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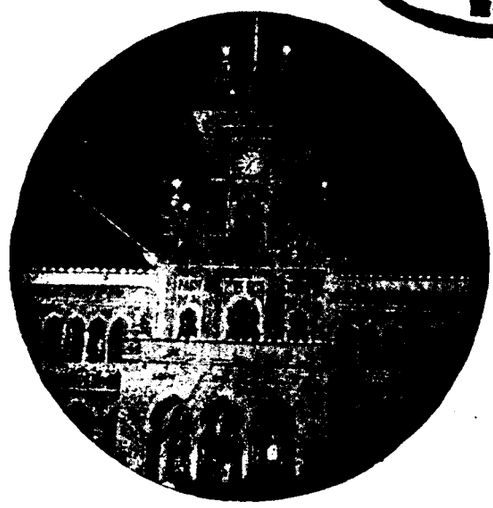

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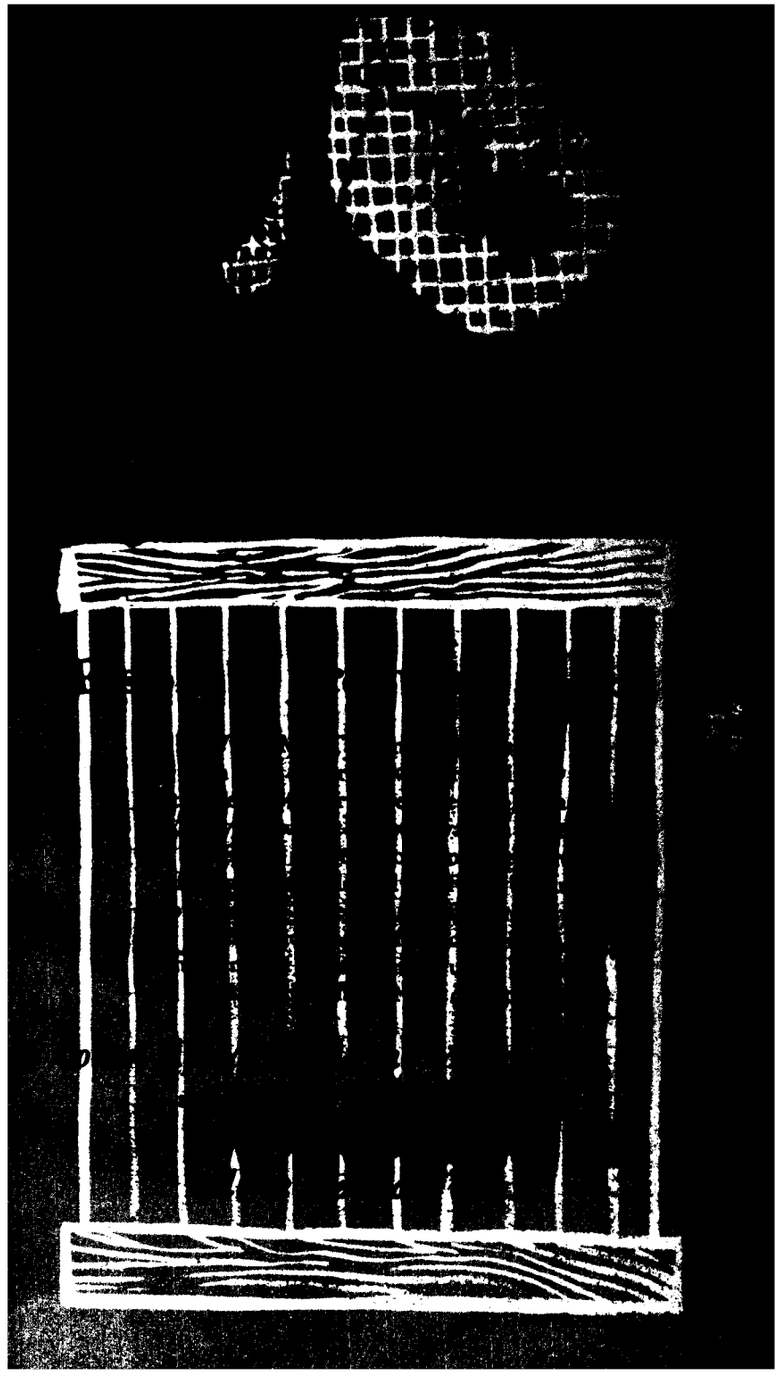

The Madras Agricultural Journal

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Madras agric. J., 45 : (5) 169—175, 1958

Relative Merits of Chilean Nitrate and Ammonium Sulphate as Manure for Rice in South Kanara

by

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Introduction: The presence of an adequate supply of available nitrogen in the soil is one of the most important factors relating to maintenance or improvement of soil fertility. The lack of sufficient nitrogen in soils, particularly those that have been cropped for many years has long been a limiting factor in crop production. Of all the nutrients, rice has responded to the maximum extent to nitrogen application in one from or other in all the rice growing tracts of the world. Green leaf, cattle manure and oilcakes are some of the important organic nitrogenous manures used for rice. But among the inorganic nitrogenous manures ammonium sulphate is the most commonly used fertilizer.

The effect of ammonium sulphate on acid soils tending to increase the soil acidity particularly if used continuously is likely to bring in limitations in crop production in the long run. If the acidity of the soil becomes too great, harmful compounds, chiefly of aluminium may go into solution, resulting frequently in what is termed as aluminium toxicity. Besides, the availability of phosphoric acid to plants in such acid soils becomes reduced due to the fixation of phosphoric acid into insoluble compounds of iron and aluminia. It will thus be seen that there is evident need for a nitrogenous fertilizer which in its continued application would not make the soil acidic.

Chilean nitrate (Sodium nitrate) according to the Nitrate Corporation of Chile Limited, London, is a natural fertilizer obtained from the mineral deposits of Northern Chile, its special properties being attributed to the natural blending of plant nutrients. It contains 16% nitrogen in the nitrate from directly assimilable by the roots of plants. It increases the activities of microorganisms in the soil and has therefore special value where conditions of reduced bacterial activity prevail as a result of high temperature. It also conserves soil calcium and prevents acidification thus increasing the

availability of phosphates in the soil. A trial was therefore undertaken to find out how far, on equal nitrogen basis, Chilean nitrate compares with ammonium sulphate as manure for rice in this district where the soils are lateritic and acidic.

The results of the trial carried out at the Paddy Breeding Station, Mangalore, for three years are outlined in this paper.

Literature: Experiments conducted at Woburn showed that application of ammonium sulphate at the rate of two cwts. per acre for several years in succession made the soil absolutely barren, the result being attributed to the acidification of the soil. Rhind and Tin (1948), while growing paddy continuously on the same land for ten years found that 100 lb. per acre per annum of amonium sulphate gave always significantly higher yields than those not treated, but that after the first three years the increase in yield declained from a maxímum of 1062 lb. per acre to a minimum of 321 lb. per acre. Ross and Mehring (1938) while discussing the physical and chemical properties of mixed fertilizers say that ammonium sulphate has an acidity of 107 and sodium nitrate an alkalinity of 36 per unit of nitrogen.

In a fifteen year experiment with three five year rotations of corn, oats, rye, wheat and grass, Jacob and Lipman (1917) have proved that sodium nitrate had a manurial value of 100 as against 65 of ammonium sulphate. Small amount of nitrate has also been noted to stimulate the action of Azotobactor. Wyche (1941) has supported the suitability of sodium nitrate as fertiliser for rice under the conditions existing in Taxas. Bartholomew (1929) while discussing the results of the experiment on the availability of nitrogenous fertilizers to rice says that sodium nitrate can be used with good advantage on distinctly acid soils. George Janssen and Metzgen (1928) have proved that rice undoubtedly drew upon the nitrate of the soil under non-submerged conditions. The cost of one pound of nitrogen in both ammonium sulphate as well as in chilean nitrate are almost the same (Sanyasi Raju 1952).

Materials and Methods: A randomized replicated experiment with ammonium sulphate and chilean nitrate applied at two levels of nitrogen 40 lb. and 60 lb. per acre, alone and over a basal dressing which consisted of 450 lb. of lime, three tons of cattle manure and 30 lb. P_2O_5 in the from of super phosphate, was started in the first crop season of 1954–53 and continued upto the second crop season

of 1954—55, crops being raised during both the seasons in a year. Lime was applied 10 to 12 days before planting and super phosphate on the day of final ploughing. Both ammonium sulphate and chilean nitrate were applied as top dressing one month after planting. Strain MGL. 2 was used for the first crop and strain PTB. 20 for the second crop. The residual effect of the different treatments was also studied during the first crop season of 1955–56. Soil from the field was analysed before and after the experiment both for fertility status and pH value.

The data are presented in tables I to V.

Discussion: It will be seen from the results that in the first crop season (Table I) chilean nitrate at both 40 lb. and 60 lb. nitrogen over basal dressing is better than ammonium sulphate at both the levels over basal dressing, the increase in percentage though not signifiicant being 4·8 and 3·9 respectively. In the second crop season (Table II) ammonium sulphate at 60 lb. nitrogen over basal dressing has recorded 16·6% significantly higher yield than chilean nitrate over basal dressing at the same level. It is also interesting to note that during the first season of the trial chilean nitrate both alone and over basal dressing has recorded better yields than ammonium sulphate alone and over basal dressing. It is also seen that 40 lb. N per acre in the form of chilean nitrate appears to be the maximum dose, the higher dose of 60 lb. producing some depressing effect during both the seasons. The results of the combined analysis of all the six seasons (Table III) show that both ammonium sulphate and chilean nitrate over basal dressing are on a par and that both these fertilisers when applied alone have recorded significantly low yields. The above findings are also in conformity with the results of the residual effect (Table IV) where the treatments that received a basal dressing (Nos. 1, 2, 3, 6 & 7) have recorded significantly higher yields (except treatment 7) over those treatments that did not receive any basal dressing (Nos. 4, 5, 8 & 9). In other words, the continuous application of these fertilisers in such heavy doses as 40 lb. and 60 lb. N per acre alone, without any basal dressing for a period of 3 years when 6 crops were raised has had some deleterious effect on the soil resulting in significantly low yields.

