th. But its probable period of onset seems to be within the period May 14th to June 4th. Out of fifty years, the onset was not clear and of usual vigour in 1908. So in the remaining forty-nine years the period covered by the days May 14th to June 4th has proved to be the probable onset period in thirty-three years. When data for some more years are collected, it may be possible to fix this probable period of the onset of the south-west monsoon in a more precise manner.

As regards the North-east monsoon it may set in on any day on or after September 29th. But the period constituted by the first twelve days in October seems to be the probable period of onset of this monsoon. In 42 out of 50 years the monsoon has set within this adjustment period. It is, therefore, possible to predict the onset of this monsoon within this period with a certainty of 84%.

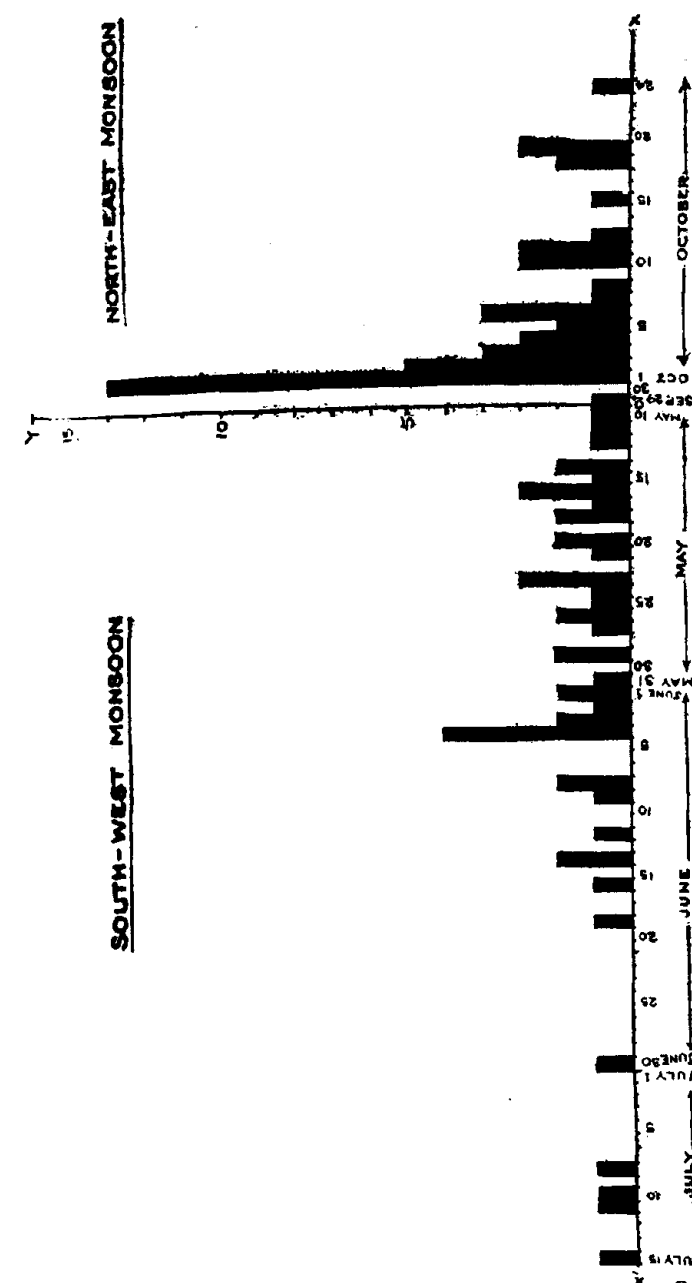
Another interesting feature of these two monsoons at Coimbatore is that the break period between them is either nil or within ten days, in 27 years out of 49 years, as in one year, i. e. in 1908 neither the onset nor the cessation of the South-west monsoon was clear. In the remaining twenty two years it varies from 11 to 34 days. It may, therefore, be tentatively inferred that the retreating monsoon closely follows the cessation of the main monsoon.

(iii) In Table II, the standard deviation, co-efficient of variation, and standard error for the different sets of centre shift averages of total precipitation in the two monsoon periods are given separately for each monsoon for periods of one, two, three etc., upto eighteen years. In the case of the south-west monsoon the co-efficient of variation has the lowest value for the eight years period and then increases and subsequently fluctuates in an unsteady manner, indicating thereby that this monsoon appears to have a cycle of variation of eight years duration. This means that this monsoon is likely to fail once in eight years.

