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Editorial.

Review of the Work of the District Economic Councils. The Government have recently reviewed the work done by these councils during the quarter ending 31st December 1936. We are gratified to read there that 'the progress so far made is encouraging. The councils in most districts have completed or nearly completed the preliminaries necessary for starting work and a few councils have started some work.' We also note with satisfaction that during the period under review, a few councils have arranged for the training of persons in veterinary matters, in maternity and general rural reconstruction work, while many others have in addition carried out actual improvements in rural education, sanitation and water supply. It is also claimed that as a result of these endeavours, a desire to improve has been roused amongst the villagers—a really most encouraging feature for the future and a valuable *sinequanon* of the success of the present drive for rural uplift.

The Government have, while recognising the difficulties involved, stated that the villagers should be prepared to tax themselves if the improvements that have been initiated so far, and those that will be planned in the future were to prove to be of lasting benefit. While agreeing entirely to this useful dictum, we may state that the Indian ryot, with his age long traditions to contribute to the village funds for the maintenance of temples, festivities, and recreations, and for the repairs of tanks, wells and buildings, will quickly appreciate the justness of a levy for the continuance of beneficient activities of the present organisations. We wish however, to point out that advantage may be taken of the existing knowledge on the present position of these ancient village systems. In most villages these methods have fallen into disuse because of the loss of regard for the verdict and the experience of the village elders, and of the unwholesome increase of absentee landholders who generally take no interest in the village welfare. More important than either of these is the fact that the margin of savings from the agricultural incomes has become reduced to a nearly vanishing point.

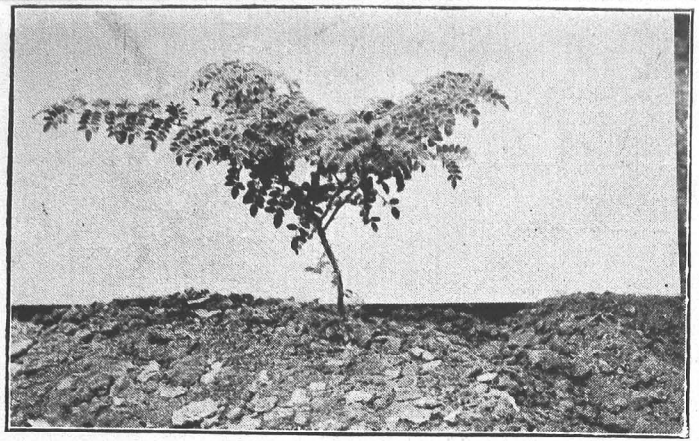
If therefore any levy were to meet with adequate response, it is essential that programmes that aim at increasing the income of the cultivator must be set on foot in preference to works in other directions. It appears to us that greater importance should be attached

to items like making of composts introduction of high yielding crop varieties, development of fruit cultivation and of bee and poultry keeping, improvement of marketing methods, and the encouragement of cottage industries. Apart from these, early and efficient arrangements will have to be made to stop the drain of wealth from the village to the courts and money-lenders. We are sure that when the villager begins to enjoy the fruits of these endeavours, he will only be too glad to subscribe and thus pave the way for further work. We are afraid that till that stage is reached, voluntary contribution will not flow on a scale we wish to have. We should suggest as an alternative that a tax on agricultural incomes in each village above a certain minimum may be thought of for the development of the much needed work of rural reconstruction.

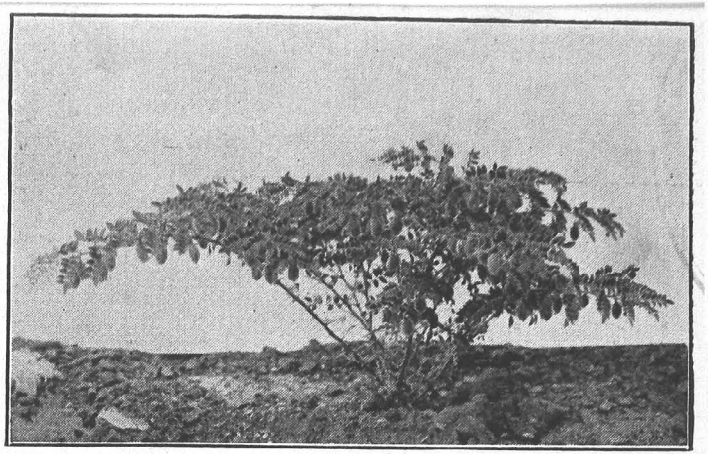
Training of farmers' sons in practical agriculture. In the July issue of this journal we referred to the Government's approval of a short course of training in practical agriculture to be given to 150 youths chosen from agricultural families. The scheme was primarily designed with a view to relieve unemployment amongst the educated and at the same time to direct their attention into activities which will be beneficial both to them and the country. It was therefore hoped that it would attract a large number of applicants.

We understand that the response from the above class had not been in some places as good as expected and that even those that turned up did not take kindly to the course. Among the several probable causes that may readily be ascribed to this turn of events, the more important appear to be that these men coming as they do with no experience of manual work, naturally evince certain disinclination to hard field work generally expected of tillers of soil. They moreover, do not seem to possess even rudimentary knowledge of the local conditions of crops or croppings and as such find it difficult to fit themselves up into the short course and to study intensively the aspects that will be useful to them later on their own farms. It seems to us that if greater stress were laid, at the time of selection of candidates for training, to the nature of agricultural experience they have had on their farms, this drawback would be easily got over and the success of the scheme would be better assured.

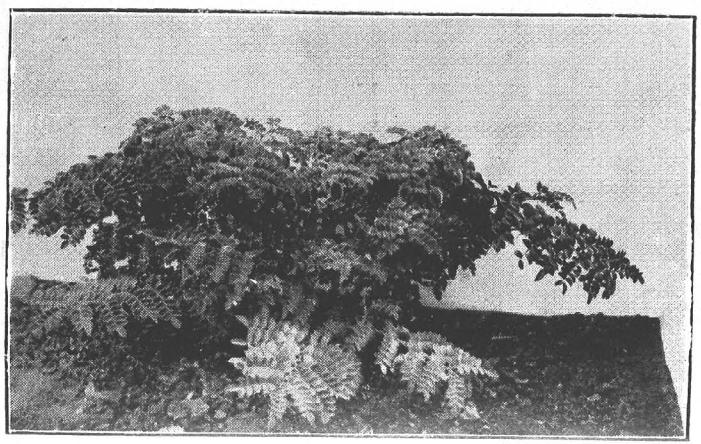
We would also urge in this connection that business aspect of farming has to be instilled in their minds at each stage of cultivation and that maintainence of complete costings of all operations and their later scrutiny are essential for their ultimate success. The students may in addition be made to visit, in company with the departmental officers, typical villages where high grade farming is practised. We feel sure that such visits will put them in personal contact with successful farmers and will create in them greater confidence and resourcefulness in their later life as agriculturists.



Strain 19



Strain 468



F. 1 of (19 × 468)

Plate I.

INHERITANCE OF BRANCHING HABIT IN GRAM (*CICER ARIETINUM*)

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Among the several types of gram (*Cicer arietinum*) raised on the Cotton Breeding Station, Coimbatore, two distinct differences in the method of branching were noticed. One type had no axillary branches till about the ninth node but had higher up strong laterals with the result that well developed plants assumed the form of an open umbrella. In the other, secondary branches occurred even from the ground level, which in their turn quickly developed equally strong tertiaries (Plate I). Both types were found to breed true. There was practically very little variation from season to season and when found, it was within narrow limits. The types isolated by the Economic Botanist, Pusa, generally exhibited greater branching tendencies as would be noted in the accompanying table against Pusa types T. 6 and T. 8.

With a view to study their mode of inheritance, the umbrella-shaped type (No. 19) isolated from the local variety was crossed with three strains with branching habit *viz.* one (No. 468) from the local and the other two (T. 6 and T. 8) from Pusa types. The F_1 plants showed dominance in the basal branching character. In the F_2 there was a clearcut segregation conforming to a simple monohybrid ratio (vide table on the reverse). It might be mentioned that in the case of the cross 468 × 19, the number of basal branches in each plant was not counted in the F_2. They were only classified into branching and non-branching categories. Their F_3 progenies were however, studied in greater detail; and the mode of behaviour was quite in agreement with the expected ratios confirming that only a single pair of factors was responsible for the differences noticed in their phenotypic expression. These were designated by the symbols Br-br.

The higher range noticed in the Pusa types seems to be influenced by modifying factors. These are being studied.

That habit in plants is controlled by a single pair of genes has been observed by Shull (1908) in *Helianthus annus* and by Abe' (1919) in *Sesamum indicum*. The data presented here form another instance along that line.

Reference.

Abe' (1919). Preliminary note on inheritance studies of some characters in *Sesamum indicum*. Bot. Abst. 3, pp. 303.

Shull, G. H. (1908). Some new cases of Mendelian inheritance. Bot. Gaz. 45, pp. 103.

The junior author is employed in the Madras Herbaceum Scheme financed by the Indian Central Cotton Committee, Bombay. Thanks are due to the Committee for permitting him to make these studies during the off season.

Table.

Parents.	Generation.	Parental branching habit.	Number of families studied.	Actual number of plants in									Total number of plants.	Expected ratio.	Value of P.
				Branched.								Non-branched.			
				No. of basal branches.							Total branched.				
				1	2	3	4	5	6	7					
19	...	...	...	...	...	...	...	...	...	...	...	30	30	...	...
T. 6	...	...	...	9	10	9	10	13	12	6	69	...	69	...	...
T 6 × 19	F_1	...	...	9	2	...	5	...	...	...	16	...	16	...	...
,,	F_2	Branched	10	152	162	63	12	5	1	1	396	142	538	3 : 1	>0·70
T. 8	...	...	...	11	13	7	6	10	6	10	63	...	63	...	...
T. 8 × 19	F_1	...	...	2	1	1	...	...	...	...	4	...	4	...	...
,,	F_2	Branched	4	69	73	43	4	4	...	...	193	65	258	3 : 1	>0·90
468	...	...	...	32	15	...	...	...	...	...	47	...	47	...	...
468 × 19	F_1	...	...	...	...	Not counted.			...	...	1	...	1	...	...
,,	F_2	Branched	1	...	...	Not counted.			...	...	72	27	99	3 : 1	>0·50
,,	F_3	,,	8	100	17	1	...	...	...	...	118	...	118	...	...
,,	F_3	,,	21	540	74	...	...	...	...	...	614	220	834	3 : 1	>0·30
,,	F_3	Non-branched	7	...	...	...	...	...	...	...	...	248	248	...	...

THE INHERITANCE OF HEIGHT *CUM* DURATION IN SORGHUM*

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In cereals, height and duration are important economic factors. Their mode of inheritance has been the subject of extensive studies. These factors are of special interest in sorghum in view of its great importance from the fodder point of view and especially since it is a cereal of dry tracts.

In maize there are several forms of dwarfishness, all of which proved monogenic recessives to the normal type (Matsuura, 1933). In wheat many instances of height segregations have been recorded, in most of which the dwarf forms were recessive to the normal (Matsuura, 1933). Winge (1924) has recorded the occurrence of dwarf types, some of which segregated into dwarfs and normals in the ratio of 3: 1, while other dwarfs gave a 1 : 1 ratio. "The results were not satisfactorily explained." In barley both dominant and recessive types of dwarfs have been met with and described (Matsuura, 1933). Parnell *et al* (1922), Akemine (1925), and Nagai (1926) have described dwarf rice plants which behaved as recessive to normal. Sugimoto (1923) reported a dominant type of dwarf plant. Ramiah (1933) observed that shortness may be a simple dominant to tallness or *vice versa*. The behaviour of the F_1s and F_2s in complicated cases strictly conforms to a Mendelian interpretation on multiple factor hypothesis.