This experiment has also revealed that in West Coast soils, which are acidic in nature the nitrogen may be applied in the from of chilean nitrate since continuous application of ammonium sulphate would increase acidity. This fact is amply borne out by this

experiment where the original pH of the soil 5·53, (Table V) was reduced to 5·1 (treatments 4 & 5) by continuous application of ammonium sulphate alone while the original value has almost been maintained by a similar application of chilean nitrate in treatments 8 and 9. It must however be stated that the heavy application of both these fertilisers did not produce any adverse effect when applied over a basal dressing, as is seen from the pH values, the yield data and the residual effect.

Summary: 1. Chilean nitrate is found to compara favourably with ammonium sulphate as manure for rice, chilean nitrate proving slightly better during the first crop season and ammonium sulphate during the second crop season.

2. The continuous application of ammonium sulphate alone has been found to slightly increase the acidity of the soil, as indicated by the pH values.

REFERENCES

Alan Murray, J. Bartholomew, R. P. — *The Science of soils and manures.*

George Janssen and Metzgen, W. H. — 1929 The availability of nitrogenous fertilisers to rice. Soil Science 28.

Grist, D. H. — 1928 Transformation of nitrogen in rice soil, J. Amer. Soc. Agron. 20.

Jacks, G. N. and Kathleen Milne M — 1955 *Rice* - Longmans, Green & Co., London.

Rhind, D. and Tin, U. — 1954 Annotated Bibliography on rice soils and fertilisers - Commonwealth Bureau of Soil Science, England.

Ross William, H. and Mehring Aron, L. — 1948 Nature, 161.

Sanyasi Raju, M. — 1938 Mixed fertilisers - Soils & Men Year Book of Agriculture 1938.

1952 The role of organic manures and inorganic fertilisers in Soil Fertility. Madras Agri. J. 39:

TABLE I

Chilean Nitrate Experiment

Treatments:

1 Basal dressing of lime 450 lb. plus cattle manure 3 tons plus Super phosphate to supply 30 lb. P_2O_5 per acre (control)
2 As in treatment 1 plus ammonium sulphate to supply 40 lb. N/acre
3 As in treatment 1 plus ammonium sulphate to supply 60 lb. N/acre
4 Ammonium sulphate alone 40 lb. N/acre
5 Ammonium sulphate alone 60 lb. N/acre
6 As in treatment 1 plus chilean nitrate 40 lb. N/acre
7 As in treatment 1 plus chilean nitrate 60 lb. N/acre
8 Chilean nitrate alone 40 lb. N/acre
9 Chilean nitrate alone 60 lb. N/acre

Layout: 9 x 5 randomised blocks

Plot size: 40' x 6'

First Crop Season's Results

	1952—53		1953—54		1954—55		Combined analysis of three seasons	
	Acre yield in lb.	% on Control	Acre yield in lb.	% on Control	Acre yield in lb.	% on Control	Acre yield in lb.	% on Control
1	2204	100·0	3494	100·0	1992	100·0	2563	100·0
2	2241	101·8	3172	90·8	2096	105·2	2503	97·7
3	2136	97·0	3222	92·2	2105	105·6	2488	97·1
4	2014	91·5	2616	76·7	1865	93·6	2165	84·5
5	2009	91·3	2704	79·2	1901	95·4	2205	86·0
6	2350	106·7	3376	98·9	2155	108·2	2627	102·5
7	2395	108·8	3332	97·6	2043	102·5	2590	101·0
8	2309	104·9	2774	81·3	1674	84·1	2252	87·9
9	2309	104·9	2998	87·8	1679	84·3	2329	91·1
General Mean	2218·5	100·8	3076 4	89 4	1945·6	97·7	2413·6	94·2
Standard error	104·8	47·6	118·4	3·44	99·8	5·01	128·1	5·0
'F' test	Satisfied		Satisfied		Satisfied		Satisfied	
C. D. P=0 05	213·6	9·7	240·8	7·0	203·2	10·2	271·6	10·6

Conclusion:

1952—53: 7 6 9 8 2 1 3 4 5

1953—54: 1 6 7 3 2 9 8 5 4

1954—55: 6 3 2 7 1 5 4 9 8

Combined analysis: 6 7 1 2 3 9 8 5 4

TABLE II

Second Crop Seasons' Results

Treatments as in Table I

	1952—53		1953—54		1954—55		Combined analysis of three seasons	
	Acre yield in lb.	% on Control	Acre yield in lb.	% on Control	Acre yield in lb.	% on Coatrol	Acre yield in lb.	% on Control
1	1666	100 0	2027	100 0	1622	100·0	1772	100·0
2	1856	111·4	1946	96·0	2050	123·4	1951	110·2
3	1736	104·2	2214	109·2	2146	129·1	2032	114·7
4	1410	84·6	1430	70·5	1617	97·4	1486	83·9
5	1154	69·2	1299	64·1	1777	106·9	1410	79·6
6	1727	103·6	1962	96·8	1861	111·9	1850	104·5
7	1607	96·4	1720	84·8	1888	114·0	1738	98·1
8	1378	82·7	1507	74·3	1467	88·2	1451	81·9
9	1453	87·5	1657	83·5	1586	95·4	1565	88·4
General Mean	1554	93·3	1751·3	86·6	1779·3	107·4	1695	95·7
Standard error	138·2	8·3	177·7	8·79	110 6	6·68	113·0	6·38
'F' test	Satisfied		Satisfied		Satisfied		Satisfied	
C. D. P=0·05	288·2	16·9	361·9	17·9	225·2	13·6	239·1	13·5

Conclusion:

1952—53: 2 3 6 1 7 9 4 8 5

1953—54: 3 1 6 2 7 9 8 4 5

1955—55: 3 2 7 6 5 1 4 9 8

Combined analysis: 3 2 6 1 7 9 4 8 5

TABLE III

Combined Analysis of Six Seasons' Results

Treatments as in Table I

	Acre yield in lb.	Percentage on control
1	2168	100·0
2	2227	102·8
3	2265	104·5
4	1825	84·5
5	1807	83·3
6	2239	103·2
7	2159	99·6
8	1852	85·4
9	1947	89·8
General mean	2054·3	94·8
Standard error	107·9	4·98
'Z' test satisfied or not	Satisfied	
Critical difference P=0·05	218·9	10·1

Conclusion:

3 6 2 1 7 9 8 4 5

TABLE IV

1956—56 First Crop Seasons' Results (Residual effect)

Treatment as in Table I

	Acre yield in lb.	Percentage on control
1	1787	100·0
2	1674	93·6
3	1714	95·9
4	1488	83·2
5	1459	81·6
6	1708	95·5
7	1861	101·6
8	1499	83·9
9	1537	86·0
General mean	1636·3	91·3
Staadard error	77·1	4·3
'Z' test satisfied or not	Satisfied	
Critical difference P=0·05	157·7	8·8

Conclusion:

7 1 3 6 2 9 8 4 5

TABLE V

pH. Value

pH before trial:	5·53								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
pH after trial:	5·62	5·48	5·40	5·11	5·01	5·60	5·80	5·40	5·54

Madras agric. J., 45 (5) : 176—179, 1958

A note on the occurrence of leeches in paddy fields and their control.

by

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Leeches (Group *Hirudinea*) are well known for their sanguinivorous habits and the annoyance they cause to man and animals. Both terrestrial and aquatic forms are met with in this group. Ponds, pools, irrigation water and marshlands are frequented by these annelids. Leeches have also been known to occur in paddy fields as recorded by De Jesus (1934) in the Phillippines.

This note is meant to record, probably for the first time, a similar occurrence of leeches in paddy fields in South India.

Leeches differ from other Annelidan worms in their oval shaped and dorso-ventrally flattened body, in the possession of two suckers, one at either end of the body, in the lack of body setae and a few other anatomical features. They are distinctly segmented like the other typical annelids, but with a smaller number of somites, usually 34 in number. The suckers are used as organs of attachment and locomotion. The mouth cavities of some leeches, as for example the medicinal leech *Hirudinaria manillensis* (Lesson) are provided with jaws armed with chitinous teeth. By making incisions on the skin of the host, the blood and lymph are allowed to flow freely and at the same time the salivary secretions are introduced into the wound thus preventing the clotting of blood. The blood is sucked by the muscular pharynx and passed into the long crop provided with lateral pouches. It has been stated that a medicinal leech can take in several times its own weight of blood and this supply will last for several months. The stored up blood is passed on from time to time into the stomach where it is digested and then sent into the intestine for absorption.

De Jesus (l. c.) has studied the habits of the common medicinal leech with the main object of devising suitable methods of control. He found copper sulphate at 1:50,000, tobacco infusion at 1:400 and *Derris elliptica* at 1:1000 deleterious to the leeches, the

last two causing mortality within 12 — 24 and 24 — 75 hours respectively. A 5% solution of common salt was found to be useful in dislodging the leeches from any part of the body. Raising the duck *(itek-Anas boschas)* in leech infested areas has also been recommended by him as a measure of control.

An interesting instance of outbreak of aquatic leeches in paddy fields was reported from the Rice Research Station, Ambasamudram during November-December 1955. The specimen concerned has been identified as *Hirudinaria granulosa* S. the common cattle leech. It is found to occur in all sheets of water frequented by cattle. This leech was found in a pest form in the paddy fields causing considerable nuisance to the farm labourers who refused to get into the fields for fear of leech bites. Leech bites are dreaded because, besides the tickling sensation and itching at the point of the bite, the victim may lose much blood and the open wounds may also serve as points of entry for other disease carrying bacteria. In addition to the Rice Research Station Farms, the fields round about Ambasamudram were also said to have been affected. However, the leeches, it may be stated here, caused no direct harm to the crop. Availing of this opportunity, a consignment of live leeches was obtained from Ambasamudram and a series of laboratory trials were conducted on methods of their control at the Entomology Laboratory at Coimbatore. Well known leech poisons like tobacco, copper sulphate and common salt, fertilizers like Ammonium sulphate and super phosphate and also some of the common insecticides in vogue (synthetic as well as those of vegetable origin) were tried.