Coming to the North-east monsoon the value of the co-efficient of variation is lowest for periods of fourteen and fifteen years. So this monsoon is likely to fail once in fourteen or fifteen years.

ONSET PERIODS OF MONSOONS AT COIMBATORE

SCALE:-
OX AND OX' - 1" = 5 DAYS
OY --- 1" = 2 ONSETS
1" = 12 OF 12 SMALL DIVISIONS



The tentative inference drawn in this connection is that the rains in the North-east monsoon period are more dependable in quantity than those in the South-west monsoon period.

(iv) The relationship existing between the pattern of rainfall, i.e., total quantity and number of rainy days (a day with 10 cents and above of rain is taken as a rainy day) in these two monsoons and their individual relationship with the annual pattern of rainfall was assessed by working simple correlations. The tentative inferences are given below :—

(a) There is no relationship between the patterns of rainfall in these two monsoon periods.

(b) The relationship between the pattern of rainfall in the South-west monsoon period and the whole year is positive and highly significant even for the level of $P = 0.001$.

Rainfall $r = +0.5744 \pm 0.1182$.

Rainy days $r = +0.7079 \pm 0.1019$.

(c) The pattern of rainfall in the North-east monsoon period is significantly related with the annual pattern of rainfall. The relationship in quantity is highly significant even at the level of $P = 0.001$, while that of the rainy days is significant only from the point of view of r being greater than 2. S. E. in value.

Rainfall $r = +0.7294 \pm 0.0987$

Rainy days $r = +0.4042 \pm 0.1320$

Summary and Conclusion : (i) The North-east monsoon period is more well-defined than that of the South-west monsoon.

(ii) The periods from May 14th to June 4th and October 1st to October 12th are the probable periods of onset of the South-west and North-east monsoons respectively

(iii) The South-west and north-east monsoons have an inherent tendency to fail once in 8 years and 14 to 15 years respectively. The longer cycle of the North-east monsoon indicates that it is more dependable for rains than the South-west monsoon.

(iv) The patterns of rainfall in these two monsoon periods have no relationship between them; but they individually influence considerably the annual pattern of rainfall.

Acknowledgment : The author is grateful to Sri T. Natarajan, Agronomist and Professor of Agriculture, for his valuable guidance. His thanks are also due to Kumari T. P. Anna for her help in the compilation of the data.

TABLE I
Details of the Monsoon at Coimbatore (Fifty years data: 1907 to 1956)

No.	Details	South-west monsoon period (June to Sept.)	North-east monsoon period (October to Dec.)	Remarks.
1	Average rainfall in inches	7.4	11.9	
2	Percentage on annual average rainfall	30.1	48.4	
3	Range of variation of the monsoon rainfall in inches	2.3 to 25.5	4.8 to 28.0	
4	* Average number of rainy days	17	18	* Rainy day — a day with 10 cents & above of rainfall
5	Percentage on annual average number of rainy days	37.8	40.0	
6	Range of variation of rainy days	6 to 38	8 to 30	
7	Duration of the activity of the monsoon in days	115	72	
8	Range of variation of the duration	59 to 139 *	38 to 89	* Due to the early onset of the monsoon in the second week of May in some years.
9	Heaviest rainfall in inches recorded during the monsoon periods with dates	5.75" on 9-6-1941	4.46" on 3-11-1940	

TABLE II
Cyclic Nature of the South-West and North-East Monsoon
Rainfall at Coimbatore