As regards the time for maturing many instances have been reported on wheat, oats, and rice. In most cases the late maturing quality is dominant and is governed by two or more genes. However, Tschermak (Matsuura, 1933) observed that in wheat earliness was dominant in F_1 and obtained a complex segregation in F_2. Similar results were also reported by Nilsson-Ehle (Matsuura, 1933). Florrel (1924) has recorded an instance of dominance of earliness in heading period in F_1 and an F_2 segregation approximating 3 : 1, indicating one allelomorphic pair of factors, with possibly a number of minor modifying factors. Clark (1924) also has reported a similar experience. Aamodt (1927) obtained an F_2 ratio of 15 : 1 for early and late heading types in a cross between a late heading Marquis-Kanred hybrid with Marquis wheat. In rice,

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Hector (1922) obtained a clear monogenic ratio in F_2 of a cross between an early and a late veriety, earliness being recessive. Bhide (1926) also reported a similar experience. Ramiah (1933) observed that the inheritance of earliness in rice may be quite simple in some cases showing a single factor difference, and rather complicated in others, which could be explained only under the multiple factor hypothesis. As regards earliness and lateness, earliness is generally found to be dominant though a single case has been recorded where earliness was recessive.

Conner and Karper (1927) while pursuing hybrid vigour in sorghum studied inter-varietal and intra-varietal crosses between different height groups in feterita, kafir and milo. "The three inter-varietal crosses made were characterised by marked hybrid vigour both in F_1 and F_2, but the intra-varietal crosses showed no hybrid vigour. Crosses between Extra Dwarf milo and Standard milo gave the F_1 which was intermediate between the parental heights, and the F_2 distribution ranged from one extreme to the other. Extra Dwarf milo crossed with Dwarf milo showed increased height of plant in F_1. The difference between these two varieties was considered to be due to several genes, the increased height in the hybrid being probably an expression of two or more complementary genes for height. Crosses between Extra Dwarf feterita and Standard feterita displayed a monogenic difference between the parents, the tall variety dominating." (Matsuura, 1933). Later Karper (1932) obtained "tall" mutants in kafir as hybrids which gave simple segregations for tall and normal in the F_2, tall being dominant. The increase in height was considered to be entirely due to the elongation of the internodes and not due to increase in the number of nodes. Sieglinger (1932) reports that in crosses between Standard broom-corn and Western Dwarf or Whisk Dwarf, the F_1 was like the Standard parent, and the F_2 gave a simple monogenic segregation for Standard and Dwarf. But in a cross between the two Dwarf types, the F_1 was of the Standard type and the F_2 gave a di-hybrid segregation of 9 Standard to 3 Western Dwarf to 3 Whisk Dwarf to 1 Double Dwarf. Sieglinger (1933) obtained also a monohybrid segregation for normal and dwarf plants in the F_4 generation of a cross between Red kafir and Reed kafir. The dwarf type is considered as resulting from a mutation due to the loss of a single height factor from the normal. Except in height and head length, the normal and dwarf plants were very similar.

In this paper an experience in sorghum in which "short-early" plants proved simple dominants to "tall-late" plants is recorded (Rangaswami Ayyangar 1934 a, b). In the Kurnool area of the Madras Presidency, sorghum is sown in the month of September and harvested early in January. Varieties that are longer in duration than the local variety, *Patcha Jonna* (*Sorghum Durra* var. *mediocris*, Snowden), do

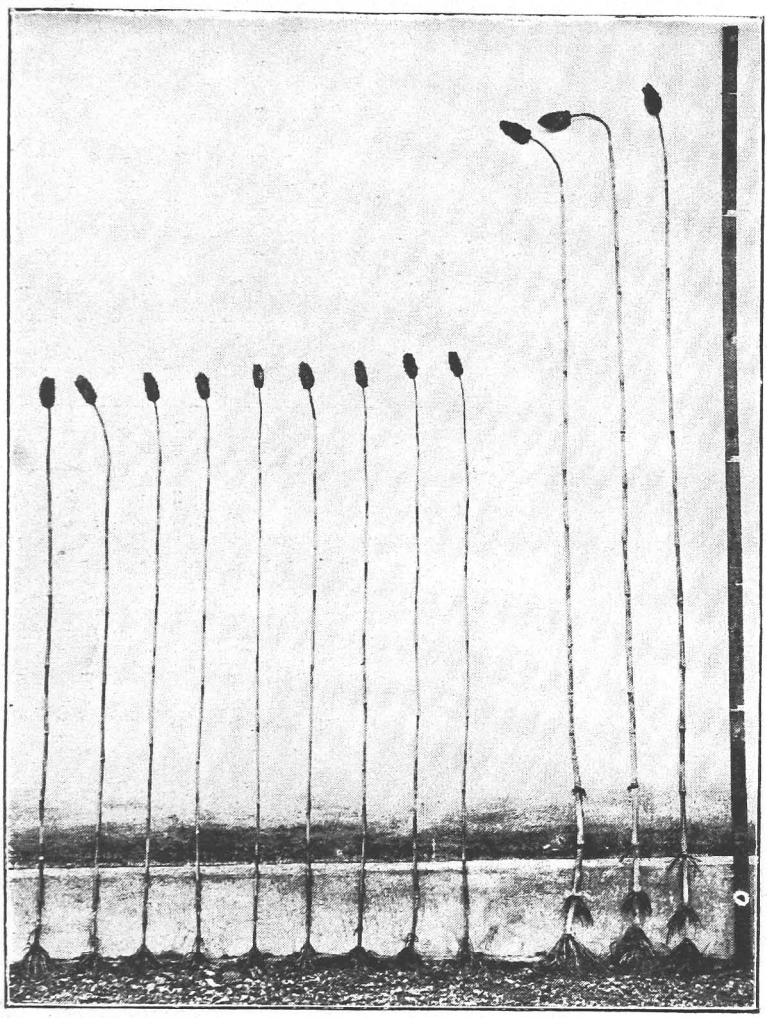


Fig 1. Segregation for Height *cum* Duration in Sorghum.

not fare well in that area. They remain leafy without heading. In a *Patcha jonna* selection (N. 29/15) grown at the Agricultural Research Station, Nandyal (Kurnool Dt.), in 1930, it was observed that out of a population of 130 plants, 95 were normal plants while 35 were rather tall, late, and un-headed at the time of harvest. Five ear-heads of the normal plants were taken over to Coimbatore and sown in August 1931. The subsequent behaviour of the progeny of these at Coimbatore is given in this paper. The August sowings at Coimbatore helped in bringing to maturity the "tall-late" plants that under Nandyal conditions could produce no earheads. This advantage of heading and seed setting was a great help in the pursuit of the character "tall-late."

By duration of a crop is generally meant the time for the crop to mature and be ready for harvest, from the time of its sowing. This duration can be divided into two parts: (1) the period of vegetative growth, and (2) the period of reproductive development. In dealing with duration, different writers adopt different indices, such as the first appearance of the earhead, complete emergence of the earhead, first opening of flowers, or complete maturity of the crop. In sorghum it was found that the duration, for comparative purposes, is best expressed in terms of the number of days from sowing to the flowering of the first spikelet on the earhead. This period can be recorded more accurately than other phases in the development of the plant, such as the appearance of the shoot, emergence of the earhead or ripening of grain. The height of plant was measured from ground level to the top of the earhead at maturity, rounded to the nearest multiple of 5 cm. The components of this height were gone into by recording internodal measurements.

Of the five earheads that were sown at Coimbatore, three proved pure for short-early and the other two segregated for short-early and tall-late. (See illustration and Table I.)

Table I.

Segregations for height and duration—F_3.

Family No.	Parental Character.	Progeny behaviour: Short — Early 120—220 cm. 69—79 days	Progeny behaviour: Tall — Late 190—300 cm. 85—98 days.	Value of P.
A. S. 631	Short-Early	93	32	
„ 634	„	88	21	
	Total	181	53	>0·30

It being now possible to secure seed from both the groups and to measure the heights of the tall-late group after heading, at harvest time, selections were carried forward from both the groups of these two families with the full complement of data on height and duration.

The F_4 was raised in 1932 and consisted of the following 24 selections (16 short-early and 8 tall-late) taken from both the families, A. S. 631 and A. S. 634. Of the 16 short-early selections sown, 10 segregated and 6 bred pure, while all the 8 tall-late selections sown, bred pure. The behaviour of the 24 selections is presented below :—

Table II.

Behaviour of F_4 Progeny.

a. Pure for Short-Early—(6 families).

A. S. 3140	A. S. 3145
,, 3141	,, 3150
,, 3142	,, 3151

b. Pure for Tall-Late—(8 families).

A. S. 3146	A. S. 3160
,, 3147	,, 3161
,, 3148	,, 3162
,, 3159	,, 3163

c. Segregating for Short-Early and Tall-Late—(10 families).

Family numbers.	Short-Early.	Tall-Late.	Unheaded and Sickly.
A. S. 3143; 3144; 3149; 3152; 3153; 3154; 3155; 3156; 3157; 3158,	840	226	108

It will be seen from the above that the short-early plants were a simple dominant to the tall-late plants, Owing to the newness of the introduction into Coimbatore, the long duration and excessive height, there were proportionately more casualities in the tall group, which accounts for the paucity of talls that flowered and ripened their earheads and whose duration and height could be recorded.

In Table III the height ranges and mean heights of the 6 shorts and 8 talls that bred pure are given. It will be noticed that there is a slight overlap in their height ranges. This overlap never obscures their separation as, "lateness" always helps in the determination of the shorter end of the talls.

Table III.

F_4 Selections from A. S. 631 and A. S. 634.
Range of Height in pure families.

Family numbers.	Height range cm.	Mean cm.
Pure short A. S. 3140; 3141; 3142; 3145; 3150; 3151;	100—240	175·1±0·6
Pure tall A. S. 3146; 3147; 3148; 3159; 3160; 3161; 3162; 3163.	190—375	296 1±0·8

In Table IV the height ranges of the 10 segregating families are recorded. The segregation is clear and the zone of overlap is guarded against with the help of the "late" part of the "tall-late" group.

Table IV.

Range of Height in segregating families in F_4.

Family numbers.	Height range in cm.		Mean cm.	
	Short.	Tall.	Short.	Tall.
A. S. 3143; 3144; 3149; 3152; 3153; 3154; 3155; 3156; 3157; 3158;	120—280	200—335	180·5±0·1	264·5±1·4

In Table V the ranges in the durations of the above 24 selections, both pure and segregating are given. The break in the durations is marked.

Table V.

Selections from A. S. 631 and A. S. 634.

Range in Durations.

Family numbers.	Duration range Days.		Mean duration Days.	
	Early.	Late.	Early.	Late.
Pure early A. S. 3140; 3141; 3142; 3145; 3150; 3151.	57—80	—	66·9±0·1	—
Pure late A. S. 3146; 3147; 3148; 3159; 3160; 3161; 3162; 3163.	—	90--119	--	100·6±0·1
Segregating A. S. 3143; 3144; 3149; 3152; 3153; 3154; 3155; 3156; 3157; 3158.	55—83	86--114	68·0±0·1	97·9±0·3

The early plants flowered from about 57 to 80 days after sowing. The late plants flowered between 90 and 119 days. In height, the short-early ranged from 100-240 cm. and the tall-late, 190-375 cm. The segregation was sharp, the combination of earliness with shortness and lateness with tallness gave, in the pursuit of each of these characters individually, a check on the other character, so that the accuracy of dates of flowering and measurements of height ran no risks in correct recording.

A fifth generation was raised by carrying forward 15 selections from family No. A. S. 3143. Of these 7 were tall-late and all of them

bred true. Of the 8 short-early selections 6 of them segregated again and two of them bred true for short-early. The segregations are given below:—

Table VI.

Segregation for Height *cum* Duration in F_5.

Family numbers.	Short-Early.	Tall-Late.	Unheaded and Sickly.
A. S. 3319; 3321; 3323; 3324; 3325; 3326.	812	266	16
Calculated 3:1	808·5	269·5	

It will be noticed that with greater acclimatization the number of tall-late plants is tending to show an increase there being a comparative absence of sickly unheaded plants. This late type probably mutational in origin, did not have optimum conditions for a healthy existence under Nandyal conditions.

