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Editorial

National Festival: It is very pleasing to note from the available statistics that the "Tree Planting Festival", celebrated throughout the Indian Dominion for the past three years as a National Festival, has been really a successful national endeavour to enrich the natural resources of India. The importance of trees has now gained the public recognition.

Every tiller of the soil knows the importance of trees. Trees give shade and shelter besides acting as wind breaks. He is also aware of the usefulness of the trees in other respects, namely, serving as wood for house building, for his ploughs and other agricultural implements and also as fuel for his domestic purposes. As such, trees are valuable asset in any farm or holding. Scientists may attach greater importance to the existance of trees particularly in high level localities of any country than an ordinary layman.

Trees are well known for their role as moderaters of weather. In foreign countries data have been collected to show that trees function not only as wind breaks but also as regulators of temperature and humidity of the atmosphere and also as helpers in the condensation of clouds. This is perhaps the reason why it is often said that trees create rain. It does not mean that without the natural cloud formation trees can bring rain but it means that trees aid the formation and condensation of clouds. This awe-inspiring capacity of trees can be well understood if it is realised that the thick foliage of trees is capable of retaining two to seven cents of rain water. Such a wet surface at such a height will really create favourable conditions for the formation and condensation of clouds.

The regulating habits of the closely grown trees in high level areas in avoiding soil erosion due to the torrential nature of rain are now being brought to light when the question of bringing every inch

of soil under plough engages the attention of both the Scientist and Administrator to tide over the present food shortage. Good trees also assist the formation of subterraneon springs due to the clevages in the soil on account of their penetrating roots and consequently control the enundations in the natural rivers. Conservation of top soil and maintenance of good subterranean springs will really contribute a lot to the agricultural prosperity of a country.

In this great national festival the Madras Agricultural Department is playing a noble role. The Departmental staff take a keen interest not only in the planting of new saplings but also in the careful and successful maintenance of those planted already. Further, with the help of the Agricultural Research Stations, the Officers are able to get ready thousands and thousands of seedlings for planting. A good variety of useful avenue trees and good green manure shrubs and plants are being raised in thousands not only in all the available open places but also in the agricultural lands as far as green manure plants are concerned. It will not be an exaggerated statement if it is said that the Paddy cultivators of the Madras State have become highly green manure minded farmers since they have realised the advantages of applying green manure to the paddy crops and getting green manure with the help of their own resources without any high initial outlay.

Creater is also a protector. This is the law of Universe. This law has to be honoured when we think of this great national festival of tree planting and take a keen interest in its celebrations. If this is done every planter of a sapling will see to its successful and useful growth and if this is actually attained in practice days are not far off when we, the inhabitants, will not only have a control over the weather but also place our country in a stable position so far as the problem of good production is concerned. A land deprived of trees and vegetation is a desert. Trees are our wealth, and let us nourish them if we are to be in health.

Crop and Land Improvement under the Krishna East Bank Canal, (Madras State)

By

M. SATYANARAYANA, B. A., B. SC., (Ag.)
Deputy Director of Agriculture

With the excavation and opening of the Krishna East Bank canal in 1937 lands formerly under dry cultivation in the canal zone got converted into wet system of cultivation. In the conversion of the dry land into wet, of the ayacut under the East Bank Canal, changes in the cropping as well as changes in the condition of the soils have been brought about. In this canal ayacut, a crop of paddy is raised between June and December, followed by Sunnhemp, or pulses like green-gram, black-gram, *pillipesara* etc. In certain blocks of land, in this canal zone, as in the villages as Srikakulam, Tenuguraopalem etc., large blocks of land extending to thousands of acres get hardened in the top foot of the soil, with white alkali deposit caused by efflorescence. The pulse crop following the paddy is diminutive in size and presents a poor appearance. A number of bore wells in the area sunk for drinking water purposes have the level of water in them rising or falling with the level of water in the river Krishna. In flood time, the water level in the bores in high up while in other periods the level in the bores recedes to lower depths. In these bores, the sand substratum with the watershed is generally reached from a depth of seventy feet from the ground level. Water from this level is pushed up to 12 feet from the ground level, indicative of the subartesian nature of the watershed.

2. The alkalinity of the soil is rendered by the rise of the sub soil water. A sure way of getting rid of the alkalinity and securing good pulse crops after paddy is by construction reservoirs, or wells around these bores and pumping water therefrom, to raise a second crop of paddy between January and June. The water from the lift irrigation led on to the fields in which the II crop paddy is raised pushes down the sub soil salts and corrects the alkalinity. In course of time, the soils are rendered sweet, to enable raising pulse crops in the second season, in the normal way. Investments in regard to boring pipes, reservoir or well construction, engine and pumpset may range from Rs. 3,000/- to 6,000/- per bore; but this investment can be recovered with the returns from two crops of paddy. The net profits may easily accrue to Rs. 400/- per year, with paddy selling at Rs. 18/- a bag of 2 imperial maunds.

3. In the adoption of this system an early start of the first crop with heavy yielding medium duration types like Potti Basangi (MTU. 3) is feasible. With the early harvest of paddy, the succeeding pulse crop

has also an early lead for full development and high yield upto 6 bags (2 Imperial maunds each) per acre. The best lands of the area in this canal zone yield as much as 18 bags of paddy, with 5 to 6 bags (2 Imperial maunds) of the grams. Those who can afford the investment, progress on these lines; but holders, incapable of such investment, may adopt one or more of the following agronomical methods to reform their lands for better production. Soils that do not sustain any kind of pulse following paddy, or that support them only to diminutive stature may be reclaimed with "*Dantu Thadupu*". After the harvest of the paddy, the fields are flooded with the canal water and the water made to stand on them as long as possible, to push down the sub-soil salts for an adequate period. In this process paddy straw that can be trampled down will help reclamation in quicker measure. A second method of tackling the fields consists in raising green manure crops as Sesbania and Daincha sown in the standing crop of paddy just before harvest, either by themselves or in mixture with the pulse crops. With the harvest of the pulses, the green matter from Sesbania or Daincha can be cut and composted for application to the first crop of paddy.

4. Another method of correcting such soils lies in the paring of land "*Gallu Teeyuta*". Strips of land in the fields may be dug at alternative intervals to depths of six inches, transporting away the dug material. With the summer weathering, the pared sub-soil gets enriched in plant nutrients; and the saline soil transported from the pared regions reduces the content of salts in the fields: this ameliorative measure helps the paddy crop to progress well. This method is specially useful in high level lands where lowering of the levels for better irrigation flow is essential.

5. If the lie of the land allows the free flow of drainage water, trenches straight and across may be dug in the fields after the harvest of paddy and free flow of water allowed through them into main drains, as long as water supply is admissible from canals.

On Some Aspects of the Cropping Behaviour in the Sandy Soils of Bapatla

By

C. HANUMANTHA RAO, B. Sc. (Ag.)
Superintendent, College Farm, Bapatla

Introduction: Vast stretches of deep sandy areas occupying nearly 103 square miles exist in the Eastern and Southern portions of Bapatla taluk. There is no large scale cropping excepting raising of paddy and tobacco nurseries in the period June to December under splash irrigation. The water source is from 20' x 20' x 12' deep dug outs or deruvue. As the water table is high water always exist 6' to 9' below ground level during the 'Punasa' season. Each 'doruvu' commands an area of 15 cents for splash watering and a ryot depending on his family takes up ragi or vegetables in small holdings and cultivates the same with the family labour — Casuarine plantation and cashewnut gardens exist in isolated patches and are generally maintained by land-lords who can invest some money till they get return in way of harvest. The soils are very poor in fertility and have very low powers of retaining moisture. Large quantities of ammonium sulphate up to 6 cwts. per acre are generally applied to tobacco nurseries at weekly intervals closely followed by profuse splash watering. With the inception of the college form in 1950 the study on the performance of crops suitable to such areas under rainfed conditions was launched and promising results are recorded for the benefit of the cultivators in the locality — feasibility to tap the sub-soil springs by fixing filtor points for growing vegetable crops in summer was also studied.

Materials and Method: The first step taken tackling the problem was sowing and planting of crops early in the monsoon and fit in certain cultural practices adopted in similar tracts of Visag District.

The next step was to sow or plant crops that are drought resistant and mature before November. Departmental strains that are of high yielding and draught resistant quality were introduced and studied with local varieties grown in the district. Quick sowing and covering with guntaka to prevent loss of moisture by evaporation was adopted.

Farm Yard Manure at 10 cart loads per acre was applied to all crops besides one cwt of ammonium sulphate to commercial crops.

Data in Natural Sequence:

1. *Sugarcane:* 5 CO varieties were tried under *doruvu* irrigation. CO 449 recorded maximum yield of 29·7 tons per acre with a Jaggery recovery of 11·16.

2. *Ragi:* AKP 2 and AKP 6 were compared with local in 25 cents plots and the planting was done behind country plough in the Punasa season under rainfed conditions and in the Pyru seasons under splash irrigation. The results of trials for two years indicated that in 'Punasa' season. AKP 2 was early by 50 days to local and recorded the maximum yield of 2,450 lb. In the Pyru season AKP 6 gave the maximum yield of 2,769 lb. of grain per acre.

TABLE I.

Yield of grain in lb. per acre.

	1950—51.		1951—52.		1951—52.	
Variety.	Pyru season.	Duration.	Punasa season.	Duration.	Pyru season.	Duration.
AKP 2	850	95	2,450	98	2,747	92
AKP 6	2,016	102	1,533	127	2,788	107
Local	1,541	118	135	159	2,227	114

Korra: Korra grown as mixture with cotton in the Punasa season under rainfed conditions gave on acre yield of 546 and 292 lb. of grain per acre.

Arika: Guntur Local Arika grown under rainfed conditions as a mixture with redgram gave 207 lb. of grain and 1,453 lb. of straw.

Redgram: Four strains 2,900, 2,745, 1,723, 3,009 were compared with local under rainfed conditions, 2 strains 2,900 and 2,745 gave 41·5% increased yield over local.

Strain 2,900 sown as pure crop gave 570 lb. of pulse per acre. Redgram strain 2,900 mixed with arika and korra gave 379 lb. and 250 lb. of pulse respectively.

Horsegram: Inspite of severe drought conditions with less than an inch of rainfall during the crop growth strain No. 116 gave 30% increase over local in the yield trial with 5 strains and local variety.

Gogu: Four varieties of gogu, local tella-gogu, yerra-gogu, kaki-gogu and pusa-gogu were under observation trial in 25 cent plots. Pusa-gogu recorded 1,600 lb. fibre closely followed by, kaki-gogu with 1,100 lb. per acre under rainfed conditions.

TABLE II.

Yield of Fibre in lbs. per acre.

Type of gogu.	Height of plant in ft.	Duration.	Yield of fibre per acre.	Profit per acre.
Pusa-gogu	8·1	189	1,600	242
Kaki-gogu	6·3	151	1,100	68
Tella-gogu	4 5	131	432	51
Yerra-gogu	4·3	130	400	38

Tomato: Seven Hybrids were compared with Deshi type besides the study on the performance of 16 varieties along with local under splash irrigation in the 'punasa' season in two consecutive years.

In the last year Deshi gave the maximum yield of 14,835 lb. per acre and in the second year Hybrid 9 and Deshi recorded maximum yields of 4,381 lb. and 3,726 lb. respectively. Of the 16 varieties under observation along with local, local gave maximum yield of 23,390 lb. in the first year and Hybrid 3 followed by local with 7,639 lb. and 6,131 lb. per acre respectively in the 2nd year.

Groundnut: TMV 1, 2, 3 were studied in comparision with local in the 'punasa' season and local was found to be more resistant to draught and gave 1,560 lb. as against 1,550 of TMV 3 and 1,210 of TMV 1 1,000 lb. of TMV 2 per acre. One month early sowing in June 2nd week, resulted in an increased yield of 300 lb. over the late sowing in July 2nd week.

Gingelly: TMV 1 and TMV 3 grown under rainfed conditions sunnhemp recorded acre yields of 150 lb. and 286 lb. of grain and 5,000 lb. of green sunnhemp fodder.

Sweet Potato: 14 varieties were tried under splash irrigation and B 4,304 and Nancy Hall recorded 10,000 lb. and 9,350 lb. tubers per acre. Jercy big stem gave 1,600 lb. of tubers and 10,500 lb. of vines per acre.

Cucumber: Wynad cucumber was compared with local in the punasa season. Wynad cucumber recorded 11,500 lb. as against 5,550 lb. of local.

Fodders: Cowpea sown under rainfed conditions gave more yields ranging from 7,003 lb. to 16,500 lb. This crop is a good drought resister and serves as a good fodder and green manure.