Central Shift Average for periods of	South-west monsoon rainfall			North-east monsoon rainfall			Remarks.
	S. D.	C. V.	S. E.	S. D.	C. V.	S. E.	
1 One year	3.9	52.7	0.5	4.7	39.5	0.7	
2 Two years	2.8	38.4	0.4	3.4	28.6	0.5	
3 Three "	2.2	30.6	0.3	2.8	23.5	0.4	
4 Four "	1.8	25.4	0.3	2.4	20.2	0.3	
5 Five "	1.4	20.3	0.2	2.1	17.6	0.3	
6 Six "	1.3	19.1	0.2	1.8	15.1	0.3	
7 Seven "	1.2	18.1	0.2	1.7	14.2	0.3	
8 Eight "	0.9	13.8	0.1	1.5	12.5	0.2	
9 Nine "	1.0	15.4	0.2	1.3	10.8	0.2	
10 Ten "	0.9	14.5	0.1	1.1	9.1	0.2	
11 Eleven "	0.9	14.8	0.1	0.8	6.6	0.1	
12 Twelve "	0.9	15.3	0.1	0.6	4.9	0.1	
13 Thirteen "	0.8	10.5	0.1	0.5	4.1	0.1	
14 Fourteen "	0.7	9.2	0.1	0.4	3.3	0.1	
15 Fifteen "	0.7	9.2	0.1	0.4	3.3	0.1	
16 Sixteen "	0.7	9.2	0.1	0.5	4.1	0.1	
17 Seventeen "	0.7	9.1	0.1	0.5	4.1	0.1	
18 Eighteen "	0.6	7.8	0.1	0.6	5.0	0.1	

Weather Review — For December, 1957

RAINFALL DATA (IN INCHES)

Division	Station	Total rainfall for the month	Departure from normal	Annual Rainfall for the year 1957	Departure from normal
North	Madras (Meenambakkam)	1.1	- 4.4	39.1	- 10.8
	Tirurkuppam*	nil	- 2.8	36.9	- 1.3
	Vellore	nil	- 2.6	35.7	- 6.6
	Gudiyatham*	nil	- 2.0	34.9	+ 3.7
East Coast	Palur*	7.1	+ 2.3	39.9	- 3.0
	Tindivanam*	1.4	- 3.0	33.0	- 0.3
	Uddalore	7.6	+ 0.1	48.8	- 5.7
	Nagapattinam	22.1	+ 11.1	62.2	+ 6.8
	Aduthurai*	9.9	+ 5.7	49.6	+ 12.4
	Pattukottai*	14.8	+ 10.3	46.0	+ 7.7
Central	Salem	1.9	+ 0.9	25.6	- 12.9
	Coimbatore (A. M. O.)*	0.8	- 0.2	35.6	+ 11.7
	Coimbatore	1.0	- 0.1	29.1	+ 5.9
	Tiruchirapalli	2.3	- 0.3	28.0	- 5.3
South	Madurai	2.4	+ 0.4	31.5	- 2.9
	Pamban	14.0	+ 6.4	42.1	+ 5.0
	Koilkatti*	1.3	- 0.5	26.5	- 1.0
	Palayamcottai	4.3	+ 0.1	30.6	+ 1.2
	Ambasamudram*	9.5	+ 5.4	32.4	+ 1.1
	Nagarcovil*	2.5	- 1.6	48.8	+ 12.9
Hills	Kodaikanal	5.8	+ 0.6	87.9	- 7.3
	Coonoor*	6.8	+ 0.4	88.9	+ 31.5
	Ootacamund*	3.6	+ 1.8	66.9	+ 19.5
	Nanjanad*	1.9	+ 0.7	67.2	+ 13.1

Note.— 1. * Meteorological Stations of the Madras Agricultural Department.

The North East Monsoon Continued to be active during the first week of the month, and after a spell of ten days, the monsoon strengthened over the south Peninsula in association with a cyclonic storm, formed in the south-west Bay of Bengal.

Dry continental air was generally prevailing over the extreme south Peninsula on 1—12—1957, when rains or thundershowers occurred at a few places in south Madras and weather was dry elsewhere in the region. As the partition between the dry and moist air at 1500 meters at sea level passed gradually southwards in the Peninsula, rains were scattered in Tamilnad on 2—12—1957, fairly wide-spread in coastal Madras and scattered in interior Madras on 3—12—1957 and local in Madras State on 4—12—1957. Scattered very light showers were received in south Madras on 5—12—1957, while weather was dry elsewhere in the region. Madras State experienced a dry weather on 6—12—1957, when an easterly wave was apparently moving across the Nicobars. As the easterly wave moved through the extreme south Bay of Bengal on 7—12—1957 weather was dry in Tamilnad except for very light rain at Pamban. For three days from 8—12—1957 scattered light showers occurred in south Madras while weather was dry elsewhere in the region. Dry weather prevailed throughout the Madras State for six days from 11—12—1957.