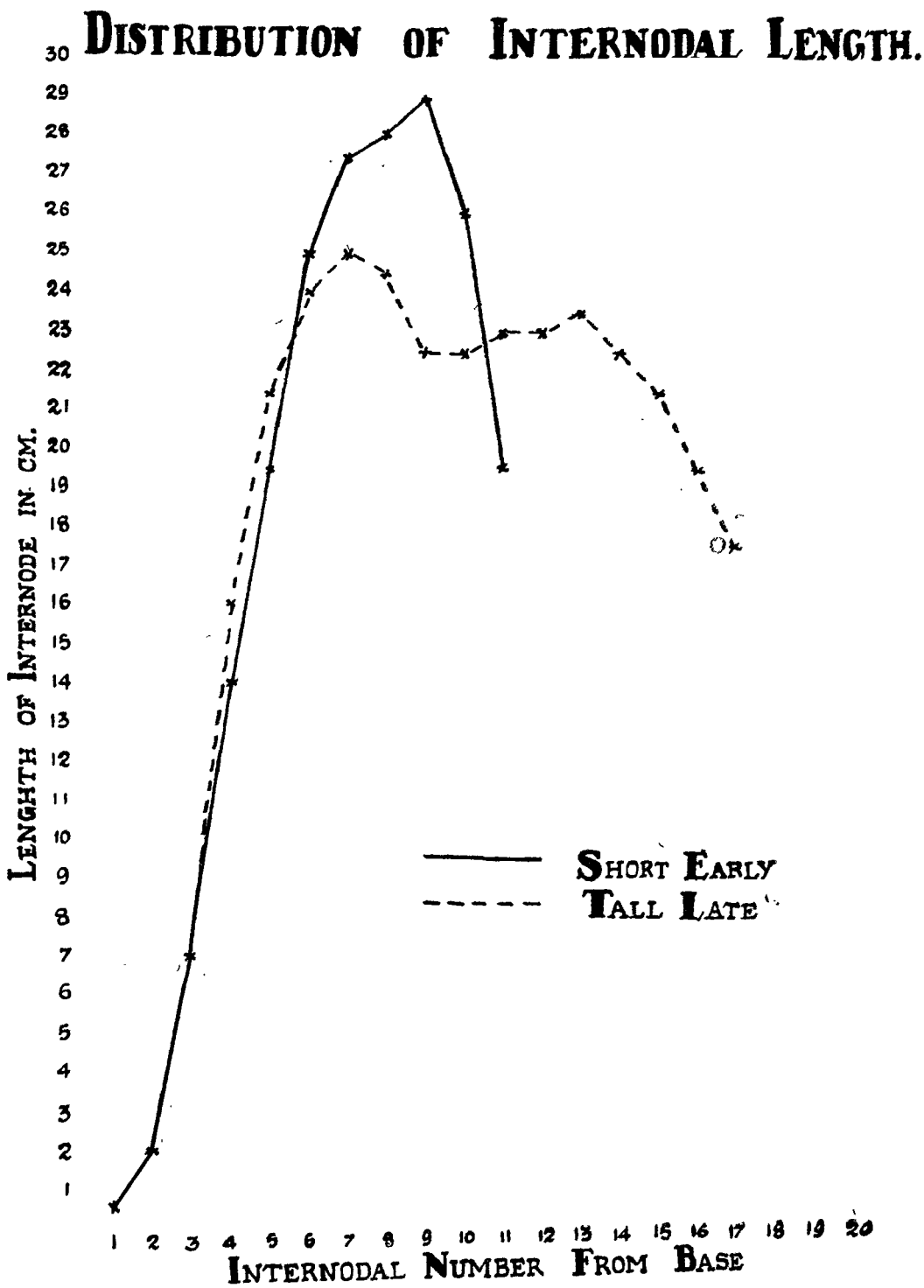
This close association of the character pairs 'short-early' and 'tall-late' led to the examination of the components constituting the more definite and closely pursuable characters, short and tall, with which duration is associated. It was noticed that the average number of internodes in the short-early was 10·6 (average of 3935 plants) and that in the tall-late, it was 16·7 (average of 2020 plants). The internodal number remained the same in both homozygous and heterozygous families.

Table VII.

Number of internodes in the selections from a family segregating for height and duration.

Selection numbers.	Internodal range Short.	Tall.
A, S. 3320; 3322.	7—13	—
A. S 3327; 3328; 3329; 3330; 3331; 3332; 3333.	—	12—22
A. S. 3319; 3321; 3323; 3324; 3325; 3326.	7—14	12--22

It will thus be noticed that tallness is the resultant of a definite increase in the *number* of internodes and not an increase in the length of each of the internodes. The length of individual internodes in each of the two groups was measured, and the trend of their lengths from the base upward is given in the following graph representing the average measurements on ten plants.


DISTRIBUTION OF INTERNODAL LENGTH.
LENGHTH OF INTERNODE IN CM.
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
SHORT EARLY
TALL LATE
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
INTERNODAL NUMBER FROM BASE

It will be seen from the above that in the short-early group there is a steady increase in the internodal length with a drop towards the approach of the reproductive phase. In the tall-late group, in the early stages there is a steady rise, followed by a slight decline in the middle of its life and then again another increase till in the final pre-heading stages there is the usual decline. This bi-modal disposition in internodal length is characteristic of most long duration varieties of grain sorghum in which the early growth under favourable conditions, the middle period of comparative constancy and the later period of a pull up find a response and adjustment in internodal growth. The internodal studies at the Millets Breeding Station (now being written up) reveal a similar trend in the many varieties under study.

It will thus be noticed that in ultimate analysis the phenomena recorded in this paper are virtually a segregation for two types of internodal number, one of which (short-early type) has an average of 10·6 internodes and the other (tall-late) an average of 16·7 internodes. In the former the distribution in length is uni-modal whereas in the latter it is bi-modal. The uni-modal internodal disposition goes with earliness and the bi-modal, with lateness. A single factor difference seems to determine the segregation between the character composite short-early and tall-late, differentiated from each other both in the number and in the disposition of internodal length. This factor is designated $\mathbf{In_1}$. $\mathbf{In_1}$ $\mathbf{In_1}$ produces short-early plants with a uni-modal disposition of internodal length; $\mathbf{in_1}$ $\mathbf{in_1}$ gives rise to plants that are tall-late with a greater number of internodes and their bi-modal disposition on the plant. $\mathbf{In_1}$ is a simple dominant to $\mathbf{in_1}$.

It is interesting to record the fact that the primary requisite for normal flowering, free heading and good yield in the single stalked big-headed grain sorghums, is general vigour. This vigour finds an expression in an increase of height and a corresponding increase in the number of internodes. In both the "shorts" and in the "talls", within the range of height and internodal number characteristic of each of the groups, the quick and early flowering plants are generally those that are characterised by vigour as represented by increases in general height. (Rangaswami Ayyangar *et al*, 1935). The following Tables show this tendency graphically.

Table VIII.

Short-Early Type—A. S. 3346. The earlier plants are the taller.

Height in cm.	Duration in Days. 63	64	65	66	67	68	69	70	71	72	73	74	75	76	77
175											1				
180															
185											1				
190															
195							2				1				
200										2			1	1	
205										1					1
210							1	1	2	3	1	2			
215							1		1	1				1	
220					1		6		1	4		1			1
225						3	4	1	2	1	1				
230						2	7	1	8	2	3	2			
235						1	2	3	4	3	3				
240						5	13	1	6	4	1				
245						2	6		12	3	3				
250				1		4	8	2	5	4	2				
255						3	7	1	3	1	2				
260				2		5	5		1	1					
265					2	6	3		7						
270		2		1	1	4	2	1	2	2					
275					5	5	1		1						
280		1			6	6	2		1						
285				2		2			1						
290		2			1	3	1								
295															
300		1			2	1									
305					1	2									
310				1	1		2		1						
315					1			1							
320					1		1								

Table IX.

Tall-Late Type—A. S. 3328. The earlier plants are the taller.

Height in cm.	Duration in Days. 88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
275																		
280																		
285																		
290																		
295																		
300															1			
305																		
310								1							1	1		
315					1												1	
320									1							1	1	
325										1		2						
330					1													
335											1		2	1	2			
340			1					1		1			1	2			1	
345				1	1			2	1	1		1		1	1			
350			1		2	1	1	1	1	1	2	1				1		
355				1	2	1			2	1		1		3			1	
360					3				3	4	2							
365	1			2	3	1	1	1	1	1	2	1	2			1		1
370			1	1	3		1		3								1	
375				3	4	3				1		3						
380		1		2		2	2	1	1			1			1			
385	1		2	3	3		1											
390				3		1	1		3	1								
395		1				1			1			1						
400											1			1				
405										1								

Height in cm.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122
275														1			
280																	
285	1																
290																	
295		1		1													
300			1														
305													1				
310		1			1		1										
315											1				1		
320		3					1								1		1
325		2	1				2						1			1	
330				1	2	1	1								1	1	
335	1						1										
340		1	1			1							1				
345		1			1	2	1							1			
350	1	1	1														
355		1											1				
360	1					1											
365																	
370																	
375			1														
380																	
385																	
390																	
395																	
400																	
405																	

It is interesting to note that the earlier plants are those that are taller and more vigorous and that the comparatively weaker ones lag behind in flowering. This fact explains why in this single stalked cereal a fine equipoise of favourable agronomic and environmental conditions from the time of sowing right up to harvest means a bumper crop and a disturbance in this optimum condition means famine. The grain sorghum is so big that if the main stalk gets a set back, the tillers never have a decent chance to pull up and replace the first head.

The impact between the definite tall-late with its pair short-early, giving a sharp segregation as between late and early, has not been without its effect on the composition of the short-early group. As has been experienced in such and similar quantitative characters, selections within the segregating groups, gave progenies which while being within the broad framework of the genetic group short-early, gave evidence of the existence of "shifts" (Engledow, 1923; Philiptschenko, 1927) the probable result of modifier genes. In Table X the behaviour of pure breeding short-early selections at various points in the height range is given.

Table X.

Pure Short-Early — Selections in the height range.

Selection No.	Character of Selection.		Progeny Behaviour			
	Height cm.	Duration Days.	Height in cm.		Duration in Days.	
			Range.	Mean.	Range.	Mean.
A. S. 3335	140	64	150—260	228 1±1·2	57—72	61·7±0·2
,, 3334	150	63	170—250	216·6±1·0	57—68	61·1±0·1
,, 3336	150	66	160—265	224·9±1·1	58—72	62 6±0·1
,, 3337	160	66	170—260	219 9±1·0	58—73	63 6±0·2
,, 3345	160	77	190—290	233·0±1·2	58—74	66·5±0·3
,, 3342	170	74	160—295	241·7±2·0	62—77	68·0±0·3
,, 3343	180	76	150—280	231·3±1·6	59—77	67·5±0·3
,, 3338	190	63	185—270	224·5±1·0	57—77	64·5±0·3
,, 3339	190	63	165—270	225·4±1·0	57—73	63·6±0·2
,, 3340	200	63	170—255	223 5±0 6	57—74	62·9±0·2
,, 3341	200	63	170—280	225·3±0 8	57—73	62·8±0·1
,, 3346	225	75	175—320	249 6±1·0	64—77	69·7±0·1
,, 3347	240	74	175—335	281 0±1·2	64—76	68·6±0·1
,, 3348	240	74	190—345	269·8±1·2	66—77	69·5±0·1
,, 3349	240	76	190—345	263·7±1·0	63—76	68·4±0·1

It will be seen that the progeny of selections taken at the taller end of the short group give a mean height in advance of the general height of the short group, thus enabling slightly taller early selections to be perpetuated. In the single stalked sorghum, as has been pointed already, a fine adjustment of environmental conditions is necessary for an optimum manifestation of height and vigour, and the pursuit of these fine "shifts" can obviously not be made in the tall-late group with its disadvantages in seed setting. The difficulties increase especially since in both the groups the earlier heading ones are more vigorous and give more normal plants whose height and duration

could be recorded without doubt, and whose seed is available for raising further progenies.

The effects of this segregation on the good earheads produced by the two genetic groups tall-late and short-early, were gone into. The average weight of earhead in the tall group was about 15 per cent more than in the short group. An analysis of a few earheads in each group showed, that in the tall group the average number of whorls was 10 as against 9 of the short group. The thickness of peduncle was 0·99 cm. in the tall plants and 0·78 in the short ones. The most noticeable difference was in the number of branches in each whorl. There was an average of 9 branches per whorl in the thicker peduncled tall plant as against the 6 of the comparatively thinner peduncled short plant.

In a number of families whose segregations have been recorded above, the midrib also was found to be segregating into white and dull-green signifying a segregation for juiciness of stalk, (Rangaswami Ayyangar, 1935 and Rangaswami Ayyangar *et al*, 1936). Cross collations between the factors **In**$_1$ and **D** (Pithy stalks) in families segregating for both the factors are given below and prove the independent inheritance of the two characters.