In all cases, wide-mouthed cylindrical jars of the museum type were utilised for the experiments with standing water up to a minimum depth of 6"–8". Five medium to large sized leeches were released in each jar. The chemicals and other insecticides under trial were used as one would use it in a paddy field viz., mere sprinkling in the case of dust formulations and spraying in the case of liquid formulations. Continuous observation was maintained for the first two hours after starting the experiments so as to record the exact number of minutes during which they show symptoms of death. Subsequently the leeches were kept under observation every two hours, later on every six hours and so on. The data collected during these trials are summarised below :

Treatment	No. introduced	Time taken for mortality.
1. *Tobacco dust :*		
4 gms. per gallon	5	5–10 minutes
2 gms. do. / 1·2 do. / 1 gm do.		10–15 minutes
2. *Tobacco waste :*		
8 gms. per gallon / 4 gms. do. / 2 do.	5	30 minutes.
3. *Copper sulphate :*		
4 gms. per gallon	5	2 hours.
4. *Common salt :*		
40 gms. per gallon	5	No effect.
5. *Ammonium sulphate :*		
4 gms. per gallon	5	72 hours.
6. *Superphosphate :*		
4 gms. per gallon	5	No effect.
Insecticides of vegetable origin etc. :		
7. Pyrethrum dust / 8. Derris dust / 9. Acorus dust — 4 gms. per gallon	5	Within 24 hours.
10. *Thevetia* decoction (used as spray)	5	Not effective.
11. Fish oil rosin soap	5	24 hours.
12. Crude oil emlsion (used as spray)	5	48 hours.
Synthetic insecticides (used in the form of spray on the surface of water).		
13. D. D. T. 0·1%	5	No effect even afer 72 hours.
14. B. H. C. 0·1%	5	48 hours.
15. Folidol 0·025%	5	24 hours.
16. Aldrin 0·1%	5	48 hours.
17. Dieldrin 0·1%	5	24 hours.
18. Endrin 0·05%	5	3 hours.
19. Bordeaux mixture (used as spray)	5	72 hours.

Results showed that tobocco dust even at a very low dosage of 1 gm. per gallon of water was highly effective, killing all the leeches within 10—15 minutes. Even tobacco waste cut into bits and scattered over surface of water at 2 gms per gallon brought about a complete kill within half an hour. Copper sulphate came next in the order of efficacy killing the leeches in 2 hours and Endrin 0·05% in 3 hours. *Acorus* and *Derris* were not as effective as tobacco. Folidol, Dieldrin and fish oil rosin soap caused very slow kill, taking about 24—72 hours. Common salt was not found effective unless made into a saturated solution.

In conclusion, it may be stated that the authors did not have the opportunity of conducting any field trials and the present laboratary trials can at best be considered only of an indicative nature. Tobacco in any form is a well known leechicide and the trials have confirmed the efficacy of this material for leech control. Waste tobacco including mid ribs, cut bits etc., which will otherwise go to waste, can be utilised by broadcasting them preferably in a powder form in paddy fields to kill the leeches.

Acknowledgment: The authors express their thanks to the Government Entomologist, Agricultural College and Research Institute, Coimbatore for the facilities made available for the conduct of these trials. The identification of the leech was done by the Professor of Zoology, University Zoology Laboratory, Madras and our grateful thanks are due to him.

LITERATURE CITED

De Jesus, Z. 1934 "Experiments on the control of the common water leech, *Hirudinaria manillensis*" The Philip J. of Sci., 53: 45–67.

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Some Important Caterpillar Pests of Madras State

by
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Introduction: Insects, as a group, are more injurious than beneficial to mankind. Imms (1947) has recorded seven lakhs of species of insects of which about ten thousand are known to be injurious, affecting plants and of these about five hundred are major pests.

In South India alone, Ramakrishna Iyer (1932) has recorded under various families, two hundred forms causing considerable damage to the cultivated crops in some form or other. Unlike many other groups, the members of this order, with few rare exceptions, are herbivorous vertable pests during the larval stage. The larval stage is familiarly known as caterpillars. The large majority are external feeders but a good number work unseen inside plant tissue. In a large number of cases, the plant may be disfigured, the foliage reduced considerably or the growth of the plant ratarded. Sometimes the evidence of damage is seen in the form of castings on the leaves, bore-holes, scrapings, cut-ends of the leaf, fluffy secretions on the stem and dead hearts.

A few typical South Indian examples of caterpillar pests representing different families under Lepidoptera with brief notes on distribution, characteristic symptoms of damage and diagnostic features indicating also methods of tackling them in plant protection work are given below:

1. *Heliothis armigera*, Hub: This is popularly known as gram caterpillar and is distributed throught South India. It is green in colour, stout and measuring 1½″ in length. The mid-dorsal portion has an apparent double blackish line. The dorsolateral region has two brownish bands, thickening at each segment behind thorax and slightly running across in first and eighth segments. The sub-lateral side has a whitish green longitudinal band with black dots as spiracles. Body hairs are short, pale and are seen arising from small cone-shaped fine pale coloured tubercles. Head-region is pale green with black ocelli. The legs are black in some and brown in others. The prolegs are stout at base and slender distally and broad at planta. The larvae show considerable colour variation and are polyphagous in habit.

It feeds on the inner contents of the pods of red-gram, Bengal gram, tobacco, groundnut and bores into the fruit of tomato and ear heads of *cholam*.

Dusting with 5% BHC. or spraying with 1% BHC gives relief against this pest.

2. *Lepidogma* sp.: This is a new record of a leaf-webber on *Eugenia jambalana* in South India (Ananthanarayanan and Venugopal 1956) and distributed in Coimbatore, Malabar and Madura. The full grown caterpillar is cylinderical, brownish in colour and attains a length of 1″. The larvae bear a pair of dark coloured longitudinal stripes, as well as a dark band across the hind border of prothorax. The mid-dorsal area is greenish or pale greenish. The setae are inconspicuous but arise from black warts which are arranged in rows. The five pairs of prolegs are very slender, pale white with crochets arranged in a circle.

The characteristic symptoms of damage is the presence of rolled up leaves and scraping of green matter.

The pest can be effectively tackled by the application of DDT. 5% dust or spraying 1% BHC.

3. *Chilo zonellus*, S.: It has a distribution in Tanjore, Madurai, Ramnad, Tirunelveli, and Coimbatore. The full grown larva is 2″ in length with brownish head portion. The body is somewhat transparent with chitinous small plates from which small blackish hairs arise. Body surface is pale whitish with irregular pinkish lines or blotches. Spiracles are black oval spots. Prolegs are light pink in colour with complete circle of crochets.

In the earlier stages the pest causes the wilting of central shoots of *cholam* as evidenced by the presence of dead hearts.

Spraying of 1% BHC. at periodic intervals may act as a deterrant.

4. *Prodenia litura* F. (Fig. 1, 1–a): The worms are nocturnal in their habits, feeding during nights and hiding under the clods during day time. The full grown larva is 1½″ in length with a small head region. The body is stout and thickest in the first abdominal segment. General colouration is velvety black dorsally and at sides

and with clean minute yellow spot over thorax. Three longitudinal yellow lines are more distinct in a pale black dorsal median band area, intermixed with numerous white dots. The prolegs have chitinised area at the sides. The planta is thick and fleshy with crochet in a line. Spiracle is oval dark coloured.

It is a serious pest, polyphagous in habit and feeds on a variety of plants such as castor, tobacco, banana, agathi, tomato, cabbage and *ganja*.

Recent investigations have proved that it can be controlled by the application of 5% BHC. dust.

5. *Amsacta albistriga*, W. (Fig. 2, 2-a): This is a serious pest of most of the dry crops in the red soil area and is particularly partial to groundnut. The full grown caterpillar is about 3″ in length. The body has a light greenish tinge between segment III and 6. The segments 9 and 10 are light brownish with the base of the tubercles reddish. There is a distinct prothoracic shield. Head, 1st and 8th segments of the body have orange red colour with black ocellar rigion. The body surface has numerous long and short setae, which are black or whitish. Legs are black. Prolegs 5 pairs are fairly stout at base and slender at tip. The spiracles are inconspicuous and visible under magnification, as thin whitish circular small patches.

It is particularly distructive to groundnut crop which is completely defoliated overnight.

In the younger stages the caterpillar pest can be brought under control by dusting 10% BHC. Fairly full grown caterpillars can be controlled by dusting Toxaphene 20%.

6. *Tarache nitidula :* The caterpillar is very active moving on the plant in a looping manner (Venugopal 1956) and has a distribution in Coimbatore, Tanjore, Madurai. The full grown caterpillar is ashy grey, greenish yellow ; green and with dots. The younger stages are brownish with ashy spots or patches. Head is smaller and mottled. The 3rd and 1st segments are of maximum size and appear swollen. The abdominal segments on 2, 3, 4 are smaller. Fleshy projections of blunt elevations on sides and dorsum are noted on segments on 1, 2, 3 and 8. Large number of black dots are seen over yellow green or brownish ashy background. Prolegs are located on 5, 6 and 10th segments with dorsal hump on each segment.

It is effectively controlled by dusting 5% BHC. or DDT.

7. *Hyposidra successaria.* Wlk. (Fig. 4, 4-a): This is a true looper affecting number of crop plants such as *daincha*, castor, sugarcane, sweet potato, *Eugenia jambolana* and mango. It belongs to the family Geometridae and the family is popularly known as span worms or measuring worms (Cherian and Rangiah Pillai 1938).

The full grown larva attains a length of 2½′ with pinkish or brick red colour. The transverse band formed by white linear spot persists with brownish or brick red patches at the sides. Paired brown dots are prominent dorsally on 2nd and 5th abdominal segments. The body is stout, cylindrical and its surface smooth and devoid of tubercles. The setae barely seen at the sides, are in the form of very thin and short hairs. The head region is smaller, shining, smooth and faintly marked with mottlings and black ocelli. Legs are dark brown and prolegs stout and strong to support the body of the substratum.

The crop is ultimately defoliated if the larva is allowed to do the damage unchecked.

Recent investigations have shown that BHC. or DDT. 5% dust completely eradicates the pest.