On 17—12—1957, a low pressure area developed over the southeast Bay of Bengal, when except for very light rains at Cuddalore, the weather was dry over the region. On 18—12—1957, the low pressure area was moving westwards across south Ceylon and the associated convergence zone to the north of it was lying over the extreme south of Peninsula, and scattered rains occurred in south Madras. As a result of the prevalence of an active zone of convergence between tropical maritime air and continental air across the Madras State, rains were localised in coastal and south Madras on 19—12—1957, fairly wide-spread on 20—12—1957 and again local on 21—12—1957. As the partition between dry and maritime air apparently shifted southwards on 22—12—1957, mainly dry weather prevailed in Madras State. On 23—12—1957, an easterly wave was apparently moving into the south west Bay of Bengal, when weather continued to be dry in Tamilnad. Weather was markedly unsettled in the extreme south west Bay of Bengal of the south east coast of Ceylon on 24—12—1957 on which date except for isolated rain at Pamban, dry weather prevailed in the rest of Tamilnad. On 25—12—1957, the unsettled condition concentrated into a deep depression of small extent centred at a distance of 300 miles south east of Nagapattinam, and rains were localised in south Madras, when weather continued to be dry in other parts of Tamilnad. On 27—12—1957, the deep depression intensified into a cyclonic storm and moved west north westwards with the result that rain was widespread in coastal Madras and scattered in interior Madras. The cyclonic storm rapidly weakened into a well marked trough of low pressure extending over Ceylon and adjoining south west Bay of Bengal on 27—12—1957, when rains were fairly widespread with scattered heavy falls in coastal Madras and scattered in interior Madras. Rainfall was widespread in south Madras on 28—12—1957, though the weather was dry elsewhere in the region. On 29—12—1957, rains were widespread in south Madras and localised in North Madras. The last two days of the month experienced fairly widespread rains throughout the Madras State.

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

Noteworthy Rainfalls for the month

No.	Date	Name of place	Rainfall in inches
1.	26—12—1957	Pamban	3.69
2.	28—12—1957	Nagapattinam	5.34
3.	do	Muthupet (Tanjore Dist.)	5.51
4.	29—12—1957	Pattukottai	3.16
5.	30—12—1957	Ambasamudram	4.81
6.	do	Coonoor	4.45

Zonal Rainfall (in inches)

Name of Zone	Month of December '57		Year 1957		Remarks.
	Rainfall for Dec. 1957	Departure from normal	Annual rainfall for 1957	Departure from normal	
North	0.3	- 3.0	36.7	- 3.8	Below normal
East Coast	10.5	+ 4.4	46.6	+17.9	Far above normal
Central	1.5	+ 0.1	29.6	- 0.2	About normal
South	5.7	+ 1.7	35.3	+ 2.7	Above normal
Hills	4.5	+ 0.9	77.7	+14.2	Far above normal

Agricultural Meteorology Section,
Lawley Road Post, Coimbatore.
9—12—1957.

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

Departmental Notifications

Gazetted Officers - Postings and Transfers

Name and Designation	Posted to or Transferred
Sri P. Gopalakrishnan, Upper subordinate	Appointed as D. A. O. Posted as Asst. Marketing Officer, Madurai.
„ S. Mahadeva Ayyar, D. A. O., Tirunelveli.	To retire from service from 4—1—1958.
„ R. Ratnam, A. O., Agri. College & Res. Inst., Coimbatore.	Granted leave for 2 months from 31—12—1957.
„ M. Bhavanishankar Rao, Vice- Principal, A. C. & R. I. Coimbatore.	To hold full additional charge vice Sri R. Ratnam.
„ D. Daniel Sundararaj, Lecturer in Botany, A. C. & R. I.	Granted leave upto 31—1—1958.
„ J. Saktharama Rao, Addl. Lecturer in Botany.	To hold addl. charge vice Sri D. Daniel Sundararaj.