Table XI.

Segregation for Juiciness of Stalk and Height cum Duration.

Family No.	Stalk — Midrib	Short-early. Pithy White **In**$_1$**D**	Short-early. Juicy Dull **In**$_1$**D**	Tall-late. Pithy White **In**$_1$**D**	Tall-late. Juicy Dull **In**$_1$**D**
A. S. 634	... ...	69	19	15	6
3154	... ...	69	15	18	5
Total	... ...	138	34	33	11
Calculated 9:3:3:1	...	121·5	40·5	40·5	13·5

$x^2 = 5{\cdot}137$, $P > 0{\cdot}1$.

Summary. The inheritance of the character composite "short-early" and "tall-late" in sorghum has been pursued and set down to be due to differences in internodal number and disposition in length. In the short group there are about 10 internodes with a uni-modal distribution in length from the base upwards. In the tall group there are about 17 internodes showing a bi-modal disposition in length.

A factor **In**$_1$ is responsible for the production of fewer internodes with a uni-modal distribution in length, **in**$_1$ gives rise to a greater number of internodes and a bi-modal distribution of their lengths. **In**$_1$ is a simple dominant to **in**$_1$.

The "absorbing influence" of crossing is manifested in "shifts" that give in the short-early group, taller and slightly later plants, but conforming to the general grouping "short-early".

The earheads of the "tall-late" plants were heavier, had more whorls, and more number of branches in each whorl than the earheads of the "short-early" group.

Factor In_1 was independent of D the factor for pithy stalks.

Literature cited.

1. Aamodt, O. S. (1927) A study of growth habit and rust reaction in crosses between Marquis, Kota and Kanred Wheats. *Phytopath.* 17 : 573—609.
2. Akemine, M. (1925) On the inheritance of dwarf habits in rice (in Japanese) (Rep. Jap. Assoc. Adv. Sci.) 1:308—314. *(Abs. in Matsuura*, 1933.)
3. Bhide, R. K. (1926) Inheritance and correlation of certain characters in Rice crosses. *Poona Agri. Coll. Mag.* 18 : 76—85.
4. Clark, J. A. (1924) Segregation and correlated inheritance in crosses between Kota and Hard Federation wheats for rust and drought resistance. *J. Agri. Res.* 29 : 1—47.
5. Conner, A. B. and Karper, R. E. (1927) Hybrid vigour in Sorghum. *Texas Agri. Exp. Sta. Bull.* 359.
6. Engledow, F. L. (1923) The inheritance of glume length in a wheat cross. *J. Genet.* 13 : 79—100.
7. Florell, V. H. (1924) Studies on the inheritance of earliness in wheat. *J. Agri. Res* 29 : 333—347.
8. Hector, G. P. (1922) Ann. Rep. Dept. Agri. Bengal, India, 1921—22. (*Matsuura*, 1933).
9. Karper, R. E. (1932) A dominant mutation of frequent recurrence in sorghum. *Amer. Nat.* 66 : 511—529,
10. Matsuura, H. (1933) A Bibliographical Monograph on Plant Genetics, 1900—1929. *Hokkaido Imp. Univ., Sapporo, Japan.*
11. Nagai, I. (1926) Studies on the mutations in *Oryza sātiva*, L II. On awned sterile, compact panicled and dwarf mutants. *Jap. J. Bot.* 3 : 55—66.
12. Parnell, F. R., Rangaswami Ayyangar, G. N., Ramiah, K. and Srinivasa Ayyangar, C. R. (1922) The Inheritance of Characters in Rice. *Mem. Dept. Agri. India, Bot. Ser.* 11 : 185—208.
13. Philiptschencko, J. (1927) (On the absorbing influence of crossing.) Bull. Bur. Genet. Leningrad, No. 5. Translation by *Imp. Bur. Plant Genet., England.*
14. Ramiah, K. (1933) Inheritance of Flowering duration in rice, (2) Inheritance of height of plants in rice, (3) Genetic association between flowering duration and plant height and their relationship to other characters in rice. *Ind. J. Agri. Sci.* 3 : 377—459.
15. Rangaswami Ayyangar, G. N. (1934 a) Recent work on the Genetics of Millets in India. *Madras Agri. J.* 22 : 5.
16. Rangaswami Ayyangar, G. N. (1934 b.) *Rep. Agric. Stations, Madras Presidency*, 1932—33. *P.* 373.
17. Rangaswami Ayyangar, G. N. (1935) Juiciness and Sweetness in Sorghum Stalks. *Madrās Agri. J.* 23 : 350—352.
18. Rangaswami Ayyangar, G. N. *et. al.* (1935) Relation of Some Plant Characters to Yield in Sorghum. *Indian J. Agri. Sci.* 5 : 75—100.
19. Rangaswami Ayyangar, G. N. *et. al.* (1936) Mendelian Segregation for Juiciness and sweetness in Sorghum Stalks. *Madras Agri. J.* 24 : 247—248.
20. Sieglinger, J. B. (1932) Inheritance of height in broom corn. *J. Agri. Res.* 44 : 13—20.
21. Sieglinger, J. B. (1933) A dwarf mutation in kafir. *J. Hered.* 24 : 337—338.
22. Singe, O. (1924) Zytologische untersuchungen uber speltoide und andere Mutanten—ahnliche Aberranten beim Weizen. Hereditas 5 : 241—286. (*Abs in Matsuura*, 1933.)
23. Sugimoto, S. (1923) Some examples of the production of anomalous races in rice. (In Japanese) Jap. J. Gen. 2 : 71—75. (*Abs. in Matsuura*, 1933).

SOME OBSERVATIONS ON SPHACELIA Spp. OCCURRING IN COIMBATORE

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Sphacelia represents the imperfect stage of the well known ergot fungus (*Claviceps spp.*). One species, *Claviceps purpurea*, invariably attacks rye grains and occasionally wheat and rye grasses (*Lolium* spp.) replacing the normal grain by a dark elongated sclerotium. This sclerotium is known as the ergot and though used in medicine is poisonous to both man and cattle. There are several species of Claviceps recorded on different grasses and *Juncus* spp. from Europe and America. The sphacelial stage has been observed on sorghum in several parts of India and Africa, on *Pennisetum typhoides* in Tanganyaka, on *Andropogon caricosus* var. *molicomus*, *A. annulatus*, *Pennisetum alopecuros* and *Ischaemum pilosum* in the Bombay Presidency. Ergot sclerotia were noted on *Pennisetum alopecuros* in India. The following are some of the observations made on Sphacelia affecting sorghum and *Panicum ramosum* in Coimbatore.

On sorghum the fungus causes what is commonly known as the 'sugary disease'. Ajrekar has recorded this from different parts of the Bombay Presidency, but the observations were confined to the black soil tracts. In Madras it has been observed in and around Coimbatore almost every year during the months of November and December, more of the disease being noticed in the latter month. It has been recorded from Koilpatti also but no attempt has been made to find out its distribution. The disease is more in the later sown crops.

The infection is said to be mostly in the flower stage and that when once the grains have passed the milk stage no further spread of the disease occurs. This is borne out by field observations also. The cold weather crop is often in the vulnerable stage during November or December depending on the time of sowing, the later the sowing the greater the disease. Even in early sown crops sometimes branches are produced which bear heads. These being later formed show more of the disease than the main heads. The disease is sometimes observed in January also when the crop is retained in the field and side branches bearing panicles are developed. The disease rarely occurs in the summer crop. Most of the varieties are affected. In all cases increased humidity and heavy rains favour the appearance and spread of the disease.

It is characterised by the formation of a big pearly turbid drop of sticky fluid, sweet to the taste and held between the outer glumes of the spikelets, here and there in the panicle. These fall on the leaves

and the soil causing a number of white spots on the ground all round the plant. The drops contain large numbers of conidia. The ovary alone appears to be infected and this is enveloped in a whitish mass of fungal hyphae which penetrate into the tissues also. When an infected panicle is dried, the diseased spikelets show a whitish oblong body between the glumes which on dissection is found to consist of a mass of hyphae and the surface is thrown into a number of ridges and furrows with closely packed conidiophores. The inner portion is of a honey coloured semisolid consistency. The dried up anthers and styles often project from the apex. In moist weather other fungi overgrow this whitish mass. No regular sclerotia as in *Claviceps* have been found in sorghum.

The conidia are hyaline, oblong or oval with rounded ends and produced in very large members, the drop of liquid formed in the spikelet being a highly concentrated suspension of spores. These germinate readily in water, the process starting in the course of four hours under laboratory conditions. By the next day secondary conidia are formed one from each conidium. The germ tube is given off from the extremities or the sides; and at its end an oval secondary conidium is produced. Ajrekar was not able to get secondary conidia but in Coimbatore these are formed readily. The spores were placed for germination in drops of water on slides. Those along the margin and those floating alone germinated; while others which were submerged did not germinate at all, probably due to lack of oxygen. Beyond the formation of secondary conidia further growth did not take place. The spores were plated in Richard's agar. The submerged spores did not germinate and no growth formation was noticeable. Spores were transferred to the sides of agar slants in test-tubes. In these the germination of the spores and formation of secondary conidia could be observed but further growth did not take place.

During November 1932 some plants of *Panicum ramosum* in the Millets Breeding Station showed a similar sugary disease. Here too whitish drops of a sticky sweet fluid were noticed protruding from several of the spikelets in the panicle and these contained numerous spores.

The drops dry up quickly when the panicles are cut and brought to the laboratory and form whitish crusts in and over the spikelets. The glumes are unaffected. The ovary is more or less replaced by a whitish mass projecting from between the fourth glume and its palea and a portion of this is spread over the other glumes also. The conidia are quite different in shape from those of the sorghum fungus. They are hyaline, falcate or sickle-shaped with more or less pointed ends, one-celled and measure $19{\cdot}8 \times 5{\cdot}8\,\mu$ the range being $14{\cdot}6 - 29{\cdot}2 \times 4{\cdot}4 - 7{\cdot}3\,\mu$.

They germinate readily in water and in 15 hours, long germ tubes with several short branches are formed. Such branches are not

noticed in the sorghum fungus. Secondary conidia are developed at the apices of the germ tubes in some cases, one on each germ tube. The behaviour of the fungus on solid media is similar to that of the fungus on sorghum.

The species of Sphacelia found on *Panicum ramosum* appears to be different from *Sphacelia Sorghi* McRae on sorghum. Ajrekar states that the spores of Sphacelia on *Ischaemum pilosum* were slightly curved, but in the absence of sketches and other details it is not possible to say whether the spores on *P. ramosum* resemble those recorded by Ajrekar. It was not possible to continue the observations on this host since its cultivation was given up at the Millets Breeding Station. So far as the author knows this is the first record of the fungus on this host.

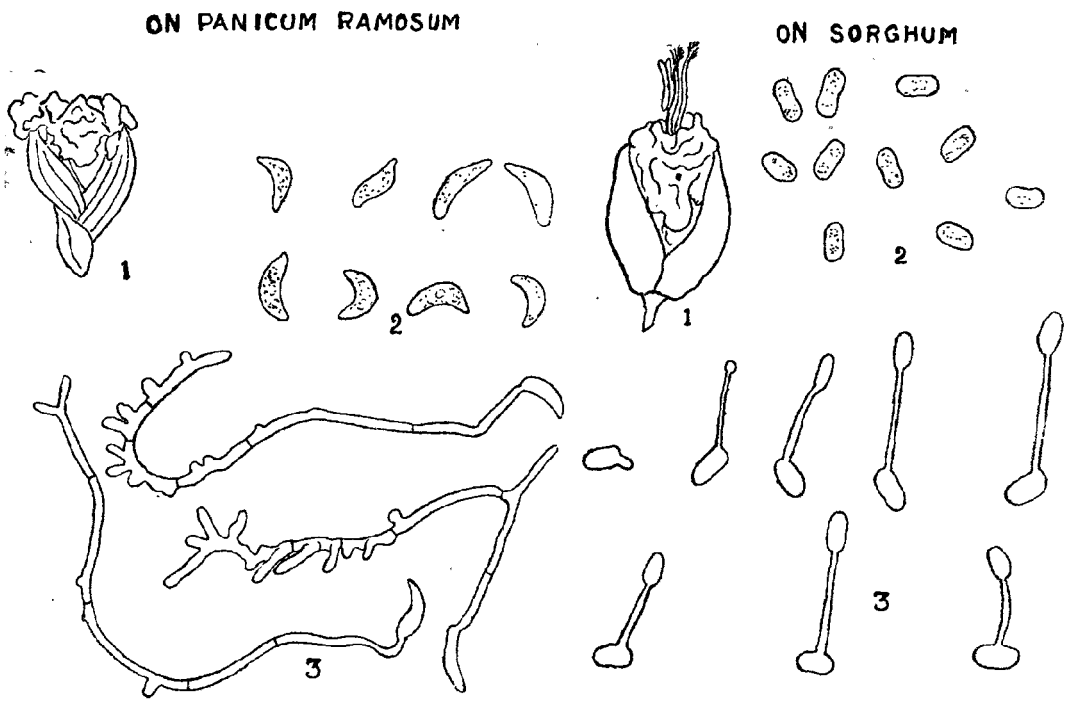
Reference.