8. *Parasa lepida*, Gram: It has a wide distribution in Coimbatore, West Coast, Madurai, Trichinopoly and Madras. The full grown caterpillar is about an inch in length with stout body. It has 4 rows of spiny ocelli placed laterally and dorsally. The ventral surface is flat and fleshy. The colouration is white on the ventral surface and greenish above. The spines on the scoli are numerous tipped red or black and they cause irritation and pain by glandular scretion. The young caterpillars feed gregariously on the lower surface of the tender leaves scraping the green matter and causing drying up of the foliage. As the caterpillars grow in size, they scatter themselves and start feeding on the entire leaves. Badly affected castor plants bear only skletonised leaves, the entire leaf blade being reduced to the mid-rib and a few veins.

The full grown caterpillars can be controlled by spraying BHC. 1% wettable powder.

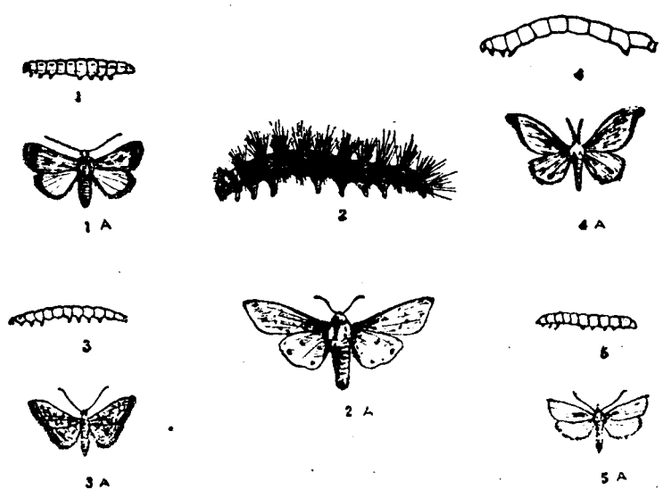

Fig. 1, 1 - A Caterpillar and adult moth of *Prodenia litura*, F.
Fig. 2, 2 - A Caterpillar and adult moth of *Amsacta albistriga*, W.
Fig. 3, 3 - A Caterpillar and adult moth of *Chilo zonellus*.
Fig. 4, 4 - A Caterpillar and adult moth of *Hyposidra successaria*, Wlk.
Fig. 5, 5 - A Caterpillar and adult moth of *Lepigdogma*, sp.

REFERENCES

Ananthanarayanan, K. P. and Venugopal, S. 1955 "Notes on a new pest, *Lepidogma* sp., (Pyralidae) on *Eugenia jambolana* in Coimbatore." Ind. J. Ent. 17 (2); 183—185.

Cherian, M. C. and Rangiah Pillai, B. 1938 Madras Agric. J. 26 : 166.

Imms, A. D. 1947 *A general text book of Entomology*, Methuen & Co., London.

Ramakrishna Iyer, T. V. 1932 Madras Agric. Bull 27, 82—87.

Venugopal, S. 1956 *Tarache nitidula* F. a semilooper pest on cotton in South India" J. Bomb. nat. Hist. Soc. 54, 207—210.

Madras agric. J., 45 : (5) 185—188, 1958

The Influence of Manuring on the Phytin Phosphorus Content of Grains.

by

A. MARIAKULANDAI, and R. SOUNDARARAJAN,
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The value of the cereal grains for human nutrition is governed to a large extent by the nature and amount of the protein and also the form of phosphorus synthesised by the plants. It has been known for a long time that a large proportion of the total phosphorus present in cereals and vegetables may be present in the form of Phytin, the calcium magnesium salt of inositol-hexaphosphoric acid. But, there is no agreed opinion among the scientists regarding its usefulness. Thus Starkenstein (1910) Hutchison and Mottram (1933), held that the compound was useful while Plimmer (1913) showed that it was not utilized by human beings. More evidence chiefly due to the studies of Mecance and and Widdowson (1935), indicated that the phosphorus of phytin was not available to a great extent to the human system. So studies were undertaken to see how far the different forms of phosphorus occurring in the grains varied with the application of different kinds of fertilisers, both singly and in combinations, and the results are furnished in this paper.

Materials and Methods: Samples of cholam grains were obtained from the Old and New Permanent Manurial experimental plots at Coimbatore. In the Old permanent Manurial plots crops are grown under rainfed conditions under the following manurial treatments: (1) No manure (2) N (3) NK (4) NP (5) NPK (6) PK (7) K (8) P (9) Cattle manure CM (10) Cattle manure residual CMR. N was applied as ammonium sulphate at 1 cwt, P as single super at 3 cwt and Potash as Potassium sulphate at 1 cwt per acre. Cattle manure is applied at 5 tons per acre. In the Cattle Manure Residual plot the manure was applied for a few years and then left off. In the new Permanent manurials treatments are similar to those in the old Permanent Manurials except for the fact that another series of plots (Western series) received in addition a basal dressing of cattle manure at 2000 lb. per acre. All the plots in New Permanent Manurial are irrigated.

The grains were analysed for moisture, total and phytin phosphorus. Total Phosphorus was estimated by the colorimetric stannous chloride methods (Dickman and Bray 1940) in the wet digest of an aliquot of the grain (Piper 1947). Phytin was extracted by the method of Mecance and Widdowson (1935) and the Phosphorus determined as in the case of total Phosphorus.

Results and Discussion: The results are given in the table below. Table I and II.

Total phosphorus: The addition of Phosphorus to the soil as fertilizer has increased the total Phosphorus content of the grains in the Old Permanent Manurial but the increase as compared with "no manure" is not marked in the New Permanent Manurial. The total Phosphorus percentage varied from a minimum of 0·3701 in the case of NK treatment to 0·6509 percent in PK treatment in the Old Permanent Manurial plots. Surprisingly the PK treatment in the Western series of New Permanent Manurial gave the lowest value of 0·5325% of Phosphorus.

Phytin P: This from of Phosphorus varied from 0·1409 percent in the Potash treatment to 0·278% in the case of PK in the Old Permanent Manurial plots. The percentages of Phytin Phosphorus were generally higher in the grains from the New Permanent Manurial plots, the variations ranging from 0·1854% in PK to 0·3701% in No manure treatment in the Western series. Generally the Phytin Phosphorus appeared to increase or decrease with the total Phosphorus percent of the grains. The increase in the percentages in general of total and Phytin Phosphorus in the grains due to the application of Phosphatic fertilizer is in agreement with the observations of Srivastava *et al.* (1955) in the case of wheat. The increase in the percentage of Phytin Phosphorus in the Phosphorus treatments over no manure in the Old Permanent Manurial and the absence of such a marked difference in the Western series of New Permanent Manurial indicate that irrigation may promote greater amount of synthesis of the Phytin Phosphorus than rainfed conditions apart from the possible difference due to the varieties grown in the different experiments.

Ratio of Phytin Phosphorus to Total Phosphorus: "No manure" has given a ratio of 0·38 while Nitrogen, NPK and PK and also CMR have given nearly identical values (viz. 0·44) in the Old Permanent Manurial The highest ratio of 0·48 has been given by NK in the same experiment. The absence of much difference between Phosphorus and non phosphorus plots is due to the increase of both total and Phytin Phosphorus in the Phosphorus treatments. The ratios are generally higher in the New Permanent Manurials plots, the variations ranging from 0·36 in the case of Nitrogen to 0·81 in the case of Phosphorus in the Western series. The general higher level of the ratios in the New Permanent Manurial would appear to indicate greater proportion of phytin in the synthesis of phosphorus compounds. As the cholam varieties grown in the two sets of experiments are different (*Periamanjal* cholam in the Old Permanent Manurial and Summer Cholam in the New Permanent Manurial), differential synthesis of Phytin due to this cause is also possible to some extent.

Non phytin Phosphorus: This fraction was calculated by subtracting the phytin from the total phosphorus. It ranged from 0·1935% in NK treatment to 0·4137% in NP treatment in the Old Permanent Manurial Plots. Cattle manure gave only 0·3548% and NPK treatment 0·2479%. In the New Permanent Manurial plots, the percentage ranged from 0·0581 in PK treatment to 0·2650 in NPK treatment in the Western series. Cattle manure registered only 0·1482% in the same series.

Thus, if non-phytin forms of Phosphorus are taken as indicative of the nutritive value of the grains Potash, NP, Phosphorus, PK and CM would appear to be the descending order of merit of the treatments in the rainfed crop. Under irrigated conditions NPK, NP, N, K and CM would appear to be the order of merit. From the point of nutritive value of phosphorus in grain, there does not appear to be any support for the view that cattle manure is superior to the inorganic fertilizers.

Summary and Conclusions: Samples of cholam grains got from the Permanent Manurial plots were analysed for total and Phytin phosphorus. The following conclusions were drawn from the determinations.

(1) The application of phosphatic fertilizer leads to an increase in the total and phytin forms of phosphorus, the variations as compared with the control being more in the Old Permanent Manurial plots (rainfed).

(2) Irrigation appears to increase the proportion of Phytin Phosphorus in the grains as compared with rainfed crops. There is also the possibility of differential synthesis of Phytin due to differences in the varieties grown in the two sets of experimental plots.

(3) If non-phytin form of Phosphorus is taken as the criterion of the nutritive value of the grain, CM does not appear to be superior to Phosphorus, PK and NP under dry conditions while under irrigated conditions NP and NPK are better than CM while Phosphorus alone is inferior to the latter. It is evident therefore that Phosphorus has to be combined with N and K for best quality grains containing more of the non-phytin Phosphorus.