Sunnhemp: It comes next to cowpea and gave 5,000 lb. to 7,000 lb. of green fodder per acre.

Buffalo Grass: Though a moisture loving type of grass it gave 8,000 lb. per acre. Splash irrigation was given in the hot weather period.

Tapping sub soil water: A 3" filter point was successfully driven up to a depth of 30' and a discharge of 4,300 gallons per hour was recorded in the hottest period of the year. With the help of a 2 H. P. petrol engine, filter points will be driven in suitable places in the next season to tide over the water scarcity in the summer months for bringing more area under vegetables.

Summary and Conclusions: Large scale cultivation of several types of crops was done for the first time in the locality and the results indicate that:—

1. Sugarcane can be successfully cultivated in sandy soils with restricted irrigation.

2. AKP 2 in 'punasa' and AKP 6 in 'Pyru' will replace the local ragi. Planting behind country plough in 'punasa' season brings down the cost of cultivation.

3. Redgram can be grown with success in the sandy areas provided the sowings are done early in the season.

4. Pusa-gogu and kaki-gogu with their high yields are a sure source of income with low initial expenditure. The leaf of kaki-gogu can be used for culinary purpose besides using the stems for fibre extraction.

5. Wynad cucumber due to its high yielding nature will evidently spread in the locality.

6. Cowpea raised as a fodder and green manure crop gives good returns and improves the soil fertility and water holding capacity of the soil if it is grown under rotation.

7. Sunhemp grown as mixture with other dry crops will serve as a good source of supply of green manure and fodder in the locality.

8. Departmental strains out yielded the local types in most of the cases and the preformance of all the crops will have to be studied for two more seasons for extension.

9. The success attained in tapping under ground water by driving filter points will facilitate large scale growing of vegetables and fruit nurseries.

OBITUARY

We deeply regret to record the demise of Sri K. C. Ramakrishnan on 9—7—1953 who was lately the Lecturer in Agricultural Economics, Agricultural College, Coimbatore for about 6 years. He was for a long time working as a Lecturer in Economics in the University of Madras and joined this Department in 1943 when Agricultural Economics was made a separate subject for B. Sc. (Ag.) Course. He was an active member of the Madras Agricultural Students' Union. We offer our condolences to the members of the bereaved family.

Some Observations on the Phenomenon of Revival of Sugarcane Shoots attacked by the Early Shoot Borer

By

K. R. NAGARAJAN, B.Sc., (Ag.)
Assistant Entomologist, Coimbatore

Introduction: While studying the borer incidence and borer population in cane shoots, in the Trichogramma colonisation Experimental plots at Nellikuppam a very interesting phenomenon was noticed. During the course of the studies, all the dead-hearts in the experimental plots were split open and examined. It was found that Argyria sticticraspis was responsible for most of the dead-hearts while Scirpophoga sp. and Diatrae Venosata were comparatively unimportant in producing dead-hearts. It was also observed, that the central core of most of the shoots was dead and rotton but quite surprisingly, a few shoots, showed the presence of healthy central growing point, which was even found producing a fresh central shoot pushing out the dead-heart. This observation indicated that all the borer attacked shoots may not die but that some of them may survive the attack.

Review of Previous Work: Ramakrishna Ayyar and Margabandu (1935) while discussing the possible effects of attack by Argyria on young shoots have not made any mention about the phenomenon of revival. Khan and Dabbir Singh (1942) in their studies on "Dead-hearts" caused by different species of sugarcane borers in the Punjab have mentioned that the Argyria sticticraspis larva is capable of completely severing the connection between the lower portion of the shoot and the central growing whorl of leaves but have not made any mention of the revival of the shoot. Issac (1938) has mentioned that 15% of the attacked shoots by top borer larvæ (Scirpophoga sp.) have revived, but the observation recorded does not concern the early shoot borer (Argyria sticticraspis),

As the phenomenon of revival of shoots attacked by Argyria sticticraspis, does not seem to have drawn the attention of any worker on cane a preliminary study was made in Nellikuppam (Madras State) on one variety of cane, CO 281, during two seasons (1948—1949 and 1949—1950) and the observations are summarised in this paper.

Method of Study: Twelve five cent plots were marked out in a bulk crop and in each plot two eleven feet lengths were marked on in each root at random, which works out to 3% of the area. Only primary shoots were taken for the study as facilities were limited. All the primary shoots emerging within that length were marked individually with twine and card-board slips dipped in paraffin wax. The cane setts were planted in August in 1948—1949, and in September in 1949—1950. As soon as

the borer infestation was noticed the dead-heart counts were started and continued every fortnight till the attack ceased. At every count, out of the total number of primaries, the number attacked and the number died were recorded. The dead-heart alone was pulled out at every count leaving the shoot undisturbed so that only fresh dead-hearts were taken into account at each count. Some of the plants dried up completely due to the attack and were pulled out. A few plants remained green in spite of the attack and put forth fresh shoots.

Results: The results of the observations are furnished in statements I and II.

Statements I and II show the total number of primaries at the initial stage (col. 2), the total number of dead-hearts formed (col. 3), primaries that were not attacked (col. 4) and the final stand of the primaries (col. 6). From the figures it can be seen that if all the shoots attacked had died and only the unattacked ones had developed into canes, the final stand should have been 114 in 1948—1949 and 202 in 1949—1950. But the final stand was 145 and 278 respectively. This increase is due to the revival of some of the attacked shoots. Out of 225 dead-hearts recorded in 1948—1949 forty five had revived which works out to 20% while in 1949—1950 out of 313 dead-hearts 76 revived which comes to 24·3%. So it is clear that under Nellikuppam conditions in August–September planting a rivival of 20 to 24% of the attacked primary shoots is possible in the variety Co. 281.

Discussion: It has been observed by Ramakrishna Ayyar and Margabandu (1935) that "a single Argyria sticticraspis larva may enter a shoot, tunnel it, come out again and enter fresh shoot." That is probably why a larva is not found in each and every attacked shoot. This observation has been confirmed by the examination of dead-hearts in Nellikuppam. From the above habit of the larva it is conceivable that it might enter a shoot and eat away a portion of the central shoot causing the dead-heart; but might not, in some cases, go deep enough to destory completely the growing point. Where the growing region of the shoot is left intact, inspite of tunnelling of the shoot by the borer, there is scope for further growth and it can slowly grow up after the attack and come up pushing out the dead-heart. This is probably how some of the dead-hearts have revived as noted above.

Conclusion: It is common experience that the ryot does not regard the attack of early shoot borer to be as bad for the crop as one would expect. The fact that an appreciable percentage of dead-hearts revive, may be, at least in part, responsible for the comparatively complacent view taken by the ryot. Hence this phenomenon is worth studying further in different seasons and with different varieties to get more detailed information.

Summary: A preliminary study was made in Nellikuppam, South Arcot District, on the revival of primary shoots of sugarcane (Co. 281) attacked by the early shoot borer, Argyria sticticraspis H.

It was observed that as much as 20 to 24% of the primary shoots, attacked by the above borer, revived.

Acknowledgments: My thanks are due to Sri C. Krishnamoorthy, B. SC., (AG.) and Md. Basheer, B. SC., (ALIG.), M. A., (STAN) F. E. S. I., the then Assistant Entomologist, Nellikuppam for all the facilities and guidance they gave for carrying out the work.

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STATEMENT No. I

Statement showing the number of primaries, dead-hearts, and final stand of sugarcane in 1948 – '49

Sl. No.	No. of primary shoots to start with	Total No. of Dead hearts	Primaries not attacked	Primaries attacked but revived	Final stand of the primaries	Remarks	
1	2	3	4	5	6	7	
1.	31	7	24	..	22	2	shoots damaged while hoeing
2.	29	21	8	11	19		
3.	38	28	10	8	18		
4.	29	22	7	3	10		
5.	45	26	19	..	19		
6.	28	21	7	8	15		
7.	29	22	7	6	13		
8.	30	29	1	5	6		
9.	25	9	16	..	13	3	do.
10.	23	22	1	3	4		
11.	21	10	11	..	2	9	do.
12.	11	3	3	1	4		
Total	339	225	114	45	145	14	

159

Final stand : 159 — 14 (Damaged while hoeing) = 145

Note: 14 shoots damaged while hoeing happened to be healthy ones. But still they have not been taken into account for considering the revivals.

STATEMENT No. II

Statement showing the number of primaries, dead hearts, and final stand of sugarcane in 1949 – '50

Sl. No.	No. of primary shoots to start with	Total No of Dead-hearts	Primaries not attacked	Primaries attacked but revived	Final stand of the primaries	Remarks
1	2	3	4	5	6	7
1.	41	38	3	16	19	..
2.	32	28	4	8	12	1 damaged while hoeing and weeding
3.	40	25	15	3	18	4 do.
4.	35	18	17	2	19	1 do.
5.	45	11	34	1	35	1 do.
6.	42	24	18	5	23	1 do.
7.	51	31	20	4	24	4 do.
8.	45	20	25	4	29	3 do.
9.	44	24	20	6	26	1 do.
10.	44	22	22	4	26	3 do.
11.	45	32	13	10	23	
12.	51	40	11	13	24	
Total	515	313	202	76	278	19
			278			

Note: All the 19 shoots, damaged, happened to be infested shoots.

		1948 – '49	*1949 – '50*
1.	Total primaries attacked ..	225	313
2.	Primaries revived ..	45	76
3.	Percentage revival ..	20	24·3

Studies in Sorghum — the Fundamentals of the White and Dull Mid-rib

By

B. W. X. PONNAIYA. B. Sc. (Ag.), M. Sc.,

AND

R. APPATHURAI, B. Sc. (Ag.),

(Agricultural Research Station, Koilpatti)

Introduction: Two types of cultivated sorghums, one having white mid-rib and other having dull mid-rib occur in nature. The white mid-ribbed types are found to have pithy stalks while the dull-mid-ribbed types have juicy stalks. The inheritance of this character was worked out by Hilson (1916) and he found it to be controlled by a single gene; the factor for white mid-rib being dominant. Swanson and Parker (1931) found distinct genetic factors responsible for juiciness of stalk and sweetness of the juice but did not pursue the inheritance of the latter.

B.W.X. Ponnaiya
and R. Appathurai

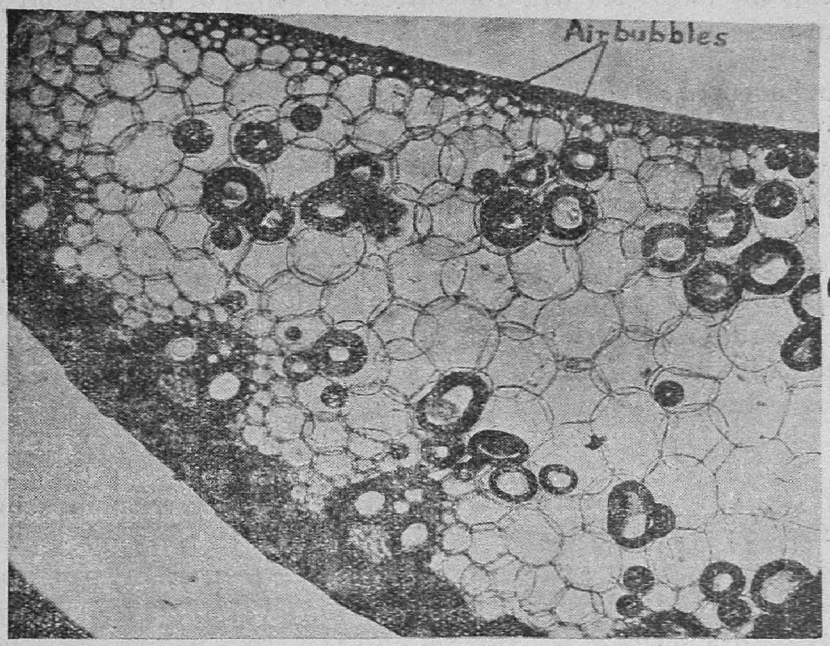

Fig. 1 (× 60)
White midrib
(note the air bubbles)

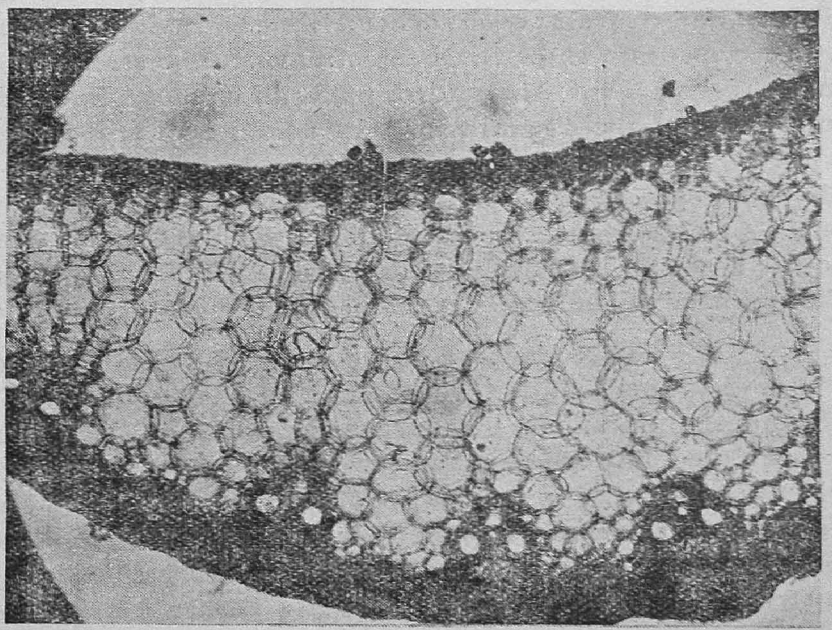

Fig. 2 (× 60)
Bull midrib

Transverse Sections of Midribs in Sorghum Leaves

Rangasamy Ayyengar *etal* (1936) found that the genes for pithy and juicy stalks to be independent of the genes responsible for the taste of juice, namely "salt" and "sweet" which is governed by a single gene. No attempt has yet been made to find out the cause of the colour of the mid rib. In this article, the cause for the formation of white or dull colour of the midrib is discussed.