Ajrekar, S. L. *Journal of the Indian Botanical Society*, 2, 55—61. 1926.

McRae, W. Notes on some South Indian Fungi. Year book of *Mad. Agri. Dept.* 108, 1917.

Ritchie, A. H. Entomological Report, 1925-26. *Abs. Rev. App. Myc.*, VI, 398.

Uppal, B. N. *et al.* Bull. 176, 1934. *Bombay Dept. Agri.*



Explanation of diagrams.

1. Diseased spikelet (dry).
2. Conidia (× 450).
3. Germinating conidia.

EXTRACT

The Indian Village—Its past, present and future. Extract of the address delivered by Rao Bahadur T. S. Venkataraman, B.A., I. A. S., F. N. I., *General President of the Twenty-fourth Indian Science Congress, 1937.*

No apology is needed in these days for talking about any aspect of 'village and village life'. The city and the town which were holding a complete thraldom over the public mind all these years are losing their glamour somewhat in spite of their admittedly alluring attractions, and the 'village' would appear to be getting increasing recognition, particularly in our country and in recent times.

India is situated in a comparatively densely populated area of the globe—about half the population of the world being crowded into a tenth of the earth's land region. This has had its effects on the type of agriculture practised in the country, the selection of crop for cultivation and the life of the people as a whole.

India also possesses a civilization and culture which was at least contemporaneous with, if not antecedent to, the civilization of Egypt, Mesopotamia, Greece, and Rome. After making considerable progress this civilization has, however, remained in a more or less quiescent and pertified state in our villages for well nigh two to three thousand years, little influenced by the great progress made by the West during the latter part of the same period. It is only within comparatively recent times that the Western civilization has come to spread into and influence, the country side.

The Aryan colonists on entering India found plenty of land to settle in, and the obvious advantages of group formation brought into being two main types of villages. One was the type similar to what is now termed 'ryotwari' where each family or group of persons took up as much land as they could cultivate depending on the number of cattle and able bodied men in the unit. Site for the village was chosen at some convenient spot such as the banks of a river or canal or proximity to other sources of water supply. The persons constituting the village chose a Headman who exercised all powers on behalf of the whole community. This type of village was generally associated with peaceful conditions.

The other type called 'Joint village' by Baden Powell, was founded by powerful families or class not necessarily agriculturalists. The government of such village was by the well known Panchayat system and occasionally a group of such villages belonged to the same clan or owed some kind of allegiance to the same warrior chieftain in return for the protection they enjoyed at his hands. In these villages the cultivating classes were sometimes in the position of tenants. 'Ryotwari' village sometimes got converted into 'Joint villages' through conquest by some warrior chieftain.

The village of South India would appear to have attained a high degree of perfection absolutely unaffected by Aryan influence from the North, so much so that certain authorities hold that some of the Aryan village institutions were copies of the Dravidian.

The headman was an important officer in village government. His office was hereditary and apparently a vestige of the ancient village chief. He was remunerated by grant of inalienable right to certain lands and later by being allowed to collect and utilize certain taxes from the villagers.

He was assisted by and later on effectively controlled by the village panchayat. This was a *council of elders not elected* and more or less self consituted from

the elders of the village who naturally and easily commanded the respect of the villagers. Justice was dispensed in the village temple and an oath before the local deity was potent in preventing persons from bearing false witness. The panchayatdars also knew the parties almost personally and were thus able to dispense quicker justice. The panchayat administered the village funds and thus commanded facilities for catering to village needs.

The village was practically autonomous and once the tax from the village as a whole was paid it had little to do with the central government and was not affected by change of dynasties. Taxes were levied for communal purposes as distinct from those by the emperor; and there was a common village fund which entertained the village guests, provided for the indigent and arranged for recreations, shows and performances of acrobatic and jugglery feats. The temple, the village tank, the guest house as well as other public utility concerns had a claim on this common fund. The central government helped in cases where works of common utility were beyond the capacities of the village. This help was given either by the waiving of certain Imperial taxes or by contributions in kind. The tax was sometimes levied in the form of manual labour and this is responsible for the huge and elaborate temples found in S. India. Occasionally also loans were raised by mortgaging the revenues of the village for definite periods.

There was not much sanitation in the modern sense of the word and no scavenging. Regular sweeping of the village streets was not common and the watchman who was responsible for sanitation thought his duty done when he pulled any carcass out of the streets. Diseases were naturally few on account of the healthier open life and there was no organised medical relief. The kitchen store contained most requisites for common ailments and the elders generally knew a few simple remedies from experience. The science of healing was, however, well advanced for the then conditions and comparatively cheap being based on easily available herbs and both metallic and organic compounds. The streets were broad. Each caste which persued its own profession lived in separate parts of the village and it was surrounded by a common and free grazing ground. The land during the Hindu period did not belong to the king but to the people who occupied it; hence, perhaps, the traditional and great attachment to landed property which still exists.

Fach village had a class of artisans who were hereditary and being non-cultivating were given definite shares of grains at harvest. In return for this the farmer was entitled to the services of the artisans both for his household and agricultural needs. Most villages had a school teacher who was maintained by voluntary presents from the parents of the children attending his school.

The village grew all the crops required to meet all its simple needs and the surplus of good ears was stored in the village granaries as a provision against future unfavourable seasons. Land was plenty, needs few and there was a great deal of contentment. The villager's outlook and knowledge were limited rarely extending beyond the confines of his own village. This had been the condition for well nigh two to three thousand years.

During this same period the West, on the other hand was rapidly evolving itself from a condition even more primitive than that of the Indian village to that of modern times. Various inventions and discoveries had enabled man to gain partial mastery over his environment and both time and space had been largely conquered.

Life has now become more complicated in all directions. The code of conduct which formerly was regulated by the simple ten commandments, has now to be regulated by a whole army of learned lawyers and the ever growing volumes of law books One very important result of the contact with the West has been the

development of the export and import trades which have affected profoundly the kind of crops grown and both the occupation and mode of the life of the villager. It steadily dragged him out of his isolation and threw him into the world currents of commerce and industry. Economics of the village was upset. The more enterprising and intelligent of the villagers are attracted by the commercial life and tended to shift themselves to the nearest town or city temporarily in the beginning but often permanently in the end. It is no wonder that such great changes have brought in their train a variety of problems.

One out-standing feature connected with Indian agriculture of the present day is its great dependence on the monsoons. Any one who has had to do with crop growing will realise how erratic the monsoons are both in time and quantity of precipitation. The unevenness and uncertainty of results in spite of his best efforts in the matter of cultivation and selection of seed, caused by factors beyond his control—such as drought, floods, and cyclones—render the agricultural income of the villager unsteady and uncertain. Secondly the villager is so little in touch with world markets wherein the results of his labours are evaluated and sold, that a large portion of his profits is intercepted by the intermediate agencies that market his produce. This is why the increase in the export trade has had comparatively little effect on the prosperity of the village as such. Thirdly, land available for crop growing has not increased to the same extent as increase in population. True some new lands have been brought under the plough and yeilds from existing lands have increased somewhat, but such increase is much less than the increase in population. The prevailing sentiments, both social and religious, that directly encourage large numbers of children were definitely needed in the olden days of plenty of land and low population. These are obvious misfits at the present time when conditions are just the reverse. Fourthly possibility of large augmentation in acre production is severely handicapped by a variety of causes such as subdivision and fragmentation of holdings and the prevalence of rigid social customs and religious sentiments which cause the waste of such valuable manures as night soil and cattle dung and adversely affect the business aspect of agricultural production.

* * * * * The continuous subdivision of lands has been a long standing feature and in certain parts has reached a considerable degree of fineness. It has gone so far as to divide the waters of a well each sharer being entitled to so many hours of lifting water from it. The Indian is, however, so much attached to his land be it small, and unremunerative, that he continues to own it if not forced out by other circumstances. Its possesion is not always considered as a business proposition but as necessary for status. This leads to the evil of absentee-landlordism. This state of affairs rules out large scale operations by outside capitalists who have the resources for up-to-date agricultural methods generally beyond the reach of the average cultivator. Another disadvantage is that it precludes fencing of the property, a valuable aid in raising agricultural efficiency. It also leads to constant and unavoidable disputes resulting from these long and irregular boundaries.

Further India is unique in possessing an enormous amount of cattle without making profit from its slaughter. The old and the weak are allowed to deplete the fodder stock of the village with the result that the fitter and hence the more useful ones do not get their due share. Cattle maintenance is not looked upon as a business proposition and the sentiment towards them is too deep seated for a rapid change.

With regard to village labour it may be stated that at certain periods, a large force of labour is needed and there is no demand during other parts of the year. This is particularly the case where the bulk of the area in the village is under the same crop. In the absence of work and hence wages all the year round, the

labour migrates to other places with the result that at the time of peak demand there is labour scarcity.

The villager is being made increasingly aware of the changes around by the extension into the village of such symbols of modern life as the post and telegraph, the bicycle and the motor bus. Economically he finds himself in a very disadvantageous position owing to his steadily diminishing agricultural income in contrast with increasing expenditure due to changes in living even in his own household. Innovations in dress and habits and new wants like tea and coffee are steadily forcing up family expenses. While the community life of interdependance has ceased to exist, the medieval social structure like the joint family system still persists rendering the villager's life unbalanced. Extra profits from an exceptionally good year are more often wasted in urbanizing his surroundings than being put by as reserve against lean years. Expenses on marriages and funerals are other sudden items of expenditure. The margin of extra income is so narrow that the loss of a buffalo or the long illness of the working member in the family is known to drop the villager down in the social scale sometimes never to recover to his original position. The only security he can offer against such debts is the land, his only possession in this world, and once pledged he finds it difficult to redeem it.

It may be remarked here that one common complaint laid at the door of the Indian by others and of the villager by the towns-men is what is termed 'low standard of life'. There exists, however, considerable confusion as to what the term really means and though it is but vaguely understood, it is nevertheless readily resorted to, when there is no room for sound and logical reasoning. To put it briefly and in easy language a higher standard of life may be defined to consist in getting more out of life's opportunities to the advantage of both the individual and his society. A rise in the standard of living must add to the productive efficiency of the individual or it is no HIGHER though it may be a DIFFERENT standard. All real progress and civilization are interpretable only on this basis. But when a townsman, weak in physique through wrong and unsanitary living, with a diversity of unnecessary and unhealthy wants and unnecessarily and perhaps also harmfully dressed, talks of his higher standard it is an obvious misapplication of the term. It is a case of a more EXPENSIVE and not HIGHER standard of life. A healthy cultured villager with his fewer and simpler needs but greater depth of character is easily the superior.

The merchant, with his desire, for commerce has a tendency to synonymise 'higher standard' with 'increased wants and greater purchasing power'. While an increase in wants as the result of a fuller life—such as books, works of art or facilities for quicker locomotion—does represent a higher standard, it ceases to be such when the increased wants are unnecessary, wasteful or harmful to the individual or society.