TABLE I

Results of Analysis of Cholam Grains from the Permanent Manurial Experiments for different forms of Phosphorus (on oven dry basis)

Plot No.	Treatment	Old Permanent Manurials Lab. No.	Total P %	Phytin P%	Non-phytin P% (By difference)	Phytin P / Total P
1	No manure	536/1956-57	0·4695	0·1760	0 2935	0·38
2	N	537	0·3922	0·1685	0·2237	0·43
3	NK	538	0·3701	0·1766	0·1935	0·48
4	NP	539	0·5940	0·1803	0·4137	0·30
5	NPK	540	0·4425	0·1946	0·2479	0·44
6	PK	541	0·6509	0 2780	0·3729	0 43
7	K	542	0·5555	0·1409	0·4146	0 25
8	P	543	0·6434	0·2440	0·3994	0·38
9	CM	544	0·5719	0 2171	0·3548	0·38
10	CMR	545	0 4689	0·2039	0·2650	0·44

TABLE II

Results of Analysis of Cholam Grains from the Permanent Manurial Experiments for different forms of Phosphorus (on oven dry basis)

Plot No.	Treatment	New Permanent Manurial (Western series)				
		Lab No.	Total P%	Phytin P%	Non-phytin P%	Phytin P / Total P
1	No manure	150/1955–56	0·4628	0·3701	0·0927	0·80
2	N	151	0·3780	0·1374	0·2406	0·36
3	NK	152	0·4926	0·2881	0·2045	0·58
4	NP	153	0·5325	0 2817	0·2508	0 53
5	NPK	154	0·4749	0 2099	0·2650	0·44
6	PK	155	0·2435	0·1854	0·0581	0·76
7	K	156	0·4161	0·2052	0 2109	0·49
8	P	157	0·4369	0·3568	0·0801	0 81
9	CM	158	0·3430	0·1948	0·1482	0·57
10	CMR	159	0·3418	0·2240	0·1178	0·66

BIBLIOGRAPHY.

Dickman, S. R. and Bray, R. H. (1940) Industrial Engineering Chem (Anal) **12**: 665.
Hutchison & Mottram (1933) *Food and the Principles of dietetics* 7th ed (Arnold).
Piper (1947) *Soils and Plants analysis.*
Mc cance, R. A. and Widdowson E. M. (1935) Biochem J. **29** : 2694.
Plimmer (1913) Biochem J. **7** : 43.
Srivastava B. N., Biswas T. D. and Das, N. B. (1955) J. Indian Soc. Soil Sci. **3** : 33.
Starkenstein (1910) Biochem Z. **30** : 56.

Announcement

A conference of Upper Subordinates of the Eastern Region will be held at Trichy on 22nd June 1958. All Upper Subordinates of South Arcot, Tanjore and Trichy are requested to attend the Conference. Delegates from other districts are also invited.

There will be a General Body Meeting of the State Association on 22nd June at Trichy. Resolutions to be discussed at this Meeting may kindly be sent in duplicate to Sri T. R. Padmanabha Rao, Special Agricultural Demonstrator, Manapparai P. O., Trichy District, before 10th June 1958.

There will also be a benefit performance at Trichy on 22nd June to raise funds for the State Association.

Your co-operation and help are earnestly solicited.

Deputy Secretary,
Upper Subordinates' Association,
Trichy District.

Madras agric. J., **45** : (5) 189—190 1958

Research Notes

The Influence of Soil Moisture on the Growth of Rain-fed Cholam (Jowar)

The importance of soil moisture for the growth of crops is very well known. Under rainfed conditions especially, the crop is left to the mercy of the vagaries of weather and the condition of the crop depends mainly on the availability of moisture in the soil. But quantitative data on the availability of soil-moisture and growth are generally lacking. In the following note some quantitative data are furnished, based on the preliminary observations made under field conditions during the 1957—58 season.

Cholam Co. 1 and Co. 3 were sown in field No. 58 Central Farm, Coimbatore on 8—7—57 in order to study the influence of weather on them, under the All India Co-ordinated Crop Weather Scheme. The sowings were done after the receipt of adequate rainfall of 0·75″ on four successive days. For seven days from the day of sowing light drizzle and rain to the tune of 0·37″ were received, favouring germination and growth of young seedlings. After a break of nine days a rainfall of 0·25″ was recorded on 25—7—57. Thereafter, the weather was mainly dry for 27 days, affecting adversely the growth of the young crop. This was followed by a rainfall of 0·40″, received on two consecutive days on the 22nd and 23rd August 1957. During the entire month of August 1957 only a total rainfall of 0·42″ was received. This happened to be 0·86″ below normal. Conditions worsened during September 1957, when a total rainfall of only 0·20″ was received on five days, none of them being a rainy day – (A rainy day is one on which atleast 10 cents of rain has been recorded) —, while the normal for this month is 1·15″. Due to such droughty conditions the crop in the field withered. But only a few plants that remained near the irrigation channel appeared green. The crop in the field would have dried up completely but for the rainfall of 0·15″ on 4—10—57 and 0·50″ on 10—10—57. The plant near the channel had grown well because of the effect of seepage, due to the water being

occasionally taken through the channel to irrigate other fields. The seepage water, even though small it might have been, has supplied enough soil-moisture for the plant to grow normally. The attached photographs reveal the difference between the stand of the crop near the channel and that in the main field. The photographs were taken on 16—10—57 and the percentage of soil-moisture at 3", 6" and 12" depths near the vigorous plant and in the main field were estimated and presented in the tables given hereunder :—

TABLE I.

Percentages of Soil Moisture at Two Different Places.

S. No.	Place	Percentage of soil moisture@ 3" depth	6" depth	12" depth
1.	Near the vigorous plant	13·15	16·74	17·30
2.	In the main field	5·42	4·65	10·31

The inference from the above table is that seepage from the channel has increased the soil-moisture to the required extent for the vigorous growth of the plant. The height of the plant near the channel was 224 cms, while the average height of plants in the main field was only 26 cms. Further, it may be seen from the photographs that the plant near the channel has reached the flag-leaf stage, while the plants in the field are stunted and withered.

This observation reveals that the crop in the field would have also reached the stature of the vigorous plant near the channel, if timely rains to the tune of 1·50" had been received.

C. BALASUBRAMANIAN
M. V. JAYARAMAN

Madras agric. J., 45 : (5) 191—192, 1958

A Note on Flowering and Fruiting in Cardamom — *Elettaria cardamomum*

The observations are confined to the Singampatti type of "Mysore Cardamoms". This is grouped under "*Elettaria cardamomum* var *major*" with erect racemes. Detailed observations were made by the authors, while they were working as Research Officers in the Cardamom Research Scheme at Singampatti. Some interesting observations were made and useful data gathered in 1946—'48 and these are summarised below :

Flowering: It was observed that this variety of cardamom flowers throughout the year in Singampatti Group. There are marked fluctuations in the number of flowers that open during the following three seasons of the year.

(1) January — March : In this warm dry period, there are occasional showers. This is conducive to the growth of aerial shoots and development of panicles. But the number of flowers that blossom during this season is as low as 7% of the total for the year.

(2) April — September (Rainy) : This is the period of maximum flowering, when about 78% of the flowers of the year open out.

(3) October — December (Cold) : The blossoming decreases in the course of this period of the year to about 15% of the total.

Thus the first three months of the year, January to March, is a period of minimum flowering. The next six months is the period of maximum flowering. During the last three months of the year, the flowering tends to decline steadily.

Blossoming: Well developed buds open out from 3 a. m. and most of the blossoming for the day is over by about 6 a. m. Both warmth and humidity are needed for the buds to blossom out. For want of either of these conditions, the blossoming is delayed. During very chill and dry days, the buds do not open at all and most of the buds wither away without even opening.

Fertilisation: Cardamom is mostly self pollinated. Flowers are protogynous and the anthers dehisce before blossoming and numerous pollen grains were noted on the receptive stigma. Bees and other insects visit cardamom flowers for pasturage, but they do not effect pollination.

Fruiting: It takes four to four and half months for a flower to develop into a fruit. It is needless to say that all the flowers do not bear fruit. Observations have shown that almost 75% of the flowers go

to waste on an average in a year. It was noted that the ratio of fruiting to flowering is not uniform in all the three seasons. In the first period, January to March, only 3·8% of the flowers of the season bear fruit, 96·2% of the flowers being shed. Of the flowers that open during the next season, i. e., the maximum flowering period, successful fruiting is as high as 30·7%. The corresponding ratio in the last period in October to December is 19·1%.

The data from which the above conclusions were derived are tabulated below:

The Number of Flowers Opened and the Fruits Set — Average of 16 Panicles.

Period and month	Average number of flowers opened in each raceme	Average number of fruits that developed in each raceme	Flowers opened for the year-percentage	Ratio of fruits to flowers	
				for the season	for the year
1st Period					
January	0·4	..	..	..	..
February	2·8	..	..	..	..
March	10·1	0·5	..	..	..
Total	13·3	0·5	6·9	3·8	0·25
IInd Period					
April	22·5	4·9	..	..	..
May	31·5	11·1	..	..	..
June	26·3	11·0	..	..	..
July	23·1	9·7	..	..	..
August	23·0	6·0	..	..	..
September	24·3	8·5	..	..	..
Total	150·7	46·2	78·2	30·7	24·0
IIIrd Period					
October	13·5	2·8	..	..	..
November	8·1	1·7	..	..	..
December	7·2	1·0	..	..	..
Total	28·8	5·5	14·9	19·1	2.8
For the year	192·8	52·2	..	..	27·05

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Madras agric. J., 45 : (5) 193—194, 1958

Occurrence of 'Flowerless' Castor Plants.

In castor the term 'Flowerless' denotes the condition of the plant where flowering has not been initiated till such time when other plants raised under identical conditions have flowered and completed their fruiting phase. A case of occurrence of flowerless plants in the F_2 population of a certain cross is reported hereunder.

A cross was effected between TMV. 2 strain and R. C. 1077, a South African variety for the purpose of studying the inheritance of the number of nodes to first inflorescence. Both the parents are normal flowering types and no case of flowerless plants was observed in them in the previous years when they were grown pure. In the F_1 generation all the plants flowered. But in the F_2 population, in certain plants flowering was not observed even after fifteen months where the sister plants had completed their fruiting phase within eight months. The flowerless plants were very tall with large number of nodes. While the flowering plants of the population began drying out after fruiting, these non-flowering plants did not show signs of drying up. The height of the plants and the node number to the first inflorescence are given below for the parents and the flowering types and the total number of nodes for the non-flowering plants.

TABLE.