**Transfers and Postings of
Upper subordinate of Agricultural Department**

Name and Designation	Transferred and Posted to
Sri M. K. Subbiah, A. D., Kodaikanal.	Hort. Dev. Asst., Madurai.
„ B. Chandrasekaran, F. M., S. S. Farm, Salem.	do Salem.
„ S. Kolandaiwamy, Ex. Officer, in Agri., Trichy.	do Trichinopoly.
„ C. L. Narayanakurup, Frt. Asst., Coonoor.	do Ootacamund.
„ John Knight, Frt. Asst., Periakulam.	do Sattur.
„ Y. K. Chandrasekaran, A. D., Pollachi.	do Coimbatore.
„ A. K. Perumal, Ex. Officer in Agri., Perambalur.	do Tirnelveli.
„ T. K. Thanikachalam, Ex. Officer in Agri., Utharamerur.	do Guindy.
„ M. Aravindaksha Menon, Ex. Officer in Agri., Shembankoil.	do Nagarkoil.
„ K. K. Ananthanarayanan, Frt. Asst. Thimmapuram.	do Madurai.
„ B. V. Viewanatha Chetty, Millet Asst.	Asst. to Systematic Botanist & Prof. Botany Coimbatore.
„ S. Raman, Instructor, Refresher Course.	Asst. Lecturer in Agri., Agri. College & Res. Inst., Coimbatore.

Name and Designation	Transferred and Posted to
Sri D. Krishnaswamy, Fodder Res. Asst., Coimbatore.	Asst. in Entomology, Coimbatore.
„ Vasudeva Singh, Asst. Suptd. Medical Farm Madras.	A. D. Tirupur, Vice Sri Adisesiah.
„ V. Somasundaram, Ex. Officer in Agri. (on leave)	Ex-Officer in Agri., Virudhunagar.
„ P. F. George, Ex. Officer in Agri., Tiruturaipundi.	do Pennagaram, Salem District.
„ C. Shanmugam, Ex-Officer in Agri. K. V. Kuppam.	A. D. Walajah.
„ A. V. Kalyanam, A. D., Walajah.	A. D. Arakonam.
„ N. Thiagarajan, A. D., Arakonam.	A. D. Pattukottai.
„ K. K. Chellappah, A. D., Katpadi.	A. D. Attur.
„ N. Kondaswamy, A. D., Attur.	A. D. Sathiyamangalam, Coimbatore Dt.
„ H. Balasubramaniam, Ex. Officer, in Agri., Thirukalikundrum.	Ex-Officer in Agri. K. V. Kuppam.



Review of Market Conditions of Commercial Crops in the Notified Areas for the Month of December 1957.

Cotton: (In this Section Lint: Candy of 784 lbs.

Kapas: Pothi of 280 lbs.)

Tirupur: There was a rainfall of 0.53 cents at Tirupur during the month and there were some light showers here and there all over the district and this was beneficial to the standing crops of cotton.

The market started with an opening balance of 3176 candy of Cambodia and 171 candies of Karunganni lint. The arrivals into the market at Tirupur during the month were 1477 candies of combodia and 78 candies of Karunganni lint which included 316 candies of Combodia locally ginned. The total despatches from Tirupur accounted for 3424 candies of Combodia and 183 candies of karunganni lint which included 1300 candies of lint sent to Madurai, Tanjore, Tirunelveli, Salem, South Arcot, North Arcot and Madras in this State and Mysore, Ahemadabad and Kerala State. There was a closing stock of 1229 candies of Cambodia and 66 candies of karunganni lint.

Kapas: The kapas market opened with the stock of 4008 pothis of Cambodia and 65 pothis of karunganni kapas. The total arrivals into Tirupur during the month were 6488 pothis of Cambodia and 37 pothis of Karunganni. The disposals during the month were 8430 pothis of Cambodia and 69 pothis of karunganni kapas. At the end of the month there was a closing stock of 2066 pothis of Cambodia and 33 pothis of Karunganni kapas in the market area of Tirupur.

Prices: Good demand continued for all varieties of cotton under report. New crop from Mysore, Salem and border areas of Kerala moved into this area. The price ranges were as follows:

Lint per candy of 784 lb.

Cambodia superior quality	Rs. 900—981
„ average quality	Rs. 800—875
Karunganni superior quality	Rs. 780—870

Kapas per pothi of 280 lb.