The most serious of the unfavourable changes coming over our village is the steadily increasing exodus of people from the village to the town. One main reason for exodus is the growing inadequacy of agricultural income not supplemented by income from other sources. A second reason is the shifting of main activities of life to the town. Educational facilities and other urban conveniences are increasingly attracting the villagers to the town. When the person has lived in the town for sometime, he often develops a dislike for village life with its limited comforts

The rapid increase of population in our country and China has become a byword and this renders incumbent a further increase of agricultural production. Science has so far not succeeded in growing crops on the roofs of houses or on road sides in towns and the best achievements of agriculture have been in the

country side. The clearly indicated line of advance for the future, therefore, lies in improving rural conditions and rendering our villages better and more efficient in the discharge of duties set to them by the country as whole, viz. (1) the proper and adequate feeding of the steadily increasing population, and (2) rearing a healthy stock of men and cattle and maintaining them in a fit condition. Both town and village are needed for the full and complete development of our country as a whole. But each has certain specific advantages and inevitable defects. In crop growing, when one comes across two types both of which possess desirable characters, the crop servant—called the breeder—tries to raise hybrids between them for producing kinds which might combine in themselves the good points of both and eliminating as far as possible the defects of either. A similar procedure is indicated between the town and the village and such a process is already in progress and it is desirable to speed it by conscious endeavour. * * * *

As the efficiency of any programme of rural improvement depends primarily on the chief agent in it, the villager, it is important to consider means for increasing his efficiency. If we compare the villager with the townsman, one point in which the latter often scores over the villager is his literacy if not always his education. Though it is true that the village teacher did exist in the olden days and atleast certain classes of the population received some kind of school and even higher education and though there is evidence that reputed universities did occasionally flourish in certain rural parts, regular schooling and education were not considered essential. Education given in the village school should obviously possess the rural and agricultural outlook and be vitally linked with the every day life of the village. Nature study lessons fit in well with the agricultural life of the villager and I have often wondered why the village vacations should be timed to the conveniences of metropolitan examinations rather than to the busiest agricultural seasons in the village when the boys could perhaps help their parents in the field and gain first hand knowledge of subjects taught in the school room. A second characteristic of the villager as contrasted with the townsman is often the slower moving intellect of the former. The linking up of villages with towns and other villages through better communication facilities, will remedy the situation. Yet another common defect of the villager is the lack of so called 'business' habits and 'business' mentality. This again is due to his environment and tradition. Nature's processes with which the village agriculturalist is primarily concerned do not generally need the punctuality of the man of business or commerce. The absence of insurance measures in our villages as in Denmark and Switzerland against crop failures and cattle epedemics, which are by no means uncommon, is largely attributable to the absence of education and business outlook. The villager's income would be both enhanced and rendered steadier by the import of the 'business' mentality into his activities such as agriculture and cattle maintenance. The villager's outlook on the world is often narrow because of the isolation and the absence of literacy. Whether he likes or not, the villager is being dragged into the world currents of commerce and industry and his horizon needs to be broadened by education.

In this study of the Indian village, the villager and village life, we have frequently noticed the need and advantages of industrializing the village. We have found that industries are desirable in the village to find employment for the people all through the year, to stabilize labour, to tone up the villager in various directions and to supplement and steady his income. The large scale industries, which have developed in the country have helped the villager but little. On the other hand, they have adversely affected the village tending to draw labour and brains away from the village. What is needed is the establishment

of cottage industries in the village itself so as to improve the conditions for living in it.

It is obvious that the closer such industries are linked up with agriculture and agricultural products the better they would fit in with village economics. Cattle being an important adjunct of agriculture, industries like cattle breeding and production of milk and milk products at once suggest themselves. Bee keeping, poultry breeding, fruit growing and canning and preparation of tinned and infant foods for the benefit of the townsman would fit in well into the village. Other suitable industries would be the partial preparation of manufactured products in the village itself as a rural industry. Cotton ginneries, seed decorticators and oil presses belong to this group. Minor industries connected with products or articles available in the village or vicinity, such as coconut industry on the West Coast and fish curing in seashore villages, help to keep the villages prosperous. Other handicrafts and domestic industries, where the needed material is imported from outside and worked in the village during the off-seasons, include weaving, dyeing and the manufacture of toys and trinkets. The mechanical efficiency obtained in the village as the result of such rural industries gives the village a 'maistry' class who should prove increasingly useful in the repairs and upkeep of farm machinery and water lifting pumps which are spreading in the country.

The purchase and sale of articles connected with cottage industries, need grouping together through co-operative organizations for best results.

As a class our villages lack the conveniences and amenities of urban life, convenience like means for rapid transport, the post and telegraph, the newspaper and the ever increasing improvements associated with the development of electricity are major blessings which it is desirable should be extended to the villages as quickly and as completely as possible. It is the absence of these in our couutry side that it is partly responsible for the prevailing distaste to village life. The village is easily healthier than the town in such important factors as pure air and open spaces and if only certain urban facilities are implanted in the village, its attractions for settlement should prove irresistible.

The general tendency for retired government officials not to return to the village but settle in a nearby town has struck me as unfortunate and is indicative of the general trend. While in certain cases perhaps the decision might be due to urban educational facilities, there is little doubt that the general unattractiveness of village life also enters into the decision. For permanent results the urge for rural improvement should be implanted in the village itself. This could be achieved only by improving the chief natural agent in such work--viz. the villager—and making it attractive for him to live and have his being in the village itself.

To sum up, there is little doubt that the villages of old were more populated than they are today largely because of conditions prevalent at the time. Those conditions will never return however much or sincerely we may hanker after them. The town and the characteristics associated with urban life are definite products in the march of events and need to be accepted as such. Though there are drawbacks associated with urban life the town has its own good points which need extension into the village to keep rural life in tune with the changes around us. At the same time the countryside has advantages like open spaces and absence of congestion which can never be reproduced in the town.

Life activities that were village centres in the past are increasingly getting town centred to the disadvantage of the former. In the interest of the country as a whole, relationship of mutual help need to be estabished between the two. The town should extend to the village its greater knowledge, quicker living and

manifold amenities of the modern age. Contributions from the countryside are of equal importance. It alone can produce the raw materials of commerce and industry and thus help in the growth of towns and cities. It alone can supply adequate and wholesome food to the millions of our land whether resident in the village or town. Lastly, the countryside alone can imbue the urban 'business' civilization with the deeper character and larger humanities which are nurtured in the villager through his more direct and constant contact with the great forces of Nature and of life. Our duty then is clear: namely, to improve the *Village*, the nucleus of our country life and infect its Chief Agent, the *Villager*, with a chosen culture of the virus of modern age through *Education* and *Industrialization*.

Agricultural Fottings

BY THE DEPARTMENT OF AGRICULTURE, MADRAS

A Superior Groundnut Variety. Improved crops mean more money for the ryots.

The Government Agricultural Research Station at Tindivanam, South Arcot District, is almost entirely devoted to the improvement of oil seed crops, on which intensive breeding and selection work has been carried on during the last six years.

The most important among the oil seed crops of the Madras Presidency is the groundnut with an annual acreage of about two and a half millions or roughly about 50% of the area in the whole of India, and the produce of Madras alone is worth about 150 million rupees. With a view to obtain the most profitable varieties for South India nearly a hundred varieties from the various groundnut growing regions of the world have been carefully tested at the Agricultural Research Station, Tindivanam during the last six years.

Saloum or A. H. 25, a selection from one of the African varieties, has proved to be superior to all the other spreading or the runner varieties, under South Indian conditions. The duration is nearly 135 days; the increase in yield over the local variety commonly grown has been as high as 20% to 30% in parts of Nellore, Guntur, North Arcot, South Arcot, Salem, Trichinopoly and Madura Districts. Besides being a high yielder, the variety is superior to others in that it is more drought resistant and is, therefore, well suited to be grown under rainfed conditions, particularly in areas of low rainfall. The smooth and cylindrical nature of the pods facilitates easy harvest of plants with most of the pods in tact. It has another desirable quality, namely bold kernels, which is valued in the market. This new variety is not intended for the irrigated season for which the local variety is preferable.

Though the variety was first made available to the ryots only three years ago, it has found favour with the groundnut growers of the Presidency and the demand for the supply of seed has considerably increased. The reason why the area under the improved variety is not more than what it is at present, is due to the fact that sufficient supply of seed is not available, on account of low multiplication of seed: unlike small grained crops, in groundnut, the yield is only about twelve times as much as the seed rate. As it is not possible to supply all the seed that is in demand for sowing, groundnut growers who have been raising the improved variety will do well to utilise all the produce entirely for sowing purposes.

It may be added that the correct seed rate for the rainfed crop on red soils is about 60 lb. of kernels per acre.

Maize as fodder. It is well known that cattle would relish some sort of green fodder at any time during the year particularly so in summer. Every good farmer is, therefore, bound to provide his working animals with at least small quantities of succulent food. The material chosen must be capable of being grown throughout the year and give a good return within the shortest period possible. Maize satisfies these conditions. Trials made at the Agricultural Research Station, Koilpatti showed that it is ready for harvest within 45 days and yields over 30,000 lbs. of green stuff per acre. This quantity can be obtained from periamanjal cholam but it takes double the time as it cannot be cut before it is in flower.

Maize is best grown on red soils where facilities for irrigation exist. When sown at the outbreak of the north east monsoon rains a very good crop can be raised without irrigation. At Koilpatti, the crop was sown over an area of 50 cents at the end of September with the help of a rain and it was ready for harvest on the 40th day. The cost of cultivation was Rs. 18 and the value of the produce was Rs. 50 giving a net return of Rs. 32 on 50 cents. The green fodder was valued at 300 lbs. per rupee.

Any farmer having lands in the vicinity of a town can easily make this a business concern. He can readily sell his fodder in small bundles and also make money in selling green cobs. A small area can be left for seed purposes so that he can have his own seed next year. The experience at Koilpatti proves beyond doubt that the possibilities as indicated above are great.

Poudrette as a manure for Paddy, Flowers and Fruits. For a little over a decade, as a means of sanitary disposal, the Calicut Municipality has been collecting its night soil and transporting it to the trenching ground at Chervannur and covering it with earth. The site is a thinly populated suburb of the town and outside the Municipality. The daily output is 30 tons, lorries of 2½ tons load making 12 trips in all; this would manure annually a little over 2,000 acres of paddy. The locality has a vast paddy area, deficient in natural as well as added fertility, and 65% of it is single crop land where cultivation is carried on in the most perfunctory manner. All that is done by way of manuring is to sprinkle a little factory ash at sowing time.

Realising the high crop production value of human waste and the scope for work in this direction in the vicinity of the trenching ground, the Agricultural Department set to itself the task of utilising night soil as a manure which in the course of about a year was found absolutely free from noxious odour and fit for handling just as other manures. Trial plots were started 3 years ago. As local coolies refused to handle the manure more due to prejudice than ignorance, scavengers from Calicut had to be taken who were paid at 12 annas a cart-load for carting and spreading. It was a surprise to the ryots to see the Agricultural Demonstrator supervise the work at the trenching ground and in the field. Ryots were loud in their objections; some of them were that the manure was responsible for rank weed growth, for more straw than grain and for bad flavour and low keeping quality of cooked rice. With great difficulty and persuasion the first trial was conducted in 1934 and the result, though to a small extent vitiated by want of timely rains, was in favour of poudrette plots that gave a 10% higher yield in grain and 25% in straw than the controls.

In 1935-36 three trial plots were laid out sufficiently early and poudrette worked in the hot weather by constant ploughing to reduce the weeds. The difference in the subsequent crop was striking with an average net profit of Rs. 4 per acre over the control which convinced the ryot of the intrinsic merit of poudrette as a manure for paddy. For the second crop of the same year the

Department helped only with a half grant the other half being met by the ryots themselves. In spite of an indifferent season, a 20% heavier yield was obtained. This result has really impressed the ryots, and encouraged them to come forward early in 1936 for permission from the Municipality for 25 cartloads of poudrette which they carted and spread at their own expense. The ryot has thus been brought round to appreciate the advantage of poudrette as a manure and when price of paddy and financial depression improve it is likely that he would use it on a larger scale.

Similar trials were conducted in and around Mangalore with success. The Cattle Improvement Society, South Kanara, Mangalore, has used poudrette for manuring fodder grasses and the crop has responded very well to the treatment. Mr. K. T. Alwa, the well-known horticulturist of Mangalore, who carries away most of the prizes in the Fruit and Flower shows at Mangalore, writes as follows:—"I have been using this manure for the last four years with very good results both for my flower and fruit plants. I have tried all sorts of manures but there is nothing to beat this. Even for paddy, it is very good. Mr. K. Thimmappa Hegde has been using this extensively for his paddy cultivation." This valuable manure is still wasted in many places on account of the prejudice of the ryots to handle it, but the department is trying to overcome the prejudice by actual demonstration and it is only a matter of time for this organic waste to be utilised extensively for economic crop production.