Materials and method: Cholam K. 2, a vellai cholam strain of the Koilpatti tract (white midrib) and Cholam M. S. 8159 another vellai cholam selection from Coimbatore (dull midrib) were studied in detail. Both the type belong to the botanical group *Sorghum sub-glabrascens*. They were raised in separate plots and observed from sowing to harvest. When the plants were at the boot-leaf stage transverse sections of the leaf mid-ribs from the 4th leaf from the boot were examined under the microscope. The weights of entire length of the midribs from the fourth leaf from the boot (at the shot blade stage) from both the types were recorded soon after removal from the plants and after drying in the air under shade.

Experiment: (a) It was observed in both the types, the midribs are dull in colour for about 20 days from sowing i. e., untill they put forth their 9th leaf. As the seedlings grow further, a white streak is formed all along the centre of the mid-rib of the 7th or 8th leaf of the white midribbed type of plants. Only at this stage the two types can be differentiated from each other. As the plants advance in growth the other leaves also show the same streaks. The streak gradually widens to make the whole of the midrib white in colour. Even after this stage, the midribs on the leaves are dull in colour as they emerge but soon turn white as they fully emerge out. The dull midribbed variety shows no change untill about ten days after flowering. After this, the midribs begin to change colour. The midribs of the lower leaves change their colour first and those at the top, later. When the ears fully mature all the midribs of the both types become completely white in colour.

(b) The transverse section of the midribs of both the types when examined under microscope did not reveal any structural or pigmental difference. The size and position of cells were similar. However, a peculiar phenomenon was observed. Whenever the section of white midrib was mounted in glycerine and covered with a cover slip, the cells in the central portion glistened with air bubbles which was not the case in the dull midrib. But for this both the sections were identical in structure and pigmentation. (Plate Figure 1 & 2).

(c) Entire midribs of fifteen leaves (4th leaf from the top) from each of the types were removed and weighed separately at the time of shot-blade stage. They were then dried in air under shade for 10 days and were weighed again, till constant weight was obtained. The percentage

loss of weight was calculated. The loss of weight was 73·9% in the dull midrib and 57·9% in white midrib (see tables).

TABLE.

Percentage of loss due to dryage of the fourth leaf midribs to their original weight			
Nature of Midrib	White	Dull	Difference
Dryage percent	57·9	73·9	16·0
S. E.	2·7	2 0	
S. E. of the difference between means	3·2		
Significant or not	Significant		
Critical difference at 5% of level	6·6		

After drying up dull midrib shows a wrinkled appearance. Its colour also changes to white and it becomes difficult to distinguish the two types of midribs by their colour.

Discussion: Ramaswamy Ayyengar *etal* (1935) have recorded that juicy type (dull midrib) gives and extraction of 33 to 48% of juice as against 17 to 20% of juice in the pithy type (white midrib). This shows that the juicy the type has a definitely higher quantity of juice as compared to the pithy type. The experiment where the dull midrib lost 16·0% more of its weight when air dried shows clearly that the juicy stalked midrib contains more of plant juice. When this extra water content is dried up the midrib wrinkles and assumes a white colour indicating that the colour has great bearing on the juice content of the midrib. No structural or pigment differences were noted in the transverse sections of the two types of midribs. But air vacuoles were found only in the case of white midrib in the pith cells. This indicates that parenchyma cells in the white midrib are either empty or partially empty.

Summary: The real cause for the formation of the white or dull colour of the midrib in sorghum is discussed in this article. The colour is not due to any pigment, or structural arrangements of the cells. The dull colour is formed by the higher cell-sap contents.

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Pure Seed and the Need for its Renewal at Frequent Intervals

By

K. B. VISWANATHAM, B. Sc., (Ag.)
Seed Development Officer

With the intensive propaganda carried on all these years, there is practically no cultivator of rice who does not grow some strain or other of it, to suit his soil, climate and season. All have realised the importance and necessity of paddy strains but from a study of the crops grown by them, during his visits to several villages in the six districts, under his charge, the author still finds that in at least more than half the area, the purity of the strain under cultivation has not been kept up at the desired level.

If one examines the crops under general cultivation critically, he finds first of all, very many wild paddy plants that have awned and coarse grains, and secondly varieties other than the strain are also seen as mixtures which are either, early or late in duration; bolder or finer in size of grain, shorter or taller in growth, and having differring colour characters in similar parts of the plant and also with different shapes of earheads. All these admixtures are technically called 'rogues' and the loss in yield of the strain caused by them is not appreciated generally by most of the cultivators.

The chief character of the wild paddy plants is that a majority of the grain sheds from the earhead as it ripens so that by the harvesting time there will barely be very few grains on the ear. Not only is the produce lost from this shedding of grains, but another and more dangerous aspect of this shedding is that the fallen grains remain in the soil and germinate when the succeeding crop is planted and thereby cause rapidly increasing proportion of such wild plants in the succeeding years. Apart from this, the fallen grains that get under the soil during the cultural operations and have no chance of germination in the succeeding season, remain viable for two or more seasons and germinate when conditions are favourable for them. Most of these wild paddy plants have red rice while the strain is usually of white coloured rice and in milling of the paddy, greater polish has to be given to the rice to remove the traces of the red colour of the mixtures which result in loss of outturn of rice. The damage caused by the other kinds of mixtures that are usually found are also not known to many. In an early duration strain, late duration rogues remain green at the time of harvest and contribute nothing towards yield, on the other hand early plants in a late crop mature far earlier than the strain and shed their grain by the time of the harvest and thereby cause loss of yield. Presence of rogues having

bolder size grains is of the same disadvantage as that of the red rice because of the reduction of outturn of rice during milling. Contrarily, finer sized grain does not get milled along with the strain but pass through the sieves along with the rice and remain in the rice unmilled causing reduction in the quality of the rice. The other kinds of rogues interfere with the general cultural and threshing operations and reduce the appearance, quality and value of the final produce.

Most cultivators would remember that, in former days, when a miller purchased paddy, his only test about the goodness of the paddy, was to crush a sample of it between the palms and assess the outturn of rice that he was likely to get while milling, which naturally depends on the proportion of red rices and bolder or finer sized grains and correspondingly reduce the price for the paddy for samples in which these are prepondering. Of course, during the intensive procurement days the millers paid no attention to the quality of produce offered to them but such conditions are gone along with the decontrol and it is quite possible that hereafter greater and greater attention will be paid by all and particularly by the millers to the purity and quality of the produce they purchase. It is thus most imperative that hereafter only the best and pure seed is utilised to cultivate the paddy crop.

The deterioration in the quality of the strain in the hands of the ryots is never intentional but is mainly due to the inevitable and increasing proportion of the mixtures and paying no attention to their removal during the crop growth period. It is also not possible for most of the cultivators to pay timely attention to such removal and therefore the general quality of the produce is deteriorating. To keep up the existing level of production and to increase it in view of the deficit in good grains that is facing the country as a whole, every ryot must change his seed and secure good seed from the agricultural depots.

Most of the readers of the Padipantalu will remember that in the issue of October 1950 (Vol. 7 No. 10) details of the Seed Development Scheme in the state have been published. However, to recapitulate, the chief function of the scheme is to produce good seed in large quantities for the use of the ryots. Nucleus seed from the Research Stations is utilised by the special staff for initially multiplying it in ryots lands in primary seed farms under their close supervision and the seed produced from such primary seed farms is being utilised for further multiplication in the secondary seed farms under the supervision of the Agricultural Demonstrators. During the three years the scheme has been in operation, the level of purity of the secondary seed farm seed that is being distributed has been on the increase year after year as the following data proves it.

Range of purity of the seed	Particulars of percentage purity of the secondary seed farm seed in the area covered by the Kakinada Seed Development Division during the years		
	1949—1950	1950—1951	1951—1952
100%	4·17	10·2	16·0
99%	10·43	22·7	33·30
98%	25·43	28·2	31·00
97%	12·20	22·4	16·30
96%	15·25	9·7	2·50
95%	17·75	3·9	0·50
94·9% 90%	13·46	2·7	0·35
89 9% to 85%	0·96	0·2	0·05
84·9% and less	0·35	Nil	Nil
Total	100·00	100·00	100·00

From this table it is pleasing to note that the proportion of seeds having greater purity is increasing year by year consequent on the progressive efforts of the Seed Development Staff, and that in 1951—'52, the proportion of seeds of less than 97% purity is negligible. It is also to be mentioned here that not only the purity of the seed but its germination quality has been kept at a high standard and practically there are no complaints during the last three years, of paddy seed from agricultural depots not germinating.

Many ryots still have an apprehension that paddy seed supplied from the agricultural depots may not be good as was unfortunately the case in certain rare cases in previous years but now they can with greater confidence and without any hesitation obtain their seed requirements from the Agricultural Demonstrators and grow the purest possible crop on their lands and help to wipe out the deficit of food in the State. Good seed usually remains tolerably pure for at least three years in the ordinary methods of cultivation adopted by the ryots.

It must however be emphasised that with all the sincere efforts of the department, it will practically be impossible to supply the seed requirements of all the ryots in one and the same year. Hence ryots must co-operate with the department by obtaining pure seed from the Agricultural Depots once in three or four years and maintain its purity by themselves to the extent possible in the remaining years.

Plant Introduction and Improvement of Grasses and Legumes (Contd.)

By

C. RAJASEKHARA MUDALIAR, M. A.
Systematic Botanist & Professor of Botany,
Agricultural College & Research Institute, Coimbatore

PART III

Improvement of Grasses and Legumes: Improvement of grasses and fodder legumes by plant introduction has been achieved in advanced countries like U. S. A., United Kingdom and Australia.

History of Grasses and Legume improvement in America: In U. S. A., when the colonists first settled they found only two local grasses namely, wild rye (*Elymus* spp.) and broom straw (*Sorghum vulgare*). These were the mainstay for the cattle during summer; even coarse reeds and sedges of the fresh and salt water marshes had to be collected to feed the cattle. Edward (1948) records that sometimes cattle were slaughtered to keep them from starvation. The grasses from England were gradually introduced and these spread rapidly and in a few generations came to be regarded as indigenous. In 1665, English grass, a term which regularly included blue grass (Poa spp.) and white clover were reported from many places. For a very long time the pastures were not controlled and grass improvement was rather slow. By 1840 the westward movement of colonists was confronted with the prairies and the uncertainties of rainfall added to the problem of settlement. The *grasses* of the Great Plains still further west were short and they were grama (*Bouteloa* spp.), *galleta* (*Hilaria* sp.,) buffalo (*Buchlœ* sp.) and other grasses. The vastness of the prairies baffled the first settlers at first; similar problems arose on the pampas of Argentina, the grassy steppes of Siberia, and even on the grass lands of North Manchuria when the Chinese migrated there. The vegetation of the Great Plains was strikingly different from that of the United States to the eastward. The characteristic natural vegetation was grass and desert shrub; in the low plains like the prairies to the eastward the grass was tall and luxuriant. The grass of these vast plains was the main reliance for the grazing of stock; the grazing was so indiscriminate that with in a short period the indigenous forage plants were gnawed to the roots. The ultimate solution of the problem of pasture improvent was provided by the Grazing Act of 1934 which stopped injury to the public grazing lands by preventing overgrazing and soil deterioration. By this Act, 142,000,000 acres of the public lands were to be organised into grazing districts. Total land used for hay and pasture was 1,126 million acres, about 59% of the whole colony in 1945. In course of time grasses for soil conservation, grasses for pastures and grasses that are tolerent for salt concentrations were introduced.