	Node number.	Height of plants.
TMV. 2 female parent	21	7′
R. C. 1077 male parent	7	4′
Flowering plants	8 to 20	3½′ to 6′
Flowerless plants	30 to 68	6′ to 15′

The frequency of the occurrence of such flowerless plants was determined to be about 6 per cent. The segregation ratio was not determined as the population of the F_2 generation was not large enough. Though the F_2 population of a number of other crosses were grown, the flowerless plants were found to occurr only in the cross between TMV. 2 (spiny) and R. C. 1077 which is a spineless South African variety.

Domingo (1945) also has reported the occurrence of the "Flowerless plants" in F_2 of crosses when one of the parents was U. S. 4 or 'the spineless variant of U. S. 4', and reported that "the particular gene complex which produces the flowerless character was obtained in F_2 of certain crosses only".

The flowerless plants are being vegetatively propagated to study their further behaviour. One plant *in situ* in the field is being observed to note whether this has a tendency to become a biennial or perennial with flowering in the second or subsequent years.

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REFERENCE

Domingo, W. E. (1945) Flowerless castor-bean plants. J. Hered. 36 : 116—120.

Madras agric. J., 45 (5) : 195, 1958.

A case of ascidium formation in *Sesamum orientale* Linn.

An instance of the formation of an ascidium involving the leaves was observed in the gingelly plant *Sesamum orientale* Linn., in the population of an irrigated crop during 1957 summer. Two ascidia were found in the axils of two leaves (Fig.). The stalks of the ascidia are thick and round. The funnel consists of two tips with two distinct midribs. The arrangement of the vascular bundles in the petiole of the leaf is in the form of an arc. But in the stalk of the ascidia, there is a central column of vascular cylinder surrounded by a wide collar. The position of the ascidium, the presence of two distinct midribs and two easily discernible tips and the anatomy of the stalk of the ascidium indicate that it is the result of fusion of two leaves. Similar cases of ascidium formations have been reported in *Tabernaemontana coronaria* R. Br., (Rao 1937) and in *Clerodendron infortunatum* Gaertn., (Chakraverti 1951). The case described herein in gingelly is an addition to the list of plants in which ascidium formation has been reported to be due to the fusion of two leaves.

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REFERENCES

Chakraverti, D. N. (1951) On the occurrence of foliar ascidia in *Clerodendron infortunatum* Gaertn. Curr. Sci. 29: 48—49.

Rao, L. N. (1937) A note on the variation in leaf form and ascidium formation in *Tabernaemontana coronaria*. J. Indian bot. Soc. 16: 217-221.

Weather Review — For April, 1958.

RAINFALL DATA (IN INCHES)

Division	Station	Total rainfall for the month	Departure from normal	Total since 1st January 1958
North	Madras (Meenambakkam)	0·3	+ 0·2	0·9
	Tirurkuppam*	1·8	+ 1·0	1·8
	Vellore	2·6	+ 1·6	3·8
	Gudiyatham*	1·2	+ 0·3	2·8
East Coast	Palur*	0·4	— 0·2	0·9
	Tindivanam*	Nil	— 1·8	1·8
	Cuddalore	Nil	— 1·0	1·6
	Nagapattinam	0·1	— 1·0	0·6
	Aduthurai*	1·0	— 0·2	1·9
	Pattukkottai*	1·9	+ 0·4	3·9
Central	Salem	2·0	+ 0·1	2·8
	Coimbatore (A. M. O.)* ..	2·6	+ 0·2	2·9
	Coimbatore	2·8	+ 1·2	3·1
	Tiruchirapalli	0·8	— 1·6	1·3
South	Mathurai	2·3	+ 0·1	3·3
	Pamban	2·6	+ 0·8	4·1
	Koilpatti*	4·2	+ 1·4	5·3
	Palayamcottai	2·4	— 0·1	5·2
	Ambasamudram*	4·3	+ 1·2	9·4
	Nagercoil*	5·1	+ 1·2	8·1
Hills	Kodaikanal	6·3	+ 1·5	14·0
	Coonoor*	7·9	+ 3·2	21·6
	Ootacamund*	1·8	— 2·1	8·2
	Nanjanad*	3·9	— 0·2	7·8

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

Madras State experienced frequent thundershowers with intermittent dry weather during the month of April, 1958.

The weather was mainly dry in Madras State on 1—4—'58. On 2—4—'58 scattered showers occurred in south Madras, while the weather remained dry elsewhere in the region. Again, dry weather prevailed throughout the State on 3—4—'58. Though thundershowers were received in south Madras on 4—4—'58, weather was dry in the rest of the region. For two days from 5—4—'58, dry weather prevailed in Tamil Nad. On 7—4—'58, thundershowers occurred at a few places in Madras State. An upper air discontinuity at 1500 metres a. s. l. passed through Palayamcottai on 8—4—'58, when, except for isolated thundershowers at Ootacamund, weather was dry throughout the State. On 9—4—'58, south Madras received showers at a few places. Mainly dry weather prevailed in Tamil Nad for two days from 10—4—'58. For 4 days from 12—4—'58, thundershowers were received at a few places in Madras State. Mainly dry weather was prevalent throughout the State for 4 days from 16—4—'58. On 20—4—'58, thundershowers occurred at a few places in interior Madras. For two days from 21—4—'58, Madras State received thundershowers at a few places. Dry weather was prevalent throughout the State for two days from 23—4—'58. Showers or thundershowers occured at a few places in Madras State on 25—4—'58, and in interior Madras on 26—4—'58. On 27—4—'58, isolated thundershowers were received in south Madras, while weather was mainly dry elsewhere in the region. During the last 3 days of the month, thundershowers occurred at a few places in Madras State.

Regarding the fluctuations of dry temperatures, they were generally below normal throughout 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.	11—4—1958	Nanjanad	1·91
2.	12—4—1958	Coonoor	3·90
3.	14—4—1958	Tirurkuppam	1·78
4.	21—4—1958	Ambasamudram	1·60
5.	21—4—1958	Koilpatti	3·31
6.	27—4—1958	Kodaikanal	1·71

Zonal Rainfall (in inches)

Name of Zone	Rainfall for April, 1958	Departure from Normal	Remarks.
North	1·6	+ 0·8	Above normal
East Coast	0·6	— 0·6	Below normal
Central	2·1	Nil	Normal
South	3·5	+ 0·3	Above normal
Hills	5·0	+ 0·6	Above normal

Agricultural Meteorology Section,
Lawley Road Post, Coimbatore.
17th May, 1958.

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

Replies received from Government on Resolutions passed at the State Conference of Upper Subordinates held on 7th Sep. 1957.

RESOLUTION No. 10 :

The request of the Association that heads of Sections should be authorised to guide students for post-graduate degree will be considered after the proposed post-graduate Institute is established.

RESOLUTION No. 11 :

(Reply recieved from the Director of Agriculture, Madras.)

Plant Protection work requires the background of research. The Crop and Plant Protection Officer should have the capacity to test the efficiency of pesticides before actually recommending its application to crops. Application of pesticides to particular pests merely because the manufacturing firm have indicated them against a particular pest without testing in the laboratory about their efficacy will not be proper and effective.

The question of creating new posts have to be decided by Government. Posts will be created as and when necessity is felt.

RESOLUTION No. 12 :

Orders have been issued in G. O. Ms. 3643 F. & A. dated 3—12—1957 framing separate *ad hoc* rules for the post of Assistant Agricultural Engineer (Soil Conservation Scheme). Necessary provisions have been made therein to enable the Upper Subordinates in the Madras Agricultural Subordinate Service to be appointed as Asst. Agricultural Engineers (Soil Conservation).

RESOLUTION No. 14 :

The posts of Agricultural Income Tax Officers and Asst. Agricultural Income Tax Officers require technical knowledge of survey work. The posts of Inspectors employed to enforce the Minimum Wages Act require knowledge of labour laws and experience in labour matters. Agricultural Demonstrators are not suitable for the posts of Agricultural Income Tax Officers, Asst. Agricultural Income Tax Officers and Inspectors employed for enforcing the Minimum Wages Act. There is no crop Insurance Act in force in this State at present.

Lawely Road, P. O.
Coimbatore,
16—5—58.

Secretary,
Agricultural Upper Subordinates' Association.

Madras agri. J., 45 : (5) 199—203, 1958

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

Cotton : In this Section Lint : Candy of 784 lbs.
Kapas : Pothi of 280 lbs.

Tirupur, Coimbatore District : There was a rainfall of 3·30 cm. at Tirupur with some showers here and there throughout the district during the month.

The market started with an opening balance of 6247 candies of Cambodia and 201 candies of Karunganni lint in Tirupur. The total arrivals into the market at Tirupur during the month were 16006 candies of Cambodia and 1112 candies of Karunganni lint which included 3415 candies of Cambodia and 437 candies of Karunganni locally ginned. Despatches from Tirupur accounted for 10286 candies of Cambodia and 705 candies of Karunganni lint sent to Madras, Tanjore, Salem, Dindigul in Madras State and Bombay, places in Kerala and Andhra States. At the end of the month there was closing stock of 11967 candies of Cambodia and 698 candies of Karunganni lint.

Kapas : The Kapas market started with an opening balance of 24261 pothis of Cambodia and 1249 pothis of Karunganni. The total arrivals into Tirupur during the month were 71471 pothis of Cambodia and 12714 pothis of Karunganni. The disposals during the period were 58619 pothis of Cambodia and 8870 pothis of Karunganni in the market area of Tirupur. At the end of the month there was a closing stock of 37113 pothis of Cambodia and 5093 pothis of Karunganni.

Prices : During the month there was a good demand for superior types of cotton both lint and kapas and the prices of kapas slightly increased during the month.

Prices in Rs. lint per candy of 784 lbs.

Cambodia superior quality	Rs. 900—981
,, average ,,	Rs. 740—860
Karunganni superior ,,	Rs. 870

Prices in Rs. Kapas per pothi of 280 lbs.

Cambodia superior quality	Rs. 120—134
,, average ,,	Rs. 100—115
Karunganni superior ,,	Rs. 114

Ramanathapuram District: During the month widespread rains were received throughout the district ranging from 2·54 cm. — 7·50 cm. and the same were beneficial to the 2nd crop karunganni and for the standing crop of Uganda.