Composting farm wastes. One of the factors for increasing the crop production is the manure supply. As the population increases, intensive cultivation has to be practised on the limited area available to meet the demand for the food products and the other necessities of agricultural produce. Cattle manure obtained from the cattle sheds is not enough to manure all the dry and garden lands adequately and the use of artificials alone is not desirable especially in dry lands. In all villages organic wastes are available. It is a common sight in South Arcot to see the cane trash in fields being set fire to, after the canes are harvested. Burning this waste produce is considered to be an economy as it saves the labour of removing the trash from the field. This is false economy. At Palur Agricultural Research Station cane trash is being converted into compost for the last few years.

The process consisted in putting small quantities of trash under the feet of cattle daily. The floor of the cattle-shed was at least one foot below ground with a hard bottom. Trash and other farm wastes were spread daily in the pit to serve as bedding for the cattle as well as to conserve the urine. The dung was spread evenly in the morning and another layer of farm waste was put over it. This was continued for about a fortnight. At the end of the period the stuff from the cattle shed was removed and heaped in a convenient waste land to make a long heap about ten feet in breadth and three feet in height. The heap was turned three times with an interval of about a month (preferably after heavy showers). The heap was moistened sufficiently to hasten decomposition. Cane trash treated in this way was ready for use in four months. Thus the manurial requirements of the dry lands can be amply met. The labour required for heaping, turning and moistening comes to Rs. 0—12—0 per ton of compost manure. This manure when analysed was found to contain a little more than half the quantity of nitrogen contained in the farm yard manure and compares very favourably with the cattle manure available in the villages.

As some organic bulky manures are necessary to maintain the physical condition of the soil the cane cultivators who do not require trash for any other purpose can convert it into compost and use it in their fields to supplement other manures and thus reap good crops at a small cost.

Selections of Seednuts and Seedlings in the Coconut. Good seed ensures good crops. In a crop like the coconut which may last as long as eighty years, and in which the bearing capacity can be properly judged only about twenty years after planting, the selection of proper seed is obviously of utmost importance. The mistake made in selection cannot be rectified later and the care and attention bestowed on gardens from poor seed would not be sufficiently recompensing.

There are two main types of coconut palms—the tall and the dwarf. The dwarf type, occasionally found in back-yards of houses, though a very early yielder, is not suited for economic planting on a large scale. It is only the tall type which is extensively cultivated for commercial purposes all over the Presidency.

Seednuts are best obtained from recognised seed centres with a reputation for quality. Nuts should be selected from high yielders, yielding about 100 nuts per tree per annum. Such trees can be recognised by a large number of leaves in the crown, by the lower leaves drooping down like the ribs of an opened umbrella and by their tall trunks. Trees with short and strong leaf-bases should be selected. Poor yielders, i. e. those yielding about 30 nuts per tree, per annum, as also irregular bearers are undesirable as seed material. Very young or very old trees are usually rejected for seed purposes.

The next consideration is the sort of nuts that should be selected. They should not be too big or too small—should be of medium size, round in shape with thin husk. Fully mature nuts harvested in the months of February to June are the best. Usually one or two nuts at the top and the bottom of the bunch are discarded. The nuts thus selected are dried in the sun for four or five days.

The selection should not stop with the nuts alone and should be continued in the nursery also. Intensive research on coconut seedlings carried on during the last several years at the Government Agricultural Research Stations on the West Coast, has shown that the following are the characters of good seedlings, i. e. seedlings which will grow into high yielders.

1. Early germination,
2. Large number of leaves in the seedling,
3. Height of seedling, and
4. Good girth of the stem of the seedling.

Such seedlings are mostly obtained from round medium-shaped nuts mentioned above.

It is always desirable to sow in the nursery about 40% more seed nuts than the number of seedlings required so as to have sufficient scope for selection, with a view to reject unhealthy and poor seedlings.

The Department of Agriculture is always ready to offer advice and possible help on this important subject of seed selection.

Time of application of Ammonium Sulphate for Paddy. Recent researches all over the world have brought out the value of artificial manures or 'fertilisers' as useful adjuncts to all bulky or organic manures. If the economics of the various systems of manuring are worked out, it is found that the application of a judicious mixture of artificials and organic manures yields the greatest margin of profit. Though the amount of fertiliser applied is very small, it gives a great fillip to the final yield, thus justifying the extra cost incurred. It must, however, be borne in mind that to obtain the best results, the optimum amount of fertiliser should be applied at the right stage of crop-growth.

In the case of the paddy crop, research work at the agricultural stations of the province has shown that a top dressing of ammonium sulphate over the usual

basal manuring of green leaf gives greatly increased yields. Though the usual agronomic practice in this province is to apply the manure at planting time, experiments conducted by the Agricultural Department show that the best results are obtained when the Sulphate is applied 4 to 8 weeks after transplanting, depending upon the variety of paddy, the nature of the tract and the fertility of the soil.

The experimental results show that significant yields are obtained when the manure is applied one month after planting at Pattambi (South Malabar), six weeks after planting at Coimbatore and two months after planting at Aduturai (Tanjore) and Maruteru (West Godavari). Developmental studies on the paddy plant have shown that this critical period when the manure has to be applied synchronises with the formation of the ear-head, which is approximately a month before flowering.

In general, for lands of average fertility receiving a basal dressing of green manure, an application of the usual dosage of ammonium sulphate, a month before flowering is highly beneficial. Its application at planting time can be of advantage in promoting initial tillering where fertility is low.

Sorghum for Popping. Sorghum, *cholam* (Tam.) or *jonna* (Tel.), is one of the staple food grains of the poor and backward classes in the presidency. One of the ways in which sorghum grain can be used as food or delicacy both by the poor and by the rich is by converting it into pops (பொரி Tam.) or puffed grains.

Among varieties of cholam grown in South India the group which is commonly known in the Tamil districts as *Talai virichan cholam* and in the Telugu districts as *Konda jonna* or *Muthyāla jonna* is the most suited for making pops. These sorghum varieties have grains which are small in size, with horny (not powdery) contents. These seeds have also thick seed coats. Sorghum varieties not having these characters do not pop well.

Popping is done by putting small quantities of grain on a hot pan kept over a steady fire. For popping large quantities, mud pots are generally used, while for small quantities small iron pans are found to be suitable. To get uniformly good pops, the grains should be only one layer thick at the bottom of the pan. To ensure the proper heating of all the grains they should be briskly stirred. A small brush made out of the midribs of the coconut leaf serves this purpose well.

As the grain gets heated by contact with the hot pan it swells and a longitudinal crack is developed on the bulging grain. This crack widens, and irregular cracks are formed cross-wise. The slight moisture in the grain is rapidly converted into steam by the heat applied. The thick seed coat offers resistance to the steam which tries to escape, with the result that there is an explosion and consequent evertion of the endosperm. The grain is thus converted into a chalky white puff which is usually hemispherical in shape with bits of the everted seed coat sticking to its bottom. A good pop looks like a tiny cauliflower in general appearance.

The popping of sorghum as a cottage industry exists in isolated places in this presidency. Pops are made into balls mixed with jaggery and are sold especially during fairs and festivals. They have a fine flavour and are easily digested. When the suitable type of grain is not available locally, the grain is imported from the Coimbatore and Cocanada areas of the presidency. There are reports of importations from Burma also.

In sorghum pops, the poor and the rich have a cheap and wholesome luxury and popping as a cottage industry deserves greater popularity.

ABSTRACTS

Soybean flour destroys Vitamin A. Flour made of legumes, particularly soybeans, and added to bread to improve the color of the crumb has been found to destroy its vitamin A content. The color which is removed by soybean flour is carotene, which is oxidized and hence decolorized in the process. Since carotene is the basic substance of vitamin A, its activity is thus destroyed. Similar tests with cod-liver oil have shown that soybean flour will destroy at least 99 per cent of its vitamin A content. (*Scientific American*, February 1937).

V. R.

Fertilizing from the Air. When wheat is grown in an atmosphere enriched with carbondioxide, Dr. Johnston reports, that the weight of straw, the number and weight of heads, and the number of grains increased in comparison with plants grown in ordinary air. The practical application of this type of fertilizer has not been found satisfactory in commercial work. (*Scientific American*, February 1937).

V. R.

Bedbugs alive for one year. An Entomologist kept bedbugs alive and fairly active for one year without any food whatsoever. This remarkable vitality explains the great prevalence of bedbugs. (*Scientific American*, February 1937).

V. R.

Artificial resin. With the increasing use of electricity for domestic and other every day purposes, there will be very few who are not acquainted with Bakelite and Bakelite products and many will be interested to know what Bakelite is and how it is obtained. An exceedingly good and readable lecture is reported in one of the recent issues of Royal Society of Arts. Though often called an artificial resin, it is only a product of the condensation of phenol and formaldehyde and is called a resin only because in appearance it resembles a resin. The condensation product when first formed is a solid which will melt on heating but solidifies again if the heating is continued for some time and in this last condition, it assumes the consistency and electrical properties of the Bakelite products commonly sold in the market. In manufacturing the various commercial articles, advantage was taken of this fact and nice looking and useful things are turned out quickly and in large numbers by simply pressing the semi-solid resinoid into appropriate models and heated till the resin sets to a hard mass irreversibly. It would be of interest to know that besides these phenolic resinoids, there are the Urea resinoids, Alkyd, Vinyl and Sterol resinoids. The reader is referred to the extremely lucid original article in the Journal of Royal Society of Arts for further information. (*Jour. Roy. Soc. Arts.* January 29th 1937).

Dr. S. K.

Review.

Text Book on Horticulture in Telugu by V. Venkateshwara Rao, Bhimavaram.

The book is primarily intended for the use of Secondary School students according to the requirements of the S. S. L. C. Syllabus and is, therefore necessarily elementary in its scope.

It deals with soils and their properties, hedges, implements used in horticulture, tillage, after-cultivation, manures and manuring, methods of propagation, insect pests and fungoid diseases and their control. A few notes on some of the most commonly cultivated flowering and orchard plants would however have made the book more complete.

There are few useful books on this important subject of horticulture easily available to the student and the teacher, and fewer still in the vernaculars. This book, it is expected, will, therefore, supply a long felt want and prove useful not only to the regular students studying for an examination and the elementary school teacher, but also to the amateurs in horticulture and serve as a brief introduction to the fascinating subject of horticulture.

The book, the first of its kind in Telugu, ought to be welcomed by all interested in the subject. The author derseves to be congratulated for his efforts which however humble they may be, should contribute much to the spread of knowledge in horticulture among the younger generation.

Copies can be had from the author for annas Twelve.

G. V. Narayana.

Correspondence.

Dear Sir,

In your issue of the M. A. J. for this month (March) I find an article on "*A new enemy of the honey bee*" by Messers M. C. Cherian and V. Mahadevan. In the introductory paragraph of the paper the authors while refering to a few previously known enemies of the honey bee have, I find, not made any reference to another wasp enemy of the honey bee recorded before from S. India with almost the same habits as *Palarus* and belonging to the same family *Sphegidae*. I would invite their attention to the following published papers containing information on it.

1. My paper on "Some insects recently noted as injurious in S. India". In which is recorded the bee hunter wasp *Philanthus Ramakrishnae T.* with a figure showing the wasp carrying a honey bee (published in report 3rd Entomological Meeting, Pusa, 1919).

2. "Bees and bee keeping in S. India" by myself and S. Ramachandran published in M. A. J., February 1934, P. 7 with a figure.

3. "Bee keeping in S. India" Madras bulletin No. 37 by S. Ramachandran with a forward by myself page 1, fig. 13, year 1935.

This sphegid wasp *P. Ramakrishnae T.* was discovered by me on the Bahabudan hills (4000') in Mysore about twenty years ago; I also noted it later on the Nilgiris and on the Palnis. It was named after me by Mr. Turner of the British-museum as a new species.

'Girija' Farm,
Mundur, S. Malabar.
14—3—'37.