A notable result of study has been the combining of the grass with legumes in soil conservation rotation. Sweet clover *(Melilotus* spp.*)* and grass, and alfalfa *(Medicago sativa)* and grass mixtures were developed for many grass areas. The worth of clovers has been realised and clovers from different parts of the world have been introduced. Among other pasture legumes introduced *Lespedeza* is one. *Medicago hispidia* is another pasture legume under trial. Rough pea *(Lathyrus* spp.*)* has been used in some places. Of the perennial legumes grown kudzu *(Pueraria thunbergiana)* and birdsfoot trefoil *(Lotus corniculatus)* are most important. Velvet bean *(Stizolobium spp.)* and *Crotalaria* spp. are other introductions in the pastures. Among the *Crotalarias, Crotalaria intermedia, C. mucronata* and *C. lanceolata* are grown for pasturage. The following are some of the important grass introductions:—

Agropyron cristatum (Crested wheat grass): Introduced from Russian Turkestan (1898). This is one of the forage grasses that has well established.

Axonopus cimicinis (Carpet grass): A native of Central Amercia, and West Indies; introduced in U. S. A. before 1832. It now grows in the tropics of both hemispheres.

Bromus catharticus: A native of Argentina, was introduced about 100 years ago. A short lived perennial.

Bromus inermis: Native of Europe, Siberia and China, introduced into the U.S.A. in 1844; it is adopted especially for a grass-legume mixture.

Rhodes grass (Chloris gayana): Introduced in 1902 from South Africa. First cultivated for pasture. Withstands trampling and recovers quickly. Also yields leafy hay.

Dactylis glomerata: A native of Europe, it is now grown in many parts of U. S. A. Forms a good mixture with *Lespedeza.*

Eragrostis curvula: Introduced from South Africa. Well adapted to southern plains.

Tall Fescue (Festuca elatior var *arundinacea):* Was introduced from Europe. It is drought resistant.

Napier (Pennisetum purpureum): Introduced from Africa; grown in many parts.

Forage Sorghums: Sudan grass *(Sorghum vulgare* var. *sudanense)* Introduced into U. S. A. in 1909 from Africa.

Jhonson grass (Sorghum halepense): Introduced from Turkey in about 1830.

The following are among the most important legumes of U.S.A.:—

Lespedeza: Only two species are annuals and these are natives of Asia, and these have revolutionised agriculture; over some 20 million acres of lime-deficient sandy land are under this crop.

The trefoils (Lotus spp.*):* *Lotus corniculatus* and *Lotus uliginosus.* These have been introduced from the Old World within the past 20 years. They are good for pastures, mixtures and give good hay.

Medicago sativa: (alfalfa): A native of Mediterranean. One of the most important forage crops of the United States. It is now grown in 15 million acres in U. S. A,

Kudzu (Pueraria thunbergiana): A native of Japan introduced in U. S. A. in 1876. Now about 300,000 acres are under this plant. Used for hay, pasturage and control of soil erosion.

Velvet bean (Stizolobium spp.*):* Vigorous, summer annual. A native of India, introduced in Florida a century ago. For soil improvement, especially sandy soils, velvet bean has been found to be one of the best crops.

True clovers (Trifolium spp.*):* More than 80 species are indigenous to U. S. A., but the native species proved to be of no Agricultural value. The origin of true clovers is believed to be South Western Asia Minor and South East Europe.

Grass and Legume Improvement work in Australia: A number of temperate and tropical legumes were introduced in Australia for the possibility of using them for the following purposes:—

(1) Pasture, (2) Grass land renovation, (3) Soil conservation, (4) Green manuring.

Pasture forms one of the mainstay of Australian agriculture. Schofield (1941) records that Queensland alone gave a return of £ 30,000,000 out of a total of £ 44,000,000.

From the trials it was concluded that temperate legumes are useless under coastal conditions. Among the numerous types of lucerns, trifoliums and Lespedezas under trial not one of them established.

Among the tropical legumes introduced the following deserve mention:—

(1) *Stylosanthes guianensis,* SW: A native of Brazil, found valuable for pasture or hay.

(2) *Centrosema pubescens, Pueraria phaseoloides* and *Calopogonium mucunoides* have established as good cover crops; these have also been found very useful for grassland renovation, and soil conservation.

Among the grasses introduced, the following were found to be outstanding:

Phalaris stenoptera, Dactylis glomerata and *Phalaris tuberosa.* Those of average performance were *Bromus inermis* and *Festuca elatior.*

The following grasses were found suitable for mixture with subterranean clover.

Festuca mairei, Phalaris tuberosa, and *Bromus inermis.*

The grasses that were outstandingly productive despite dry season were :—

Bromus arduennensis, Dactylis glomerata and *Bromus inermis* etc. Pasture improvement along four main lines are suggested for Australia by Mctaggart (1940).

(1) Use of superphosphate and subterranean clover to raise the carrying capacity.

(2) The sowing of pasture species mainly confined to the areas of liberal rainfall.

(3) Improvement in methods of pasture management.

(4) The recognition and selection of improved strains of pasture species.

India : The improvement of grasses and legumes in India has been sporadic as already pointed out. This work was taken up in Delhi from about 1946 onwards, and several grasses and legumes have been under trial. From Delhi, seeds were distributed to different centres. Apart from this there has not been any concerted action for improvement of grasses and legumes. But by individual efforts very important grasses and legumes have been introduced in India for the past seven or eight decades. Outstanding among those introductions are :— *Napier grass* (Elephant grass) : *(Pennisetum purpureum) :* This is a native of Southern Rhodesia and the sets of this grass are said to have been imported in Bombay in 1915 as reported by Mann (1926). In Madras State, however, the slips and seeds of this grass were obtained direct from South Africa and tried at the Central Farm, Coimbatore (1917). In Bengal this was introduced only in 1927 from a third source, namely, Peredeniya, Ceylon. This is at present one of the important heavy-yielding fodder grasses all over India.

(2) *Guinea grass (Panicum maximum) :* This is also a native of Africa. It appears to have been cultivated in West Indies, Jamaica long before its introduction in India. In Jamaica it is said to have been introduced about 1774, from the Coast of Guniea under interesting circumstances. It is stated that one John Ellis got some birds from Guinea and took them to Jamaica, and with the birds, some seeds also for feeding. The birds died soon after they reached Jamaica, and the seeds were thrown out as useless. From these seeds a luxuriant growth of grass was noticed by Ellis, which was later cultivated in his garden, from where it spread throughout Jamaica. It is not exactly known as to when and by whom Guinea grass was introduced in India, but it is reported to have been successfully grown by J. Bell, Secretary to the Agri-Horticultural Society in Madras in 1831. This grass was cultivated on a field scale in Saidapet Farm (1837). This is now one of the widely grown irrigated fodder grasses ; this has been observed to thrive remarkably well under sewage conditions in Coimbatore, Madurai, Bangalore

and other places. Under purely rainfed conditions its performance was observed to be satisfactory in Pattambi (Malabar) and Hosur.

(3) *Buffalo Grass (Brachiaria mutica):* This is a native of West Indies. It was introduced by Charles Camphell in 1804 into the Calcutta Botanical Gardens. It was said to be introduced in Poona in 1896. In Madras State, it was first noted in Quilon, where it was cultivated in an intensive scale. It is believed that this grass must have been introduced into Quilon from Ceylon by some private persons.

(4) *Thin Napier (Pennisetum polystachyon):* This has spread in India from Tropical Africa and is found to be one of the best grasses under rainfed conditions for heavy rainfall tracts of the West Coast; this has now spread rapidly by self-sown seeds; in Wynaad and Taliparamba it is spreading vigorously and has occupied all available waste places and hill slopes suppressing other grasses and weeds.

(5) *Lucerne (Medicago sativa):* Although lucerne is considered a native of Western Asia according to De Candolle and hence thought to be largely used in India from time immemorial, there is no evidence of its having been grown in India more than 130 years ago; but it appears to be certain that it entered India from North West. This is also one of the widely cultivated leguminous fodders under irrigated conditions.

(6) *Berseem (Trifolium alexandrinum):* This is a well known fodder legume of Egypt and known by the popular name Egyptian clover. It was first introduced in Sind in 1904; it was conclusively proved by trials that berseem is one of the very valuable introductions for Sind. It has proved to be one of the best leguminous fodders. It grows in soils which are slightly saline and hence used in the reclamation of saline soils.

Research of grasses and legumes: Concentrated action to improve the grasses and forage legumes was taken by the Indian Council of Agricultural Research in formulating a model scheme in 1951. The participating States were required to prepare a scheme based on the model scheme. A scheme was prepared by the Madras State and submitted for approval by the Indian Council of Agricultural Research, and this awaits sanction. According to this scheme indigenous and exotic pasture grasses and legumes are to be obtained from the Indian Council of Agricultural Research for testing and pure line selection. Hybrid material of F_2 stage is to be supplied from Delhi for breeding and selection of plants, the following desirable characters have to be watched: wide adaptability, good seeding habit, low water requirements, resistance to disease, drought and frost and response to manuring. The experiments have been programmed to be taken up at three different centres, namely, Coimbatore, Hosur and Siruguppa.

Agronomic investigations include, application of organic and mineral manures, grass legume mixture, controlled versus indiscriminate grazing etc.

Madras: In Madras State grass improvement work was preceded by a preliminary survey of the Grass flora; Jacob (1939, 1942, and 1944) has surveyed parts of Travancore and Madras State and recorded the indigenous grasses. He has also drawn a grass map of Madras State showing principal annuals and perennials Chandrasekhara Ayyar, et al, (1949) have surveyed the grasses and legumes of Coimbatore district and enumerated the list of fodder grasses and legumes. The first intensive study of the grasses was made in the Botany Section of the Agricultural Department by raising some of the important perennial grasses of the State and multiplying the mass selected bulks. This work was gradually expanded when new introductions were received either from other parts of India or from outside. From out of the 150 grasses and 60 fodder legumes received in this Section, America contributed 40 grasses and 4 legumes, Ceylon 24 legumes and United Kingdom 6 grasses. Besides these a few species were received from Armenia, Singapore, Peru and other parts. The total number of plants tried including exotic and those received from other parts of India is 480. The performance of the following among the introductions deserve mention:

Grasses: *Eragrostis curvula:* An introduction from Amercia, was tried at Ootacamund and Nanjanad, and very vigorous growth was recorded in spite of frost.

Bromus inermis: Introduced from America and tried in Ootacamund and Nanjanad. Growth was very vigorous at Ootacamund and promising.

Dactylis glomerata, Eragrostis lehmaniana and *Eragrostis chloromelas*: All introductions from America, were tried at Nanjanad and found to be good.

Panicum antidotale: An introduction from Australia in 1932 has been found to posses drought resistant qualities. It has been found successful in some parts of Madras State, As it seeds freely and the seeds give a high percentage of germination, its propagation has been made very easy.

Chloris gayana (Rhodes grass): An African introduction has performed very well at Coimbatore. This has been independently introduced in Banaglore and is one of the best grasses raised under sewage conditions. In Hosur it is cultivated as a pasture grass.

Cynodon plectostachyum, Pilger — (Giant star grass): This is an African introduction introduced in 1940. It was found to be very good

for soil binding. It is being tried for soil conservation purposes along earthen embankments of tanks, irrigation channels etc.

Cenchrus ciliaris: (Bangalore variety): This was obtained from the Indian Diary Institute, Bangalore, where also it is stated to be an exotic grass. It performance at Coimbatore under dry rainfed conditions was very good. This has been distributed to different parts of the State and is well reported upon.

Among the leguminous forage crops introduced, the following deserve mention :—

Indigofera endecaphylla: Though indigenous to India, seeds were obtained from Delhi and Ceylon. Its performance was observed to be best in higher altitudes with heavy rainfall such as Anamallais, Araku-valley etc. In Anamallais, this has been observed to form a good mixture with the local buffalo graas, called *Paspalum platycaule.* As a soil conserving plant it was found to be excellent ; along with the local grasses it was found to give best mulch and cover for the soil. Efforts are being taken for its large scale multiplication.

Trifoliums: (clovers): *Trifoliums* spp. have been recently introduced from Africa and distributed to the Research Stations in the Nilgiris for trial. It has been observed that in the Nilgiris, *Trifolium* spp. particularly *Trifolium repens* and *Trifolium subterraneum* have already become naturalised at elevations of about five to six thousand feet ; but it is not known as to when it was introduced in the Nilgiris. They have also been found to form good mixtures with *Pennisetum clandestinum* and *Paspalum platycaule* and other grasses.