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

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

	Opening stock	Receipts	Total	Disposals	Closing stock
Kapas	2000	35500	37500	34500	3000
Lint	670	4050	4720	4025	695

The following were the prices of kapas, lint and seeds in the district during the month.

Prices in Rs for Kapas in pothi of 284 lbs.

Karunganni	Rs. 86—97
Tinny Karunganni	Rs. 80—90
Tinny	Rs. 67—82

Prices in Rs. for lint in candies of 784 lbs.

Karunganni	Rs. 740—806
Tinny Karunganni	Rs. 680—735
Tinny	Rs. 631—712
Cambodia	Rs. 700—925

Seeds per maunds of 82—2/7 lbs.

Karunganni	Rs. 9·20— 9·75
Tinny	Rs. 9·75—10·60
Cambodia	Rs. 6·50— 7·85

South Arcot District: Arrivals to Villupuram and Panrutti markets came to 27 pothis and one pothi respectively. Despatches from Villupuram market to Coimbatore District amounted to 32 pothis. The trade had a stock of 34 pothis at the end of the month. The average price per pothis of 280 lbs. worked out Rs. 72·11.

Groundnut: *South Arcot District:* Arrivals of summer crop groundnut commenced during the month.

The market opened with an opening stock of 1678 tons and the arrivals from the district produce amounted to 1989 tons while arrivals from other districts like North Arcot District, Madurai, Trichy, and Tanjore etc. came to 1084 tons. The offtake by oil mills and country chekkus was 2244 tons and 368 tons respectively. Despatches to other districts like Madras, Salem, North Arcot, Tanjore and exported to other places viz. Pondicherry amounted to 400 tons and 32 tons respectively. Wastages were calculated at 96 tons. The stock with the trade at the end of the month stood at 1611 tons.

Prices improved slightly due to decreased arrivals. The average prices in the several markets ranged from Rs. 132·69 to 150·90 per candy of 531 lbs of kernels according to quality.

The regulated markets of Tiruvannamalai and Vellore attracted fair arrivals. Other markets, being started about a year back only, are expected to get more produce during the coming season.

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

Quantity in tons.

Name of Commodity	Opening balance	Arrivals	Disposals	Closing balance.
Groundnut kernels	503	1172	1398	277
Groundnut pods	553	1602	1333	822

Prices: The prices of groundnut and its products went up considerably as compared to last month.

The prices of groundnut kernels that ruled during the month this year were Rs. 130–155 of 531 lbs; of oil Rs. 275–310 all per candy of 500 lbs and pods Rs. 9–15 per bag of 80 lbs.

Ramanathapuram District: The following were the arrivals, disposals and closing stocks of pods and kernels in Virudhunagar market during April 1958.

	Opening stock	Receipts	Disposal	Closing stock
Groundnut pods (in tons)	—	350	350	—
Groundnut kernels in candy of 531 lbs.	705	1300	1320	685

The following were the prices of pods, kernels, oil and oilcakes during the month at Virudhunagar.

Pods in maunds of 82–2/7 lbs.	No transaction.
Kernels in candy of 531 lbs:	Rs. 135—162
Oil per candy of 500 lbs.	Rs. 285—305
Oilcakes per maund of 82–2/7 lbs.	Rs. 8—10·00

Gingelly: *South Arcot District:* Vridhachalam market had an arrival of 1221 bags of 164 lbs. from district produce aad 432 bags from other districts. The country chekkus utilised 1069 bags for crushing. Despatches to other districts came to 553 bags. The trade was left with a balance of 387 bags.

Tobacco: At the end of the month there was a stock of 10905 cdys of chewing and 125 cdys of cheroot tobacco. About 3130 cdys of chewing and 180 cdys of cheroot tobacco were despatched to Nilgiris, Salem, North Arcot, South Arcot and Tanjore Districts in Madras State and to Mysore, places in Bombay, Kerala and Andhra Predesh States.

The following were the price range :

Prices in Rs. per candy of 500 lbs.

Variety	I Grade	II Grade	III Grade
1. (a) *Chewing tobacco:* (Sun cured)	260—315	180—250	140—175
(b) Other varieties	210—290	150—185	75—120
(c) Chewing pit cured; grown in Palladam and Sulur areas)	200—260	120—190	75—110
2. *Cheroot varieties:* (Sun cured grown in Erode and Bhavani Taluks)	190—240	150—180	80—100

Cardamom: Good varieties were received in the plantation areas of Madurai during the latter part of the month.

Arrivals of Cardamom at Pattiveeranpatti for auction sale was fairly good. Arrivals at Thevaram and Bodinayakanur was poor.

The prices were more or less steady.

The following were the average prices of Cardamom in important assembling markets.

Prices in Rs. per lb.

Pattiveeranpatti:	
1. Sun dried	9·06— 9·39
,, (inferior)	7·69— 9·00
2. Store Green	9·06—10·41
,, (inferior)	7·70— 9·00
3. Splits	6·30— 7·30
4. Lights	4 — 5·90
5. Seed	7 —10·70
Thevaram:	
1. Green	Nil
2. Lights	7·70—8·16
Bodinaickanoor:	
1. Shipment	7·67—8·10
2. Lights	4·01—5·80

Madras agric. J., 45 (5) : 204, 1958

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

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

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

Name of Market Committees.	Section 5 (1)		Section 5 (3)		Weighmen.	
	A	B	A	B	A	B
S. A. M. C.	116	1281	68	907	60	856
N. A. M. C.	117	733	87	625	47	388
C. M. C.	89	677	102	547	97	313

A = Issued during the month.

B = Issued upto the end of the month.

Meetings: A meeting of the South Arcot Market Committee was held on 17—4—58. Nine members including the Chairman and Vice-Chairman attended the meeting and 32 subjects were disposed of at the meetings. They included the followings:

1. The Administration report of the Committee for the year 1957-58 was approved.
2. The Government were requested to take immediate steps to declare paddy as a commercial crop under Madras Commercial Crops Markets Act.
3. Opening of a Regulated Market at Gingee was sanctioned.
4. One of the Superintendents of the Committee was permitted to undergo the Market Secretary Training Course at Sangli or Hyderabad at Committee's cost.

Quality Analysis: Nil.

Quality Competition: Nil.

Madras agric. J., 45 : (5) 205—210, 1958

QUALITY OF GHEE

by

Sri K. SRIRAMAN,
Asst. Marketing Officer, Madurai

Coimbatore and Salem districts in Madras State export large quantities of ghee and butter. It is estimated that roughly one and a half lakhs of tins (each tin contains 37½ lb. nett butter or ghee) of butter and ghee are exported outside these districts. The important assembling centres are Dharapuram, Moolanur, Kangayam, Palladam, Tirupur, Uthukuli, Avinashi and Coimbatore in Coimbatore district and Tiruchengode, Rasipuram, Athur, Namakkal and Dharmapuri in Salem district. Butter from adjoining areas like Karur of Tiruchiraplli district and Oddanchatram, Appiampatti of Madurai district also find a market in these district. The exports are roughly half in the form of ghee and the other half as butter or cream butter. This butter also is ultimately used for ghee production by the consumers. Very little of butter is used as such in South India.

Ghee is a convenient form of preserving animal fat in the tropical countries where putrefaction takes place very rapidly. The milk is boiled, allowed to ripen overnight adding a little curd as starter and then the upper portion of curd is removed and the butter is churned from this portion with a fluted wooden ladle, adding water. The little butter obtained daily is preserved in a mud pot, either dry, or in water or in buttermilk. The daily accumulations of butter are added on and sold once in a week at the shandy or when a merchant calls on them at the village.

Ghee forms an important article of food in the vegetarian diet. In South India it is used along with the rice meal, while in Northern India, it is mostly used in the preparation of *chappathies* and sweets, which involve futher heating of the ghee over prolonged periods. Because of this difference in the usage of ghee, butter in South India is clarified into ghee, boiling it to nearly 125° to 128° C, while in North India the temperature is rised upto 110° to 115° C only. The flavour and texture of ghee is different due to the difference in heating. Trivedy *et al.* (1948) have found that none of the chemical constants of ghee undergo any change, when ghee is heated to such high temperatures as 250° C for periods varying from 6 to 45 minutes. Sethna and Bhat (1950) express the opinion that ghee produced at 120° to 130° C is of the finest quality with minimum moisture. Hence in may be assumed that the South Indian ghee is in no way inferior to the quality of ghee obtained in North India in respect of preparation of ghee.

Flavour, texture and colour are the common tests of the consumers to define quality. The acceptable flavour of ghee, differs according to tracts. In South India where ghee is prepared at a fairly high temperature when the casein and sugar gets partly charred, the ghee gives out a caramelised flavour, which is appetising. The characteristic sweetish flavour of ghee is much sought after. The grainy feel of ghee is important. Cow ghee granules are much smaller than that of buffaloe ghee granules. The colour of the ghee attracts attention. The beautiful yellow colour of cow ghee which is due to the yellow carotinoid pigment and the pale whitish yellow colour of buffaloe ghee are preferred. While these outward characteristics of appearance, taste and smell satisfy the consumers, the genuineness of the ghee is not readly tested. The commodity butter or ghee, is now-a-days so skilfully adulterated or concocted that it looks and tastes like the real thing and betrays its *ersatz* character only when chemically analysed. A recent survey made by the Directorate of Marketing and Inspection, Union Ministry of Food and Agriculture disclosed that 33 percent of the ghee samples collected all over India, contained practically no ghee at all, while in another batch of samples, it was noted that 58% of the samples, were adulterated. It is imperative in the interests of national health that very effective legislation should be enacted to stop the adulteration of ghee or butter fat, which is one of the most important foodstuffs of the vegetarian dietary. Suitable standards should be prescribed for genuine ghee, so as to protect the interests of the consumers and the dealers in ghee or butter. For this, the chemistry of ghee should be known. Chemically considered, butter fat is a Glyceride of fatty acids. In addition, it also contains small amounts of colouring and mucilagenous matter, together with minute fragments of animal tissues, constituing the " unsaponifiable matter ". The most important of this unsaponifiable matter is cholesterol. As all other chemical units, butter fat also has certain characteristic physical and chemical constants, varying but within narrow limits, by which its identity may be fixed. Various studies on the composition and quality of butter have been made in foreign countries and in India. The work of Plymen and Aiyer (1921) has disclosed that the analytical figures for butter fat and ghee can be mutually applied. Hence studies on the chemical composition of butter made in the foreign countries would also apply to ghee of India. Patel *et al.* (1944) have pointed out that the B. R. (Butyro Refractometer Reading) & P. V. (Polenske Value) were significantly high while the R. M. (Reichert Meissl Value) was lower in ghee from cows as compared to buffaloe ghee. This difference in the compisition of butter fats is also to be noted. The quality of butter or ghee produced by the cow or the buffaloe, should be studied in detail for fixing suitable standards in each tract.