T. V. R. Ayyar.

Dear Sir,

In reply to Dr. T. V. Ramakrishna Ayyar's (Rao Saheb) letter I have to state that I am aware of the three publications, mentioned by him. These publications, especially Nos., 2 & 3 however do not contain much information on the wasp-*Philanthus*. I am of opinion that this wasp is not of sufficient importance to be included amongst the insect enemies mentioned by me and Mr. Mahadevan in our paper on "A new enemy of the Indian Honey bee." Hence the omission.

It may be stated in this connection that the Mysore Entomologist also does not consider this wasp of an importance in his State.

Lawley Road P. O.
10—4—1937.

M. C. Cherian,
Govt. Entomologist.

Crop & Trade Reports.

Receipt of raw cotton at press and spinning mills.

Total cotton pressed and unpressed.

	Bales of 400 lbs. against an estimate of 533,100 bales for 1936–37.	Figures for corresponding period in the previous years.
1--2—37 to 19—2--37	9714	12394
Do. 26—2—37	13823	18618
Do. 5—3—37	19422	23661
Do. 12—3—37	26438	28497
Do. 19—3—37	33450	37400
Do. 26—3—37	43835	50938
Do. 2—4—37	59258	61937

	Cotton bales received at mills.	Exported by sea.	Imported by sea.
1—2—37 to 19—2—37	9662	6853	2712
Do. 26—2—37	13746	10634	2712
Do. 5—3—37	22018	15101	4025
Do. 12—3—37	29442	16227	4781
Do. 19—3—37	32967	19065	5980
Do. 26—3—37	38878	21187	24552
Do. 2—4—37	53275	24043	25186

College News & Notes.

Students' corner. The university examinations for the first and second year B. Sc. students commenced on the 5th instant, and for the third year students they will comence on the 14th.

Officers' club. During the Easter holidays open tournaments in Bridge (auction and contract) and Table Tennis were conducted. About 45 teams for auction bridge, 22 for contract bridge and 35 for Table Tennis competed. Players from Trichy, Gobichettipalayam, Avanashi, Tiruppur, and local clubs participated.

Auction Bridge:

Winners: Mr. Doraiswamy & „ Chandrasekhara Ayyar. } Annur.

Runners: „ Ponnambalam & „ Srinivasa Ayyar. } Coimbatore Cosmopolitan club.

Contract Bridge:

Winners: Mr. Vembathi Subramania Ayyar & „ Venkatasubba Ayyar. } Gobi.

Runners up: Mr. Somasundaram & „ Vetrivel Mudaliar. } Gobi.

Table Tennis:

Winner: Mr. Krishnaswami.

Runner up: Mr. N. Muthuswami.

The Tournament committee is to be congratulated on the unqualified success it had in the conduct of the above tournaments.

M. A. S. U. Please see the advertisement inside front cover page.

Weather Review (FEBRUARY 1937.)

Summary. Local thunderstorms have occurred during the middle of the month causing heavy showers on the north Madras coast and in the later part of the month in the hill stations. A few showers have also been recorded in the Ceded districts and south Madras. The rainfall has been appreciably above normal in the Circars, above normal in the Ceded districts, normal in the south, below normal elsewhere in the Peninsula. The chief amounts recorded are 5·3″ at Gopalpore on the 14th and 2·7″ at Vizagapatam on the 15th.

RAINFALL DATA

Division	Station	Actual for month	Departure from normal @	Total since January 1st	Division	Station	Actual for month	Departure from normal @	Total since January 1st
Circars	Gopalpore	7·8	+7·1	7·3	South	Negapatam	0·0	−0·6	4·4
	Berhampore *	4·4	+3·3	4·4		Aduthurai *	0·2	−0·1	0·4
	Calingapatam	3·2	+2·7	3·2		Madura	0·0	−0·4	0·1
	Vizagapatam	3 1	+2·2	3·1		Pamban	0·3	−0·4	4·2
	Anakapalli *	2·9	+1·4	2 9		Koilpatti *	1·5	+0·7	2·1
	Samalkota *	1·6	+0·8	1 6		Palamkottah	1·1	+0·3	3·0
	Maruteru *	0·9	0·0	0·9					
	Masulipatam	2·8	+2·4	2·8					
	Cocanada	1·0	+0·7	1·0	West Coast	Trivandrum	0·2	−0·4	1·4
	Guntur *	0·5	−0·7	0·5		Cochin	0·9	+0·1	1·3
Ceded Dists.	Kurnool	1·0	+0·8	1·0		Calicut	0·0	−0·2	0·0
	Nandyal	1·1	+0·9	1·1		Pattambi *	0·1	−0·5	0 10
	Hagari *	0·5	+0·2	0·5		Taliparamba *	0·0	−0·2	0 0
	Bellary	1·2	+1·0	1·2		Kasargode *	0·0	−0 6	0·0
	Anantapur	0·7	+0·4	0·7		Nileshwar *	0·3	+0·1	0·3
	Rentachintala	1·6	...	1·6		Mangalore	0·0	−0·1	0·0
	Cuddapah	0·3	+0·2	0·3					
	Anantharaju-pet *	0·0	...	0·0	Mysore and Coorg	Chitaldrug	0·0	...	0·0
Carnatic	Nellore	0·7	+0·6	0·7		Bangalore	1·8	+1·7	1·9
	Madras	0·0	−0·3	0·1		Mysore	0·7	+0·5	0·7
	Palur *	0·0	−0·5	1·5		Mercara	1·1	+0·9	1·1
	Tindivanam *	0·0	−0·8	0·4					
	Cuddalore	0·3	−0·6	1·9	Hills.	Kodaikanal	1·3	−0·1	2·2
Central	Vellore	0·1	−0·2	0·3		Coonoor *	6·4	...	7·5
	Salem	0·0	−0·3	0·0		Ootacamund *	1·0	+0·2	1·3
	Coimbatore A. C. & R. I. *	0·1	−0·2	0·1		Nanjanad *	2·5	+1·9	2·6
	Coimbatore	0·1	−0·2	0·1					
	Trichinopoly	0·0	−0·5	0·3					

* Meteorological Stations of the Madras Agricultural Department.

@ From average rainfall for the month calculated upto 1935 (published in Fort St. George Gazette).

Weather Report for the Research Institute Observatory.

Report No. 2/37.

Absolute Maximum in shade	...	...	93·7°F.
Absolute Minimum in shade	...	...	62·5°F.
Mean Maximum in shade	...	...	91·2°F.
Departure from Normal	...	...	+0 6°F.
Mean Minimum in shade	...	...	68·2°F.
Departure from Normal	...	...	+2 7°F.

Total Rainfall	...	...	0·09″
Departure from Normal	...	...	0·21″
Heaviest fall in 24 hours	...	...	0·04″
Total number of rainy days	...	...	Nil.
Mean daily wind velocity	...	...	1·2 M. P. H.
Mean humidity at 8 hours	...	...	75 5%
Departure from Normal	...	...	+4·0

Summary. The mean minimum temperature was above normal by 2·7°F and the mean maximum by 0·6°F. Otherwise the general weather conditions continued to be normal.

Departmental Notifications.

I. Transfers & Postings.

Name of officers.	Transferred	
	From	To
Mr. K. M. Jacob.	Taliparamba	Manantoddy.
,, P. Kesavunni Nambiar	Tiruppur	Palghat.
,, T. K. Thangavelu	Coimbatore	Coonoor.
,, M. Narasimham	Samalkota	Siruguppa.
,, S. Dharmaligam	Pattambi, A. R. S.	Coimbatore.
,, M. B. V. N. Rao.	Berhampore	Coimbatore.
,, K. B. Viswanathan	Berhampore	Anakapalli.
,, P. Somayajulu	Maruteru, A. R. S.	Maruteru, F. M.
,, P. Sitaramiah	Maruteru	Anakapalli.
,, V. S. Narayanaswami Iyer	Tanjore	Nannilam.
,, T. A. R. Iyengar	Nannilam	Arantangi.
,, V. A. Jagannadha Rao	Vizianagaram	Challpalle.
,, A. Doraiswami	Paddy Section	Co_2 Scheme Tiruppur.
,, B. G. N. Menon	Co_2 Scheme Tiruppur	Coimbatore.
,, R. Alagiamanavalan	Madanapalle	Kalahasti.
,, A. M. Muthayya Nattar	Aruppukottai	Pollachi.
,, L. Sankarakumara Pillai	Tinnevelly	Rasipuram.
,, D. S. Subrahmanya Ayyar	Rasipuram	Tinnevelly.
,, A. Chidambaram Pillai	Salem	Madura.

II. Leave.

Name of officers.	Period of leave.			
Mr. K. M. Venkatachalam Pillai	3½ months	on m. c.	from	18—1—37.
,, J. Suryanarayana	3 ,,	,,	,,	4—3—37.
,, K. Bramhachari	2 ,,	,,	,,	24—2—37.
,, K. Veerabhadra Rao	1 month	,,	,,	
,, Edwin Amirtharaj	2 months	,,	,,	
,, N Ramadoss	1 month		,,	5—4—37.
,, R. Vasudeva Rao	2 months	on m. c.	,,	12—2—37.
,, M. Subramaniam Pillai	3 ,,	,,	,,	1—3—37.
,, M. B. V. N. Rao	1 month		,,	1—4—37.
,, B S. Narasimha Iyer	2 months		,,	5—3—37.
,, A. Krishnaswami Iyer	6 ,,	on m. c.	,,	26—1—37.
,, T. Gopalan Nayar	2 ,,	,,	,,	4—1—37.
,, I. Kurma Rao	6 weeks	,,	,,	4—3—37.
,, P. Parthasarathy	3 months	,,	,,	26—3—37.

PRESS COMMUNIQUE

Fort St. George, March 19, 1937

(G. O. Ms. No. 655, Development).

No 213—With a view to ascertaining the extent of unemployment among the educated classes in the Province, the Government directed the Commissioner of Labour and Rural Uplift to take a census of the educated unemployed, making a start with graduates in Law, Arts and Sciences and Diploma holders. The Commissioner issued a press notice in July last asking the unemployed among graduates in Law, Arts and Sciences and in Engineering and Medicine and Diploma holders in Economics and European languages to send in their names to him along with certain particulars. But only 759 persons responded to the notice. The Government consider the response most disappointing but propose to make another attempt but this time over a wider field so as to embrace all educated unemployed persons.

2. The expression "educated unemployed" requires as precise a definition as possible for the purpose of the census. The Government observe that the Sapru Committee of the United Provinces defined the expression "educated young men" as people who had received education at the universities, intermediate colleges, high schools, vernacular middle schools, or at the industrial or technical institutions or professional colleges or schools and passed one of the examinations specified in the margin. In regard to the question as to what was meant by "unemployment" the Committee held the view that young men who after taking a University Degree or Diploma remain without employment between the ages of 23 and 26 and in the case of men with only school education all those who have finished their school education but do not want to proceed to any university and remain unemployed should be treated as unemployed. These definitions do not, of course, claim to be perfect but seem to afford a basis to proceed upon and the Government direct that these criteria be applied for the purposes of the census of the educated unemployed of this province also.

M. A.
M. Sc.
LL. B.
B. A.
B. Com.
B. Sc.
B. Ag.
Intermediate in Arts, Science, Commerce and Agriculture.
High School Examination.
Vernacular Middle Examination.
Oriental Titles Examination.
Final Examinations of the Technical Institutions, Engineering, Medicine.

3. All the educated unemployed within the meaning of paragraph 2 above are accordingly invited to send their names within six weeks to the Commissioner of Labour and Rural Uplift, Chepauk, Madras, with the following particulars:—

(1) Name.

(2) Address.

(3) Qualifications.

(4) Employment, if any, previously held.

(5) Nature of employment sought.

Replies should be sent with the superscription on cover "Unemployment Enquiry".

C. J. PAUL,

Secretary to Government.

CONCESSION FORM

(For subscribers only)

To

The Secretary,

M. A. S. UNION,

Lawley Road P. O., Coimbatore.

Sir,

I am a subscriber to your journal and wish to avail of the 50% reduction in the Price of the Cumulative index from 1911 to 1930. Please send me by book-post a copy for which I am enclosing herewith postage stamps to the value of annas twelve, to cover both cost and postage.

Signature

Address