Calopogonium mucunoides, Desv. : A native of Tropical America, is said to have been introduced in Burma in 1920. This is grown extensively in rubber estates; this adapts itself to any soil but thrives best in heavy rainfall tracts, within six months of its sowing it covers the soil completely. This has been introduced in the West Coast rubber estates long ago, and is regularly being grown as a cover crop. This was introduced in Wynaad and Ambalavayil Farms and has established very well in all waste places; the fodder is also relished by cattle. Large quantities of seeds have been distributed all over the State to be raised as cover crops. In the east coast it has been successfully raised in Arakuvalley and Narasapatnam.

Pueraria phaseoloides: (Tropical Kudzu): This is a popular cover crop in rubber plantations in India, Ceylon, Indo-China, and Malaya. The trials in Madras State revealed that it is best suited to heavy rainfall tracts such as Mangalore, Burliar, Nileshwar, Wynaad and other places. Seeds have been distributed to these tracts for extension in all hill slopes.

Centrosema pubescens: This a tropical American plant growing wild in Trinidad and introduced successfully in Malaya, Ceylon and South Africa. It has been observed to grow vigorously and spread over a large space in a short time. In the trials at Coimbatore this has been observed to withstand dry weather and form a good cover. This is now under trial in heavy rainfall tracts such as Nilgiris, Malabar, South Kanara and Arakuvalley. From the reports received so far, its performance was not so good as kudzu or *Calopogonium*. All these three cover crops, namely, *Centrosema pubescens*, *Pueraria phaseoloides* and *Calopogonium mucunoides* have been used as fodder and found suitable in Australia.

Glycine javanica: This is used as fodder legume in Southern Rhodesia as recorded by Sampson (1932); this was collected in one of the surveys near Coimbatore on a rocky hill slope. The seeds were collected and tried at Coimbatore; it formed a good cover and at the same time found to be a good fodder.

Conclusion and suggestion for improvement and development: From a survey of the Plant Introduction work, it is clear that in countries like U. S. A. and Australia to start with, there was a great dearth of economic plants, and by strenuous and carefully planned work by means of a 'Plant Introduction Bureau', phenomenal success has been achieved in the matter of food self-sufficiency. Raw plant materials for vast industrial development have been produced by developing excellent pastures grown with nutritive grasses and legumes, milk and dairy products were produced in such large quantities as not only to meet their home requirements, but also to export to other countries. An efficient 'Soil Conservation Service' has been organised and steps were taken to control erosion on steep slopes, in severely eroded areas, in waterways, on high banks, and in the treatment of gullies, by introducing suitable over crops like 'kudzu' from Japan.

In the U. S. A. the first shipment of Sorghums, Martin (1940)–from South Africa in 1857 formed the nucleus, and hundreds of other Sorghum varieties from different tropical contries, followed suit, and to-day the prairie lands of the semi-arid west are regularly cropped with drought-resistant Sorghum species. The U. S. A. now grows about 8,000,000 acres of grain sorghum and 2,000,000 acres of sweet sorghum for fodder purposes. The same story repeates itself in the case of Australia also with regard to wheat, fruits and fruit products.

All this achievement in America and Australia is undoubtedly due to the formation of an organisation for plant exploration and introduction. The formation of such an organisation in India cannot but be too much over emphasised. Pal (loc cite) has emphasised it, and Parthasarathy (loc cite) has reiterated it with equal force.

From a study of the plant introduction work in other countries and in India it is suggested that the following improvement and development are worthy of consideration by the authorities.

(1) *Formation of an efficient Plant Introduction Bureau:* This work which now forms one wing of the Department of Botany in the Indian Agricultural Research Institute, Delhi, may be formed on the same lines as in U. S. A. or Australia. When such an organisation is formed, the useful information so far gathered by sporadic introductions, will form the basis for future work on more advanced lines. The material received by the bureau may be passed on to different states. The seed material received by the States may be passed on to the Department of Agriculture, for trial by the Section of Botany. In each State, 'Plant Introduction Gardens', have to be located in different parts so as to represent different climatic and soil types. In Madras State such a nucleus organisation was functioning already during 1947 to 1949. In the selection of sites for 'Plant Introduction Gardens' the best land in the selected locality must be earmarked, with good irrigation facilities.

(2) *Systematic survey of plant wealth:* It is admitted on all hands-Chopra (loc cite)-that the vast plant wealth of India has not yet been completely explored. It is suggested that the 'Botanical Survey of India', which was still recently functioning has to be revived. The Government of India have already taken action in this respect by the appointment of a Special Officer for the re-organisation of the 'Botanical Survey of India'. When the Botanical Survey of India is revived, it can be the central organisation co-ordinating the work of branch organisations in each of the States. Intensive survey work can be taken up in each State and district floras compiled and published. In Madras State intensive survey of local floras has already been taken up and much progress has been made.

(3) *Improvement of grass and forage legumes:* "Fodder crop as such is grown only over about 4·6 lakhs of acres in Madras State"—Krishnaswamy, et al (1948)-The same authors quote the fodder production from all sources as 33·75 million tons, dry roughage, which works out at 4·91 lb per day cow unit. The authors recommend that 'fodder will have to be grown as a pure crop to bridge the gap between demand and the supply'.

As already pointed out a Scheme for the improvement of grasses and legumes has been drawn up on the lines of the Model Scheme suggested by the Indian Council of Agricultural Research. The main object of the scheme is the establishment of a chain of grass and fodder research stations in well defined regions of the State both under rain-fed and irrigated conditions; the scheme also contemplates the study of the

nutritive value of grasses and fodder crops that give the maximum yield. The programme of work in brief includes (a) the trial of indigenous and exotic grasses; (b) breeding of hybrid material. In this connection Larin (1951) states that introduction into cultivation of wild species has been observed to be a quicker method of developing new forage plants than breeding from existing cultivated varieties. The author quotes as example the increased yield obtained in growing wild forms of *Fescue* and *Dactylis glomerata* than the cultivated local varieties. The experience of the Russian worker is well worth consideration in the breeding programmes that may be contemplated; (c) Agronomic investigations regarding grass — legume mixtures, cultural, irrigational and manurial requirements etc.; (d) investigation on controlled and indiscriminate grazing in collaboration with the Forest Department.

It is suggested that the scheme as recommended by the Indian Council of Agricultural Research merits top priority, so that the fodder supply of the State is placed on a sound basis.

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Trade Notes:

The receipts of loose cotton at presses and spinning mills in the Madras State from 1st February 1953 to 26—6—1953 amounted to 160174 bales of 392 lb. The receipts in the corresponding period of the previous year were 163648 bales. 181853 bales mainly of pressed cotton were received at spinning mills. No bales were imported by sea during the week ending 26—6—'53 the progressive totals being 4623 bales exported and 49968 bales imported from 1—2—1953 to 26—6—1953.

A Note on Camphor Industry in Madras State

(Received from the Director of Agriculture, Madras)

There are two sources of obtaining camphor. One is from the leaves, twigs and stems of the Camphor tree (Cinnamonum camphora) and the other is from the leaves of the camphor plant (Ocimum Kilimajaricum) (syn. Ocimum camphora).

Cinnamom camphora or tree camphor: Rao, et el (1925) state that though the tree can be cultivated in all parts of India with an annual rainfall of 40" and over, its cultivation as a commercial enterprise is not profitable. Deo (1949) states that India has failed to produce camphor from Cinnamomum camphora (tree camphor) though it has been successfully cultivated in Dehra Dun, Saharanpur, Nilgiris, Mysore etc.

On the Nilgiris, about 40 acres were put under the tree-camphor between 1937 and 1945 in Halacarai Estate near Coonoor belonging to Messrs. T. Stanes & Co., Coimbatore. The yield per acre worked out to 60 lb. of camphor and 10 lb. of camphor oil per year whereas in U. S. A. and Ceylon the average yield is 125 to 150 lb. of camphor.

There are about 25 large sized camphor trees of about 75 years of age in Mangalam Camp Estate (near Sultan's Battery) in Wynad, belonging to Messrs. Techno Chemical Industries Ltd., Calicut. During the past three years, they have also planted about 150 seedlings (rooted shoots separated from the old stumps) in the same Estate and all these plants are reported to be growing vigorously. They have also planted a few grafts of camphor obtained on Cinnamom seedling root-stock, but the growth of these grafts is reported to be poor.

Camphor trees exist now in the following Agricultural Research Stations:

Government Botanical Gardens, Ootcamund: Two large sized trees, and also a plantation of 100 trees above the Mazdoor lines.

Sim's Park, Coonoor: One large sized camphor tree.

Fruit Station, Burliar: One large sized and one small sized tree.

Agricultural Research Station, Taltparamba: 21 small sized trees of about 35 years of age but with stunted growth. Camphor extraction was attempted for the first time in December 1952.

Agricultural Research Station, Ambalavayal, Wynad: Six seedlings were planted in 1951 and those are coming up well.

The camphor tree has not been found to develop viable seeds in any of the places where it is grown in this State, though the tree has been found to flower at Coonoor and Burliar. It is, however, reported that the tree develops seed at Dehra Dun. The Forest Research Institute, Dehra Dun supply fair quantities of seed to indenters. Messrs. Techno Chemical Industries Ltd., got supply of seed regularly for the past 3 years from the Forest Research Institute, Dehra Dun.

It is also reported that the Silviculturist, Ootacamund has a few hundred well-grown seedlings for distribution. Cuttings of young leaves as well as mature leaves and twigs from the camphor tree can be taken for extraction of camphor, only when the tree is about 15 years of age and over. The percentage of crystalline camphor obtained is reported to be 1·5% of the fresh leaves and twigs. The camphor and camphor oil is obtained mixed together, and the oil portion is

separated by pressing in hand press and fractional distillation and fractfonal crystallisation. From a recent trial disillation at Agricultural Research Station Taliparamba by an improvised method, about 2% of crystallined camphor and camphor oil was obtained. The percentage of camphor and oil obtained at Halacarai Estate in Nilgiris and in the Mangalam Camp Estate in Wyanad is reported to be 3%.

In this State, the Wyanad, the Nilgiris, Kodaikanal hills and the Shevroys are the most suitable places for growing camphor trees, since this species grows well in hills rather than in the plains. At Arakku, the camphor trees are coming up well and these trees are noted in Anantagiri on the way to Arakku. From 15 year old trees about 50 lbs. of camphor and about 25 lbs. of oil may be obtained anuually per acre. Therefore, unless the price of camphor is about Rs. 5/- per per pound, it may not be worth-while to grow camphor trees on a commercial scale. The price of Japan camphor came in the Madras city down from Rs. 3—8—0 to Rs. 3—0—0 per pound 1952. The comparatively low yield, a period of 15 years and over to become fit for cuttings of leaves, uneconomic price level of camphor—all these lead to the conculsion that the cultivation of the tree-camphor does not hold out much promise in this State.

Ocimum Kilimanjaricum (Syn: Ocimum Camphora): Dec. (1949) has recorded that this new plant begins to yield camphor after about 4 to 6 months of its introduction and that 3 to 4 cuttings can be taken per year easily. The plant is not grazed or browsed by animals. The leaf yields camphor. After harvest, the leaves can be cut, dried and stored without loss of camphor. It is an additional point in its favour that dried leaves can be sent to distilling centres for extraction of camphor. This plant develops such a good root system that the hill slopes can be protected from soil erosion by the growing of this species of plant. It is understood that the Forest Department has already introduced this plant in "Top Slips" (Nilgiris) for preventing soil erosion.

In the Mangalam Camp Estate in Wyanad, Messrs. Techno Chemical Industries Ltd., have planted about 1,000 seedlings and it is reported that these plants have made excellent growth. The firm has also extracted camphor from the leaves of this plant. A few thousand seedlings are also raised by them for planting in the next monsoon season. This plant is also reported to be grown on a small scale on the Shevroys (Salem district) by one individual planter. In northern India, particularly near Dehra Dun, this plant is reported to be growing semi-wild and also as a cultivated crop.

Ocimum camphora: Has been introduced for trial in the Agricultural Research Stations in Tallparamba and in Wynad and a short account of work done is given below.

At Agri. Res. Station, Ambalavayal in Wyanad: In 1950, a few seedlings were raised with seed obtained from Messrs. Techno Chemical Industries, Ltd., and planted out on the station. In 1951, some seed was obtained from the 1950 crop with which seedlings were raised and there at present 200 seedlings growu on the farm.

About 12 Ozs. of seed collected in this station were sent to the Government Lecturing and Systematic Botanist Coimbatore in 1952 for distribution to various Agricultural Research Stations for trial.