Cambodia superior quality	Rs. 130—143
„ average quality	Rs. 100—125
Karunganni superior quality	Rs. 110—

Ramanathapuram District: At the close of the month widespread showers were received throughout the district and were beneficial to the standing crops of cotton. The standing crop of Karunganni cotton is reported to be good.

The three markets of Sattur, Virudhunagar and Rajapalayam opened with a stock of 1315 candies of lint only. The arrivals during the month amounted to 2600 pothis of kapas and 550 candies of lint. About 2600 pothis of kapas and 310 candies of lint were disposed of during the month leaving a closing balance at the end of the month viz. 1390 candies of lint only.

The following were the prices of cotton in Ramanathapuram district during the month.

Kapas: Pothi of 280 lb.

Karunganni kapas	Rs. 105—114
Tinny karunganni	„ N. A.
IInd crop karunganni	„ 80—92
Tinny	„ 65—75
Uganda Ist quality	„ 132—142
„ IInd quality	„ 115—125
Cambodia	„ 100—108

Lint: in candies of 784 lb.

Karunganni	„ 840—871
Tinny karunganni	„ N. A.
Tinny	„ 712—772
Inferior Tinny	„ 661
Certified Uganda	„ 1101—1125
Uncertified Uganda	„ 1075
Cambodia	„ N. A.

Seed prices in Md. of 82 2/7 lb.

Karunganni	12.50 to 12.63
Tinny	12.83 to 12.93
Uganda	11 to 11.93
Cambodia	8 to 10

South Arcot District: Arrivals to Villupuram market amount to 700 pothis and to Panruti 103 pothis. Despatches were to Coimbatore district which were to the tune of 880 pothis. The trade had a stock balance of 63 pothis at the closing of the month.

The average prices at Villupuram and Panruti stood 84.40 and 87.75 respectively. Compared to previous months the prices declined at Villupuram and improved at Panruti.

Groundnut: South Arcot District: The market opened with a balance of 2365 tons. The arrivals of groundnut kernels amounted to 10939 tons from the district itself and 2359 tons from North Arcot, Salem, Tiruchirapalli etc. A quantity of 4798 tons was consumed by oil mills and 369 tons was consumed by country chekkus in the district for extraction of oil. A quantity of 5771 tons was despatched to Tanjore, Tiruchirapalli, Salem and Madras and 52 tons was despatched to Pondichery. Wastages amounted to 989 tons and there was a closing balance of 3589 tons at the end of the month.

Due to larger arrivals coupled with moist stuff marketed prices were on the decline. The average in the several markets ranged from 131.63 to 143.69 according to quality.

North Arcot District: The stock position of groundnuts was as follows in the district during the month.

Stock position:

			<i>in tons.</i>	
	O. B.	Arrivals.	Disposals.	Closing balance
Groundnut kernels ...	506	5152.65	4960.65	698
Groundnut pods ...	1807	1851	2191	1467

Prices were showing an upward trend due to keen demand by small crushers. The prices of groundnut oil, groundnuts etc., were as follows:

Groundnut kernel Cdy of 531 lb.	Rs. 101—135
Groundnut oil Cdy of 500 lb.	Rs. 280—317
Groundnut pods bag of 80 lb.	Rs. 8—10
Groundnut oilcake per Md. of 82 2/7 lb.	Rs. 8—9.50

Ramanathapuram District: The Virudhunagar market started with an opening stock of 645 cds. of kernels and 100 tons of groundnut pods. The receipt during the month was 2100 cds. of kernels and 2200 tons of pods. A quantity of 700 cds. of kernels and 1700 tons of pods were disposed of during the month leaving a closing balance of 2045 cds. of kernels and 600 tons of pods.

The following were the prices for kernels and pods and oil during the month.

Groundnut pods (per Md. of 82 2/7 lbs.)	Rs. 13 — 16
Groundnut kernels (per candy of 531 lbs.)	Rs. 158 — 164
Groundnut oil in tins of 35 lb.	Rs. 20.75 — 21

Gingelly: South Arcot District: Arrivals declined from last month and totalled 737 bags, of local produce of which 699 bags were received at Vridhachalam. Besides the above 311 bags were received at Vridhachalam and 5 bags at Tindivanam from the neighbouring districts. A quantity of 20 bags were consumed by mills and 1112 bags by chekkus. 562 bags were despatched to Tiruchirapalli, Tanjore districts etc. At the end of the month a closing stock of 441 bags were in the markets.