The fatty acids present in butter fat of cow and buffaloe as given by Godbole and Sadgopal in their book " Butter fat Ghee " are given below :

Fatty acid	Cow butter fat	Buffaloe butter fat
1. Butyric acid	4	4
2. Caproic acid	2	2
3. Caprylic acid	0·9	0·9
4. Capric acid	2	2
5. Lauric acid	4·5	4·5
6. Mpristic acid	10	9

Note: The above six acids are easily assimilable saturated fatty acids of low molecular weight being steam volatile, and are estimated as Reicher Meissl value (water soluble portion) and Polenske value (water insoluble portion).

7. Palmitic acid	26	31
8. Stearic acid	10	12
9. Acid higher than Stearic	...	0·3

Note: The above acids are non-assimilable saturated fatty acids of high molecualar weight.

10. Oleic acid	34·5	30
11. Linoleic acid	5	4

Note: These acids are assimilable unsaturated fatty acids.

12. Uusaponifiable	1	0·45

The proportionate percentage of the glycerides of saturated acids of high molecular weights on the one side and that of the glycerides of either saturated acids or acids of low molecular weights on the other, seems to decide the comparative assimilability and digestibility of any given fat. It is seen that roughly about 40% of butter fat is non-assimilable while the rest 60% is assimilable, Coconut oil contains more of assimilable fatty acids while beef and mutton tallow contain more than 50% of non-assimilable acids. The content of the lower fatty acids is fairly high in butter fat as compared with other oils and fats. The Butyric acid content of about 4·0 percent is a significant factor to note in butter fat composition. Hence the characteristics of the butter fat are determined in the Reichert Meissl value and the Polenske value. The Reichert Meissl value (R. M.) indicates the quantity of water soluble, steam volatile fatty acids present, these acids being chiefly Butyric and Caproic. The Polenske value (P. V.) determines the water insoluble, steam volatile, fatty acids. These two values are important in the determination of the adulteration of butter fat. Besides these two values, the fact that the Refractive Index (R. I.) of butter fat varies within a very small range, can also be utilised for determining the purity of the butter or ghee with the help of a Butyro-Refractometer. Apart from these positive determinations for ghee, some tests to detect adulterants in ghee can also be taken up. The usual adulterants in South India are Vanaspathi or some

cheap vegetable oils. Addition of these adulterants would alter the Reichert Meissl, Polenske and Butyro Refractometer readings and hence can be detected. In addition, the difference in the composition of the sterols between the animal and vegetable matter, can give a definite indication of the admixture of vegetable and animal fats. Phytosterol is the sterol of vegetable origin, while Cholesterol is from animal origin and these form additive compounds with Digitonin. Cholesteryl acetate, melts at about 114°C (corrected) and Phytosteryl acetate, at least 10° higher. This difference in the melting point can be utilised to detect adulteration of the butter fat with any vegetable fats. This is determined by the Phytosteryl Acetate (P. A.) test. Gingelly oil is to be added to all Vanaspathi manufactured, to the extent of 5% and this fact can be utilised to detect the presence of Vanaspathi (Hydrogenated hardened vegetable oil) in butter fat or ghee by applying a specific chemical test called the "Baudouin Test" (B. T.) for detecting the presence of gingelly oil.

While the above tests and determinations are employed for testing the purity of butter, the freshness of the product can be ascertained only by the determination of the percentage of free fatty acids (F. F. A.). Old butter, due to putrefaction develops acidity and the presence of water soluble free fatty acids starting from C4 upwards and also their corresponding aldehydes are poisonous in their character. It is therefore considered that rancid butter is likely to be injurious to the health of human beings and hence an upper limit for the presence of free fatty acids in butter or ghee is to be prescribed. The development of acidity in butter is determined by the storage conditions and hence can easily be controlled. The villagers in Coimbatore and Salem districts keep the butter in a dry condition in mud pots and take care to see that all the buttermilk adhering to the butter is washed out thoroughly before storage, as they believe that the butter-milk or moisture develops rancidity. Rangappa and Banerjee (1948) have found that *desi* butter stored in butter milk changed every day was better than keeping it dry and acidity development was controlled. It was also found that storage of butter in dilute (0·8% solution) lactic acid solution however bestowed the longest keeping quality and produced good ghee with the least acidity.

Having discussed the various chemical values of butter fat and suggesting the same for the detection of adulteration, it is important to fix up the limits of the various values within which the pure cow or buffaloe butter or ghee would fluctuate. Various studies made throughout the world indicate that the composition of the cow or buffaloe milk fat varies according to (1) the breed of the animal (2) the season of the year (3) the care and treatment given to the animal (4) the stage of lactation of the animal (5) the degree of nourishment of the animal (6) the influence of disease (7) the effect of hormones (both internal and injected) (8) locality and (9) the kind of feed given to the animal. The method of preparation

of butter or ghee may be considered theoretically, to have some effect on the composition of butter. The R. M. is not affected either in clarification or on keeping. Hence Doctor *et al.* (1940) have concluded that the method of preparation has no appreciable effect on the chemical constants.

Standards have been fixed by the Government of India, to detect adulteration in ghee, under the prevention of Food adulteration Act 1954 and Rules 1955. The Government of India have also prescribed standards for grading ghee under "Agmark", taking into consideration, the limits within which genuine ghee components may vary normally. The following are the "Agmark" specifications, at present followed in Madras State, for grading ghee.

		Grade designation	
		Special	General
1.	Baudouin test	Negative	Negative
2.	Butyro-refractometer reading at 40°C.	40·0—43·0	40·0—43·0
3.	Reichert – Meissl Value	Not less than 26·0	Not less than 26·0
	(Samples showing R. M. value below 28 need not be subject to compulsory P. A. test in Madras and Andhra States. Instead at least 33% of the total samples analysed by any grading chemist shall be subjected to P. A. test in the States of Andhra and Madras).		
4.	Polenske value	1·0—2·0	1·0—2·0
5.	Moisture content	Not more than 0·3%	Not more than 0·3%
6.	Percentage of free fatty acids (as Oleic acid)	Not more than 1·4	Not more than 3·0

It would be seen that all the precautions have been taken to guarantee the purity of ghee graded under "Agmark" specifications of the Government of India,

To make available pure ghee to the consumers, some packers have been recognised by the Government of India to grade ghee, establishing ghee grading laboratories and appointing qualified approved chemists for analysing the ghee. The quality of the Agmark ghee is also checked by the staff of the marketing section of the Government of Madras. There are seven such recognised ghee grading laboratories in Madras State, as given below :

1. Messrs. Lingam and Co., Avanashi Road, Ghee grading station, Coimbatore.
2. Sri Venkateswara Laboratories, ghee grading station, Kattur, Coimbatore.

3. Messers. T. M. L. Angappa Chettiar, ghee grading station, Kangayam. via. Erode, Coimbatore district.
4. Messrs. R. K. Ganapathi Chettiar, ghee grading station Kangayam, Coimbatore district.
5. Messrs. Dhanalakshmi & Co., ghee grading station, Tirupur, Coimbatore district.
6. Messrs. Amarchand Gulabchand & Co., Sun ghee Laboratory and Refinery, Tirupur, Coimbatore district.
7. Messrs. Madurai ghee supplying Company and ghee grading Laboratory. 1, Chinnu Pillai Lane, Amman Sannadhi, Madurai.

The consumers of "Agmark" graded ghee are assured of purity. The flavour, texture and colour can be decided easily by the consumers. Hence, it is always advisible to purchase "Agmark" ghee.

REFERENCES

Trivedy, J. N., Maruthy, G. K. Kukada, S. M., and Dastur.	1948	Ind J. dairy Sci. 1, 69.
Sethna, K. and Bhat, J. V.	1950	Ind J. dairy Sci. 3, 39.
Plymen and Aiyer	1921	Mem. Dept. Agri. India - Chem. Series 6, 187.
Patel, M. D., Patel, B. M. and Dave, C. N.	1944	Ind. J. Vet. Sci. and Anim. Husb. 14, 97.
Rangappa and Banerjee	1948	Ind. J. dairy Sci. 1, 45.
Doctor, Banerjee, and Kothawalla	1940	Ind. J. Vet. Sci. and Anim. Husb. 10, 68.

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Announcement

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THE RAMASASTRULU MUNAGALA PRIZE, 1958

1. The prize will be awarded during the College Day and Conference in 1958.

2. The prize will be in the form of a medal and will be awarded to the member of the Union who submits the best account of research or enquiry, carried out by him on any agricultural subject.

3. The subject matter shall not exceed in length twelve foolscap pages, typewritten on one side.

4. Intending competitors should notify to the Secretary of the Madras Agricultural Students' Union with a covering letter giving the full name and address of the competitor. The author's name should not be shown on the paper, but should be entered as a *nom-de-plume*.

5. Four typewritten copies of the paper should be sent.

6. The name of the successful competitor will be announced and the prize awarded at the time of the College Day and Conference.

7. Paper or papers accepted will become the property of the Union, and the Union reserves to itself the right to publish all or any of the papers.

8. All references in the papers to published books, reports or papers by other workers must be acknowledged.

9. The last date for receipt of papers is 1st July 1958.

C. M. Bhakthavathsalu,
Secretary.

Edited and published by Dr. K. Ramakrishnan, B. Sc., (Hons.), Ph. D., for the Madras Agricultural Students' Union and printed by A. Subramaniam, at The Coimbatore Co-operative Printing Works, Ltd., Coimbatore.