Six pounds of air-dried leaf were sent to the Curator, Ooty in 1952 for extraction of camphor and it is reported that camptor was extracted from it.

Agri. Res. Station Taliparamba: 236 seedlings were planted in August 1952 but the plants have not made very satisfactory growth, probably due to failure of

monsoon during the year. Recently 5 lb. of leaves were collected from these plants and camphor was extracted.

The seeds of *Ocimum camphora* can be had from (i) the Forest Research Institute, Dehra Dun, (ii) the Secretary, Agri-Horticultural Society, Bangalore, and (iii) Messrs, Techno Chemical Industries Ltd., Kozhikode. The Agricultural Research Station, Ambalavayal and the other Agricultural Research Stations to which the seed was distributed by the Government Lecturing and Systematic Botanist, may be able to supply a few pounds annually in the years to come.

Regarding yield, it is reported that in Dehra Dun the yield of camphor for *Ocimum Camphara* per acre is 18 lbs. per acre per year in addition to which about 60 lb. of oil can be obtained per acre per year. The Pepper Specialist, Taliparamba has however, reported that from an acre of *Ocimum Camphora* it may not be possible to obtain more than about 40 lbs. of camphor annually. Messrs. Techno Chemical Industries Ltd., get about 1% of camphor from the leaves of this plant grown in their Estate in Wynaad. At the Agricultural Research Station Taliparamba, five pounds of fresh leaves was recently distilled and 0·75% of camphor was obtained. The camphor was found to be of excellent quality and not mixed with oil.

Wynaad, Yercaud and Anamalais appear to be the most suitable places for this species of plant for the reason that the plant makes excellent growth even under purely rainfed conditions. The West-coast may also prove suitable for growing this plant as a purely rainfed crop.

In view of the low price level for camphor, it would not, perhaps, be profitable to grow *Ocimum camphora* as a pure crop, but it is worth-while to grow this as an inter-crop in plantations of coconut, mango, pepper etc.

Ocimum camplora appear to hold out good promise for development of camphor industry in this State on a large scale for the following reasons :

(a) The plant is said to grow in any kind of land which is unfit for any other cultivation (such as waste lands in forest areas) as a purely rainfed crop. (b) The plant begins to yield camphor after about 4 to 6 months of its introduction and 3 to 4 cuttings can be taken per year easily. (c) The plant is not grazed or browsed by animals and even the dired leaves can be distilled for camphor extraction. (d) The plant serves as a preventor of soil erosion in places where it is grown. (e) An average yield of about 40 lb. of camphor can be expected from one acre of this crop per year.

Data pertaining to imports and prices of camphor: India depends practically for her entire requirments of camphor on foreign countries. The important countries from which camphor is imported are Japan, Formosa, Hongkong, U. K., and U S. A. The quantity of camphor improted into Madras State has been increasing year after year after the war, as shown below :—

Year.	*Imports by sea.* (in pounds)
1944—45	124
1945—46	8,702
1946—47	48,873
1947—48	2,37,096
1948—49	2,89,123
1949—50	3,82,630
1950—51	5,89,240
1951—52	6,22,981

The prices of camphor have, of late, come down as shown below :—

Period.		*Price of Japan camphor in Madras City,* (per pound)
1951	January	Rs. 6—6—0
	July	,, 4—2—0
	December	,, 3–10—0
1952	January	Rs. 3—8—9
	April	,, 2–15—0
	July	,, 3—0—6
	October	,, 3—0—0
	December	,, 3—5—0

No survey of the camphor industry has been made in this State and details of production of camphor in Madras State are not available. No commercial quantities at economic levels could be produced so far in this State and that only feeble attempts to manufacture camphor have been made here and there.

Mofussil Notes :

The Silver Sickle (Crop Competition)

The phenominal yield of 12,000 lb. (wet grain yield) by the State prize winner attracted the attention of every one in the state including Sri K. Subbayya Naidu and two others of Vedullavalasa village, Narsannapeta Taluk of Srikakulam District. As has already been stated by Sri K. Subbayya Naidu in his experiences (Published in Vol. 9 No. 9 September 1952) in the Padipantalu he took it very seriously and attempted to reach that yield by intensive cultivation. His attempt in 1951–'52 gave an acre yield of 9,660 lb. (wet grain yield) thus raising the rank of Srikakulam district to the second place and securing for him the Regional prize for the Visakhapatnam region.

Many cultivators in this and the neighbouring districts still disbelieved the possibility of producing such a heavy crop as 9,666 lb. (58 bags) and almost challenged Sri K. Subbayya Naidu to repeat his performance. While several others, of his own village tried to emulate his method of cultivation and few of them entered into the crop competition of 1952–'53. To meet the challange Sri K. Subbayya Naidu has cultivated the same land in 1952–'53 season also, using similar methods of cultivation. He has grown a mixed green manure crop of sunnhemp, Pillipesara and Sesbania which was estimated to have yielded green leaf at 6,000 lb. per acre. To supplement it, he has carted an additional quantity of 4,000 lb. per acre of green leaf consisting of calotrophis and wild indigo. The entire quality of green manure was puddled and at the time of the final ploughing Super Phosphate at 264 lb. per acre and Ammonium Sulphate at 132 lb. per acre were also

puddled into the soil. Well grown seedlings of MTU. 19 were transplanted on 1st August 1952. In the middle of September a top dressing of 'Parry's mixture' manure at the rate of 801 lb. per acre was applied at the time of weeding. In the middle of October another application of Ammonium sulphate and Super phosphate at the rate of 130 lb. and 65 lb. respectively was made. The crop grew and tillered very well. Sri K. Subbayya Naidu adopted three different spacings in the plot. In 70 cents he planted the crop at a spacing of 18″×18″ while in 50 cents the crop was planted at 12″×12″ and in the remainder of 50 cents the spacing adopted was 12″×10″. Just a fortnight before the harvest, counts of ear bearing tillers were taken by the Seed Development Officer, Kakinada with the following results.

Spacing	Average No. of tillers per plant	Calculated tillers per unit area of 20 Sq. ft.
18″×18″	15·5	137·7
14″×12″	12·0	205·7
12″×10″	9·6	230·4

Seeing that the closer spacing has given the maximum number of tillers per unit area and thereby is likely to produce the maximum yield, he has selected that part of the field for harvesting for crop competition. Ten cents of area was first harvested by the Agricuitural Demonstrator, Narsannapeta, Sri J. Suryanarayana in the presence of the local competitors and the public and a yield of 9234 lb. of wet paddy per acre was obtained. Since the yield is over 8,000 lb. the District Agricultural Officer, Srikakulam was wired for and on 9—12—1952 another patch of ten cents was harvested by Sri P. Somayajulu, the then District Agricultural Officer, Srikakulam. It so happened that the Seed Development Officer, Kakinada was also present at the time of the harvest. Most of the competitors of the village and some leading ryots of the district were again present and after threshing, the yield recorded was 9,110 lb. of wet paddy per acre. If the usual allowance for dryage of grain of 15% is allowed the yield of the dry weight of the production per acre is 7,744 lb. or 46 bags and 108 lb. which really is very good. From the scientific aspect, the main feature of the Japanese method of cultivation of rice are adopted in the cultivation methods adopted here namely, (1) Application of heavy dose of green manure (2) incorporation of fertiiiser in the soil so that it is readily and for a long time available to the plant at its root zone and (3) the closer spacing. The strain MTU. 19 used being a comparatively nonlodging one, the crop did not lodge till the ripening stage of the earhead and even thereafter, it has not completely and flatly lodged to damage either the grain or the straw.

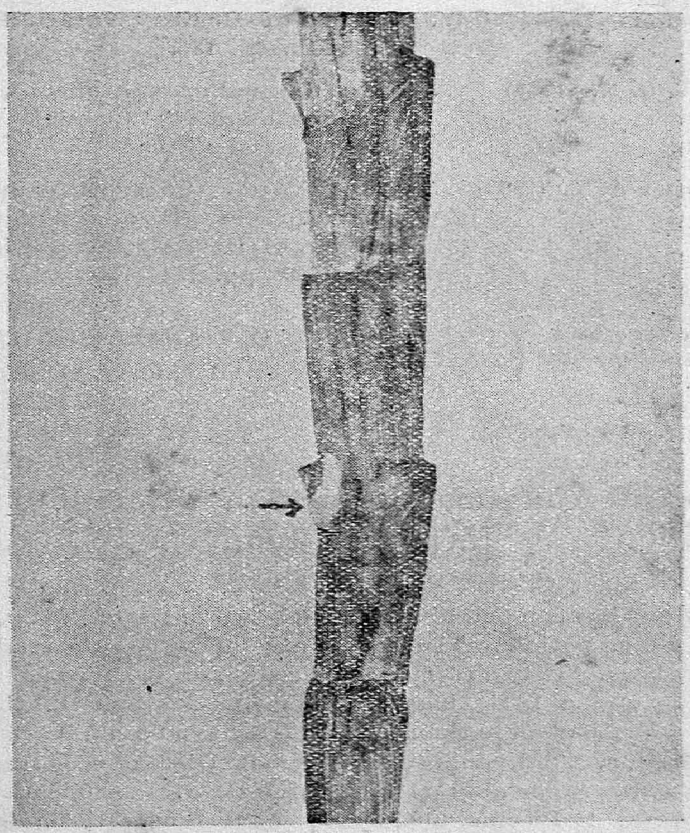
Seeing the result of this comptition the spirit of producing more by adopting the above methods has taken hold of many cultivators who have determined to cultivate their entire holdings with the improved methods in the next year. The noteworthy event which requires mention in this connection is that the enthusiasm of the taluk ryots in the achievement of high production prompted them to honour Sri K. Subbayya Naidu at a public function organised by them at Narasannapeta on 21—12—1952 presided over by Sri L. Lakshmanadas, M. L. A. and presenting him with a SILVER SICKLE with ivory handle in the presence of Sri M. B. V. Narasinga Rao, the Paddy Specialist who by chance was touring in the area at the time.

K. B. Viswanadham,
Seed Dev. Officer
Kakinada.

Research Notes:

Growth From a Dried Specimen of *Dendrobium aqueum* Lindle

In October 1952, a specimen received from Sri Jackson of Travancore Tea Estates, Vandiperiyar (P. O.) was identified in the Madras Herbarium as *Dendrobium aqueum* Lindle. This is an epiphytic orchid commonly found in Western Ghats at elevations ranging from 3,000 to 7,000 ft. The specimen was left in a brown paper cover for incorporation later on. On 15th of April, 1953, when the specimens were sorted out for poisoning and preservation, the stem of *Dendrobium aqueum* Lindle was noted to have a bud development to over 3 mm. in length (vide photograph). On careful examination, it was noted to have another similar but smaller bud development.



Singh (1933) has recorded the production of buds on dry specimen of *Coleus barbatus* Benth belonging to the natural order Labiatae, a fortnight after the collection of the plant while changing the drying sheets. Natarajan (1950) has recorded the occurrance of fresh buds growing from the dry terminal distal ends of the herbarium specimen *Portulaca tuberosa* Roxb. belonging to the natural order Portulacaceae fifteen days after its collection.

The editors of the Journal of Bombay Natural History Society, (1950) have recorded their experience of the dried tubers of *Euphorbia khandalensis* Blatt bursting into flowers six months later; and after leaving it in formaline fumes for

one year when planted in a pot, it continued to flower and fruit for more than eight years. They have also stated that it is common experience in Bombay to find epiphytic orchids growing even after they have been dried, pressed and attached to the herbarium sheets; but no specific instance has been given.

The present case of growth from the dried specimen of *Dendrobium aqueum* is interesting in that the growth is after a change in climate from the very hot weather to the humid and rainy weathers experienced at Coimbatore at that period. The atmospheric humidity was ranging from 70% to 75% during the hot period and with the continuous summer showers received, the humidity rose above 82% and reached even 97%. This increase of humidity of the atmosphere had envigorated the buds of the more or less dried specimen to grow. This indicates the efficient adaptability of the epiphytic orchids in utilizing the moisture of the atmosphere even without the special tissues as velamen.

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Agricultural College and Research Institute, Coimbatore

D. DANIEL SUNDARARAJ & GIRIJA LAKSHMANAN

Production of Abnormal Leaves in Groundnut—Arachis Hypogea, Linn.