The prices of gingelly in Vridhachalam market during the month were Rs. 59-95 per bag of 164 lb as against 64-67 in the previous month.

Tobacco: Coimbatore District: Planting of Tobacco crop in the district has been completed. The condition of the standing crop is reported to be satisfactory.

About 2010 candies of chewing and 125 candies of cheroot tobacco were exported to places in Ramnad, Tanjore and Tiruchirapalli districts in Madras State and Mysore and border areas of Kerala State.

Tobacco trade continued to be dull at the beginning of the month. The prices increased by about Rs. 25/- 75/- per candy at the end of the month for all varieties due to recent announcement, made by the State Government relating to the substitution of central Excise for State Sales Tax.

The price ranges as follows: (per candy of 500 lb.)

Variety	I Grade	II Grade	III Grade
<i>Chewing Tobacco: Suncured:</i>	Rs.	Rs.	Rs.
Meenampalayam	200—275	150—200	75—150
Other Varieties	200—250	100—180	50—95

Cheroot varieties:

(Grown in Erode & Bhavani taluks)	200—290	140—180	80—120
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Pit cured:

Chewing tobacco (grown in Palladam & Sular Areas)	200—250	100—190	50—90
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Cardamom: Madurai District: The arrivals of cardamom at the different primary assembling centres like Pattiveeranpatti, Bodinaickanoor, Tehvaram, Uthamapalayam, Cumbum etc., were good at the beginning of the month. Subsequently the arrivals began to decline due to cold weather and failure of seasonal rains.

The prices obtained in the open auction for the different grades were firm at the beginning of the month. Then it began to decline by 2 to 3 annas per lb. upto the middle of the month. It again firmed up and was steady and firm at the close of the month except for a small decrease of 2 to 3 annas per lb. in the auction held on 27—12—1957 at Bodinaickanoor. On the whole the rise and fall in prices per lb. during the month ranged from 2 to 5 annas only depending upon demand and offtake in North Indian cities like Bombay, Delhi, Calcutta, Kanpur, Amritsar etc. The minimum and maximum prices that prevailed for the different grades in Madurai district during December 1957 are given below:

Grades or Variety.	Prices per lb.	
	Minimum. Rs.	Maximum. Rs.
1. Sundried	... 6.50	9.95
2. Green		
(a) Extra	... 10.50	13.02
(b) Green	... 8.70	10.32
3. Shipment	... 8.27	9.07
4. Splits	... 6.00	9.18
5. Lights	... 4.25	8.32
6. Rice (Seeds)	... 7.14	12.12

Review of Administrative Activities of Market Committees during December, 1957.

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

Enforcement: The progress of licencing by the Market Committees during the month are as follows:

Name of the Market Committee	Section 5 (1)		Section 5 (3)		Weighmen	
	A	B	A	B	A	B
South Arcot Market Committee	630	2947	571	2672	—	6
North Arcot Market Committee	756	3868	207	1963	51	1005
Coimbatore Market Committee	103	1287	85	1197	13	668

A: Issued during the month.

B: Up to the end of the month from January 1957.

Meetings: A meeting of the South Arcot Market Committee was held on 28—12—1957. Seven subjects were disposed of and twenty eight subjects were adjourned.

An ordinary meeting of North Arcot Market Committee was held on 30—12—1957 and 27 subjects on the agenda were disposed of.

Quality Analysis: No analysis was done during the month.

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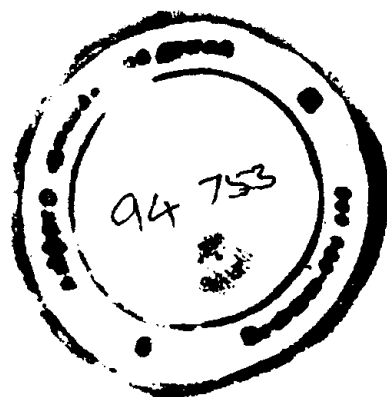
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