The groundnut has compound leaves with two apirs of leaflets situated close to each other on a long petiole. The leaflets are opposite, sub-sessile with a short pulvinus at the base. They are medium sized, i. e., 3·6 cms. × 1·8 cms. in the spreading varieties and a little bigger, 5·1 cms. × 2·4 cms. in the bunch types. Instances where a leaf had more than four leaflets have been noticed at the Agricultural Research Station, Tindivanam (South Arcot District—Madras). The supernumerary leaflets are invariably smaller in size, i. e., 2·0 cms. × 1·1 cms. in spreading and 3·5 cms. × 1·6 cms. in the case of bunch types. Their number varied from one to three per leaf. Normally two or three such leaves occur in one plant in the bunch and rarely two in the spreading type but in the East African variety AH 6668 'Teso bunch' as many as ten abnormal leaves were counted. The attachment of these leaflets to the main rachis is peculiar, they are not distributed like the normal leaflets but are found attached to a small pulvinus which appears to be a branch of the pulvinus of the normal leaflet. In some cases, the leaf blade is not developed and a stipule like spur is noticed in place of the abnormal leaflets (vide plate). This abnormality, was not confined to any single variety but was noted in all the 37 bunch and 49 spreading varieties raised on the station. But this occurence was more common in the bunch types than in the spreading types. In

the variety AH 262 'Improved Spanish' the occurance of abnormal leaves with 7 leaflets was more common. The abnormal leaves are produced when the plants are about a month old and immediately after the receipt of heavy rains following a severe drought. The leaves produced subsequently are normal.

The reason for this abnormal behaviour is rather difficult to assess. Since none of the other species of Arachis have been reported to have more than four leaflets it cannot be attributed to ataavistic tendencies. Possibly, it is only an attempt to get rid of the excessive water content and in this respect it may bear resemblence to the production of diminutive leaves in rainy weather in the case of the normally cladode and phyllode bearing plants like Opuntia delinii, Casuarina equisetifolia, Parkinsonia, etc.

Agricultural Research Station, Tindivanam

M. BHAVANI SHANKER RAO
N. SRINIVASALU

Review

'Plant Protection in India' published by Messrs. The Imperial Chemical Industries (India) Limited: The second edition booklet 'Plant Protection in India' published by Messrs. The Chemical Industries (India) Limited issued this year has been got up in attractive form and contains useful information.

It is divided into ten sections giving details of recent advances, materials brought to use for protection of field crops and stored products, sprayings and dustings and the equipment for them, compatibility of sprays and dusts and common insect pests, fungus diseases and weeds, and their control. The booklet is well printed and has a number of excellent illustrations.

Considerable trouble was taken in getting up Section VI-on common insect pests and their control. Under 'control' in this section there are only a few items that require some changes from the view point of Madras Department of Agriculture. With the rapid changes that are taking place in Economic Entomology no booklet on the subject can be perfect by the time it comes out of the Press and on that account its value cannot be under estimated.

V. T. R.

Madras Bananas — A Monograph by K. Cherian Jacob. (Government Printing, Madras, 7 Rupees 6 annas.): Mr. Cherian Jacob has given the botanical and the horticultural world a monumental work in the monograph on Madras Bananas. The monograph has nine chapters dealing with the history of the banana, area, nomenclature of the the cultivated bananas, systematic descriptions etc. The author has made the book further useful and interesting even to a non-scientist by including in the monograph chapters dealing with cultural practices, economic, Banana products, dietetics, analysis of the fruits of the varieties of Banana. There are five appendices which enhance the value of the book and makes it easy for reference to any aspect of banana dealt within the book. There is besides an exhaustive Bibliography and a carefully prepared index. The monograph runs to 228 pages and what is most noteworthy is, the publication has as many as 84 beautiful illustrations.

While there have been publications, mainly by foreign authors, such as William Fawcett's "The Banana, its cultivation, distribution and commercial uses" 1913 and that of P. K. Raynalds, "The story of the banana, 1926 and several others in the form of bulletins, articles etc. vide the Bibliography of the monograph, it will not be an exaggeration if I state that the Madras Bananas is unique in its kind, the first to clarify the nomenclature of the cultivated bananas and fine banana a new and fitting name, and also the first to standardise the varieties and give each of them all through systematice description. A perusal of chapter ii will show clearly how the author arrived at the new name MUSA SAPIDISIACA, K. C. Jacob, nom, now, (Musa Sapientum L, et Musa) new specific name "Sapidisiaca" suggested to Jacob by no less a Botanist than Dr. N. L. Bose of the Kew Herbarium, London, takes its first half from Sapientum and the second half from Paradisiaca. It must be remembered that this not a combination, but a *nomen novum* as the author has clearly explained it from the systematic Botanist's point of view. Mr. Jacob has gratefully acknowledged the apt suggestion made by Dr. N. L. Bose.

As a book, systematic Botanist with an eye for details as well as for classification, the 500 varieties which were subjected to study have been standardised and classified into 53 varieties, 15 sub varieties 5 exotic types and one instable type. Appropriate common names mostly selected out of the local names have been allotted to them. Detail and accurate systematic descriptions of the varieties etc. are given in chapter vi for which a very valuable artificial key has been furnished in chapter v.

The author is to be conguratulated for the valuable service rendered both to the scietific and the lay world. The book will prove useful to the Reaearch workers or Bananas and to the common man who is interested in growing bananas for whom there is plenty of information on all aspects, such as selection of varieties, cultural practices, economics, Dictetics, analysis of varieties of fruits etc. Banana is definitely cheaper fruit than mangoes or apples in India, easy to raise and one that is available in the market all round the year and this monograph should help the banana grower to raise large plantations through which banana fruits should be made abundant for consumption by the majority who are poor who cannot afford to go in for costlier protective food. The book is well got up and price moderate so that it could be on the shelves of not only reseach libraries but also Colleges, Schools and private libraries of individuals interested in fruit growing.

S. N. C.

Gleanings

Novel mothod of interplanting sugarcane with Rice-Taiwan's sugar development programme : The traditional preference of farmers for food crops has resulted in interplanting of the crops on Taiwan, including the interplanting of rice and cane, rice and vegetables, cane and legumes, and other systems. Rice – cane interplanting in 1947 – '48 was carried on over 15,000 acres, which amounted to 5% of total sugarcane acreage. The economics of the system is that cane planting, usually from August to September, can take place while the second crop of rice is going to flower in the field. Agronomists have ingeniously arranged to have one row of rice moved close to the next in every five rows, allowing one row of space for the planting of sugarcane. As it is important to maintain a certain level of water for the flowering period of rice, the seed pieces of cane are just put on the top of the mud of the paddy field and covered with soil and fertilizer, until the rice is harvested. This rice – cane interplanting system makes a bridge for a rotating system of rice and sugarcane within three years.

[Extract from *Sugar*, February 1953, p. 39]

Minor elements in nutrition of sugarcane - Role of copper : In an investigation on the practice of inter-calary cultivation of food crops (corn, carrots, beans, potatoes) it was noted that on strips where potatoes had been cultivated the yields of cane and sugar were greatly in excess of yields on strips where potatoes had not been grown. Records showed that the potatoes in question had been sprayed with Bordeaux mixture, which indicated that the phenomenon was due to the copper that had been incorporated into the soil. In a subsequent series of field experiments on various sandy, sandy loam, and clay types of soil treated with 4 to 7 kilograms of copper sulphate per hectare, it was found that yields of cane and sugar were increased by 30 to 40% and more. However, this increased production did not carry over to the first ratoon crop, which were not above ordinary ; in other words, the copper treatment had no after-effect.

[Extract from *Sugar*, March 1953, p. 66]

M. L. K.

Weather Review — For the month of June 1953.

RAINFALL DATA

Division	Station	Total rainfall for the month in inches.	Departure fromnormal in inches	Total since 1st January in inches	Division	Station	Total rainfall for the month in inches.	Departure fromnormal in inches	Total since 1st January in inches
Orissa & Circars	Gopalpur	12·8	+7·3	16·6	Central Contd.	Vellore	1·9	— 0·9	6·0
	Calinga-patnam	12·1	+7·4	16·2		Gudiyatham*	1·7	— 0·3	7·1
	Visakha-patnam	5·3	+1·2	9·7		Salem	6·6	+ 3·5	14·9
	Arakuvalley*	9·4	+3·7@	16·4		Coimbatore (A. M. O.)*	2·6	+ 1·6	14·5
	Anakapalle*	5·7	+2·4	8·5		Coimbatore	3·1	+ 1·6	14·9
	Samalkot*	5·0	+0·6	8·4		Tiruchirap-palli	1·3	— 0·5	9·6
	Kakinada	5·5	+0·8	6·7					
	Maruteru*	5·8	+1·5	6·5	South	Naga-pattinam	2·8	+ 1·6	8·5
	Masuli-patnam	4·3	+0·1	4·4		Aduturai*	1·0	+ £	5·9
	Guntur*	3·1	—0·8	4·4		Pattukottai*	0·7	— 0·1	7·3
	Agrl. College, Bapatla*	3·5	+1·1	4·1		Mathurai	3·7	+ 2·1	14·6
						Pamban	1·1	+ 0·9	4·7
	Agrl. College, Farm, Bapatla*	3·6	X	4·6		Koilpatti*	0·1	— 0·2	7·5
						Palayam-cottai	0·1	— 0·3	8·0
	Renta-chintala	12·1	+8·5	16·2		Amba-samudram*	1·0	— 0·5	10·7
Ceded Districts	Kurnool	2·1	—0·8	2·2	West Coast	Trivandrum	10·7	— 2·5	17·8
	Nandyal*	5·0	+1·1	6·8		Fort Cochin	11·4	—17·1	28·7
	Hagari*	1·8	+0·2	3·0		Kozhikode	18·1	—16·7	24·1
	Siruguppa*	4·6	+1·7	6·5		Pattambi*	11·8	—15·9	16·5
	Bellary	1·9	+0·2	3·1		Taliparamba*	14·8	—25·3	16·7
	Cuddapah	0·5	—2·5	0·8		Wynaad*	13·1	— 0·4	24·1
	Kodur*	1·1	—1·2	2·5		Nileshwar*	16·4	—25·7	18·7
	Anantapur	2·4	+0·3	4·1		Pillicode*	13·2	—28·2	19·4
						Mangalore	17·3	—22·9	18·5
Carnatic	Nellore	0·6	—0·7	0·9		Kankanady*	18·0	—23·4	20·0
	Buchireddi-palem*	0·5	—0·8	1·0	Mysore & Coorg	Chitaldrug	1·2	+ 1·4	4·4
	Madras (Meenam-bakkam)	0·6	—1·3	2·2		Bangalore	2·9	J. N.	10·7
						Mysore	1·9	— 0·6	11·0
						Mercara	18·7	— 6·8	23·2
	Tirur-kuppam*	1·1	—1·4	2·5	Hills	Kodaikanal	4·5	+ 0·3	18·7
	Palur*	4·0	+2·3	6·7		Coonoor*	4·3	+ 1·7	28·7
	Tindivanam*	0·6	—0·8	4·8		Ootacamund*	12·3	+ 8·2	23·1
	Cuddalore	3·2	+1·8	6·4		Nanjanad*	16·2	+ 9·6	27·1
Central	Arogyavaram (Chittoor dt.)	1·6	—1.0	4·3					

Note:—

1. * Meteorological Stations of the Madras Agricultural Department.
2. @ Average of eight years data for Arakuvalley is given as normal.
3. Average of ten years' data is taken as normal.
4. X The Farm was started only in 1951.
5. £ = 0·01"
6. J. N. = Just Normal.

Weather Review for June, 1953

The month began with a weak monsoon, that was restricted to Tenasserim, the Andaman sea and the South-east Bay of Bengal. On the fourth day the monsoon strengthened in the Andaman Sea and the adjoining South-east Bay of Bengal and the conditions also were favourable on that day for the advance of the monsoon in south Ceylon and the Comorin—Maldives area. The monsoon remained in the same state for about a week with signs of advancement in different directions.

Monsoon was weak to moderate in the east Arabian sea till 14—6—1953 upto Latitude 15°N. As a result of the shallow depression in the Bay of Bengal on 15—6—1953 the Bay monsoon penetrated into the north-west Bay of Bengal and north-east India. In the Konkan area it became strong and extended into Deccan (Desh), Hyderabad and south Madhya Pradesh. In the Konkan area the monsoon was fairly active till 18—6—1953, on which day it was generally active in Malabar and South-Kanara. Till 23—6—1953 it was moderate to strong in the east Arabian Sea and moderate in the south and Central Bay of Bengal. In the subsequent three days the development of the monsoon was more towards north. The axis of the monsoon trough moved south on 27—6—1953 with signs of strengthening in the central Bay of Bengal and neighbourhood. In the remaining three days of the month the monsoon development did not show any large change.

So far as the West Coast region is concerned, it is to be recorded that not only the setting of the monsoon was late but also the subsequent development is, so far, very much below normal.

Day temperatures were generally above normal over the Madras region as a whole in the first half of the month. In the second half variations were very wide and certain regions recorded sub-normal temperature. As usual places like Rentachintala, and Gannavaram recorded high temperatures of 117° and 116°F respectively.

The note-worthy falls recorded in the month of June, 1953 are detailed hereunder:

S. No.	Date	Place	Rainfall in inches
1.	7—6—1953	Trivandrum	3·3
2.	,,	Fort Cochin	3·5
3.	10—6—1953	Alleppey	2·5
4.	,,	Kozhikode	3·4
5.	14—6—1953	Nagapattinam	2·6
6.	18—6—1953	Gopalpur	4·1
7.	19—6—1953	Calingapatnam	6·6
8.	20—6—1953	Mangalore	2·8
9.	21—6—1953	Ooty	3·4
10.	,,	Mercara	4·8

The details of the Zonal rainfall in the Madras State are given in the following table:

S. No.	Name of the Zone	Rainfall for the month in inches	Departure from normal in inches	Remarks
1.	Orissa and Circars	6·78	+ 2·82	Above normal
2.	Ceded Districts	2·43	— 0·13	Just below normal
3.	Carnatic	1·51	— 0·13	do.
4.	Central	2·69	+ 0·57	Fairly above normal
5.	South	1·31	+ 0·44	Above normal
6.	West Coast	14·48	—17·81	Far below normal
7.	Mysore and Coorg	6·18	— 1·50	Below normal
8.	Hills	9·33	+ 4·95	Above normal

Agricultural Meteorology Section,
Lawley Road Post, Coimbatore
Dated 8—7—1953

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

Departmental Notification

GAZETTED OFFICERS

Transfers and Postings

Name	From	To
Hanumantha Rao, Y.	Asst. Agri. Eng. Inspection	Asst. Agrl. Eng. Community Project Area.
Mohamad Ali. A.	Agrl. Eng. Supervisor	Asst. Agrl. Eng. (Machanical)
Madhava Rao, V. N.	Asst. in Fruits, Coimbatore	Asst. Fruit Specialist, Mangalore
Narasimha Rao, M. P.	Chillies Specialist, A. R. S. Lam	Research Officer under Planning Commission
Samuel Sundararaj, J.	Asst. in Fruits Coimbatore	Systematic Botanist, Banana Research Aduturai
Sivaswami, E. G.,	D. A. O. on leave	Spl. D. A. O. crop campling Tanjore
Venkatachalam, Ch.	D. A. O.	Junior Lecturer in Agriculture Bapatla
Vaidyanathan, M.	D. A. O. Crop Sampling Tanjore	Addl. D. A. O. Manures Tanjore

UPPER SUBORDINATE SERVICE

Transfers and Postings

Name	From	To
Abdul Khader, M.	A. D. Gobi	A. D. Erode
Anantaraman, P. V.	Chemistry Asst., Coimbatore	Paddy Asst. Coimbatore
Appa Rao Reddy, B.	A. A. D. Anakapalle	Chemistry Asst. Coimbatore
Alagappa Pillai, S.		A. D. Tinnevelly District
Achuthan, V.		A. D. Pollachi
Aravindaksha Menon, M.		Dairy Manager, Coimbatore
Ananta Rao, K.	Paddy Asst. Anakapalle	Asst. Meteorology, Samalkotta
Balasubramaniam, M. A.	Coconut Nursery Asst. Pattambi	Pepper Asst. Taliparamba
Balakrishnan, M. P.		P. P. A. Ento. Ootacamund
Balakrishna Rao, K.		Paddy Asst. Mangalore
Balagopalan, A.		Ento. Asst. Kasargode
Chami, A.		Spl. A. D. Manures Madurai
Chellappa, N. P.		A. D. Harur
Doraiswami, G.	P. A. to D. A. O. Pattukotai	A. D. Gobi Coimbatore
Dhandapani, A.		Spl. A. D. Sugarcane Gudyattam
Francis, S. P.		Spl. A. D. Manure Madurai
Fernadez, A.		Paddy Asst. Coimbatore
Gopalakrishnan, P. K.	Ento. Asst. Kasargode	Fruit Asst. Coonoor
Govinda Rajan, M.		Spl. A. D. Pattukottai
Govindaswami, T. N.		Seed. Dev. Asst. Paddy Madura
Ganesa Pillai, S.		Spl. A. D. Manures Tinnevelly
Ganesa Pai Mizar, K.		Paddy Asst. Mangalore
Gopalakrishnan, B.		Myco. Asst. Coimbatore
Govindaswami, T. N.	Seed Devep. Asst. Madurai	Spl. A. D. Manures, Madurai
Govinda Iyer, T. A.	Asst. in Chemistry, Coimbatore	Statistical Asst. Chemistry,
Hanumantha Rao, G.	Asst. in Paddy Tirur-kuppam	A. R. S. Buchireddipalayam
John Chandra Mohan	Asst. A. R. S. Amba-samudram	Asst. in Paddy Coimbatore
Jayaraman, M.		Spl. A. D. Manures Sholavandan
Jayabheema rao, K.	Asst. in Pulses	Statistical Asst. in Meteorology, Coimbatore
Korukutty, C. K.		Spl. A. D. Manures Tanjore

Name	From	To
Kameswara Rao, G.	Spl. A. D. Manures, Kovvur	A. D. Kovvur
Kuruvilla, M J.	Potato Asst. Nanjanad	P. P. A. Shoranur
Koyammu, K.	Oil Seed Asst. Chowghat	Coconut Nursery Asst. Pattambi
Kuppuswami, B. S.	Fruit Asst. Coonoor	Fruit Asst. Coimbatore
Kumari C. Janaki Devi Moursund		Botany Asst. Bapatla
Krishnamurthy, N. V.		Asst in Chemistry, Mannargudi
Koraga Bhandari, K.		Tuber crop Asst. Mangalore
Lakshminarayana Rao	Cotton Asst. Coimbatore	Cotton Asst. Hagari
Masilamani, B. P.	D. A. O. Salem	Seed Devep. Asst. Madurai
Mariakulandai, Dr. A.	Gazetted Asst. Lecturer in Chemistry	Asst. in Chemistry Coimbatore
Mabalingam, M.	P. P. A. Ootacamund	Pepper Asst. Taliparamba
Murahari Rao, G.	Asst. in Millets, Narasapatnam	A. A. D. Anakapalle
Muhamad Abdul Rahman Baig	S. D. Asst. Bellary	Spl. A. D. Gudur
Mahadevan, S.		A. D. Peravurni
Manamohan Lal, S.		Paddy Asst. Aduthurai
Meenakshi Sundaram, P. C.		Paddy Asst. Aduthurai
Mahadevan Pillai, K.		Spl. A. D. Tanjore
Mahamad Fasiuddin	A. A. D. Banganapalle	Spl. A. D. Proddatur
Narayanan, W. R.	A. R. S. Pattambi	A. R. S. Palur
Narasimha Razu, P. V. L.	Chemistry Asst. Anakapalle	Chemistry Asst. Coimbatore
Nanjayan, K.		Spl. A. D. Trichy District
Palaniyandi, V. G.	Paddy Asst. Palur	Paddy Asst. Tirurkuppam
Palaniswami, K. M.	Plant Quarantine Inspector, Shembaganur	A. A. D. Tiruvadanai
Padmanabha Menon, E.	Pepper Asst. Taliparamba	A. D. Manantoddy
Prasada Rao, D. M. V.	Asst. Lec. in Botany, Bapatla	Chemistry Asst. Coimbatore
Pranatharthiharan, S. V.	A. D. Rasipuram	F. M. Hosur Cattle farm
Radhakrishnamurthy, P.	A. D. Rajampet	F. M. Agrl. College Farm Bapatla
Ravi Kumar	A. D. Peravurni	F. M. Central Farm Coimbatore

Name	From	To
Raman, N. V.	Ent. Myco. Asst. Tindivanam	Spl. A. D. Ariyalur
Rebelle N. S. P.	Tuber crop Asst. Mangalore	A. A. D. Udipi
Rama Rao, V.	Sugarcane Asst. Anakapalle	Millets Asst. Narasapatnam
Rama Rao, M. V.	Asst. Physiology Anakapalle	Asst. in Chemistry, Anakapalle
Raghumurthy, M.		Millets Asst. Hagari
Rathinasabapathi, V.		Spl. A. D. Trichy
Ranganathan, S. R.		Spl. A. D. Madurai
Ratnasabapathi, N.		Do. do.
Ramasubbu, G.		Spl. A. D. Trichy
Rangayya, B. G.		A. D. Chengam
Ramanathan, P.		A. A. D. Salem
Rodrigues, J. R. J.		A. A. Puthur
Ramachandran, L.	A. D. Tenkasi	A. D. Narasannapeta
Sivasubramaniam, V.	Cotton Asst. Srivalliputhur	Cotton Asst. Coimbatore
Suryanarayana Raju	Cotton Asst. Hagari	A. D. Tanuku
Somasundaram Pillai	A. A. D. Tiruvadanai	A. D. Virudunagar
Shanmugasundaram, A.	Asst. in Paddy Coimbatore	Asst. in Paddy Piricularia Scheme, Coimbatore
Swaminathan, K.	Do. Aduturai	Do. Aduturai
Srimathi Kalyanikutty	Asst. in Paddy (On leave)	Paddy Asst. Pattambi
Shanmugasundaram, N.	Asst. in Chemistry, Bee Scheme, Coimbatore	Plant quarantine Inspector, Shembaganur
Subramaniam, P. T.	P. P. A. Shoranur	Potato Asst. Nanjanad
Sheenappa	Myco Asst. Vittal	A. D., Mangalore
Subbarao, V. V.	Millets Asst. Nandyal	Spl. A. D. Kavali
Srirami Reddy, L.	Do. Hagari	S. Develop. Asst. Adoni
Srinivasamurthy, V. S.		P. P. A. Ento. Anantapur
Subbarao, G.		Asst. Sugarcane, Anakapalle
Subramaniam, A.		Asst. Physiology, Anakapalle
Shanmugam, N.		Paddy Asst. Tirurkuppam
Srayankumar, S.		Paddy Asst. Palur
Sitapathy, S.		Spl. A. D. Pattukottai
Soundira Rajan, R.		Spl. A. D. Trichy

Name	From	To
Subbiah, K. K.		Spl; A. D., Madurai
Sivappa, A. N.		Do. Do.
Subramaniam, K.		Do. Do.
Selvaraj Carvelho, A.		Spl. A. D., Trichy
Sennayan, P.		Do. Do.
Srinivasan, A. V.		Do. Do.
Subarayalu, M.		Paddy Asst., Ambasamudram
Srinivasan, K. R.		A. D., Wandiwash
Seshadri, V. S.		Fruit Asst., Coimbatore
Suryanarayana, K.	A. D., Narasannapeta,	Spl; A. D., Anakapalle
Sundaram, V. P.	A. D., Salem	A. D., Rasipuram
Sambasiva Rai, I. K.	Fruit Asst., Mettupalayam	Fruit Asst., Mangalore
Thiruvengadam, R.	Spl. A. D., Sugarcane, Gudiyattam	Senior Sugarcane Asst., Gudiyattam
Thambu Raj, D.		Spl. A. D., Trichy
Ummerkutty, O. V.	Asst. in O. S., Badagara	Asst. in O. S, Nileshwar
Venkataraman, C. N.	Dairy Manager, Coimbatore	Chemistry Asst., Coimbatore
Venkateswara Rao, L.	Spl. A. D., Kavali	Millets Asst., Nandyal
Venkateswara Rao, P.	Spl. A. D., Gudur	Seed Dev. Asst., Bellary
Vrishaba Dass, P.		A. D., Kallakurichi
Vinayagam, S.	A. D., Chengam	Agrl. Inspector, Borstal School, Palamcottah
Venkatachalam, K.	A. D., Kovvur	Spl. A. D., Manures, Kovvur
Vasudeva Menon, K.	Asst. in Plant Physiology, Coimbatore	Asst. in Chemistry, Coimbatore

Agricultural College and Research Institute Library, Coimbatore

LIST OF ADDITIONS FOR THE MONTH OF JUNE 1953

1. CHROMOSOME *first word* .. Chromosome breakage—Symposium *Supplement to* Heredity Vol. 6, 1953.

2. COMMONWEALTH ECONOMIC COMMITTEE .. Oliver and Boyd, London. Grain Crops, 1953. Commonwealth Economic Committee.

3. GAUMANN (Ernest Albert) .. Fungi: Description of their morphological features and evolutionary development by Federic Lyie Wynd. Ist Edn. 1953. Hfner Pub. Co ; New York.

4. LARSON (Olaf F) ... Ten years of rural rehabilitation in the United States. 1950. Indian Society of Agricultural Economics.

5. MADRAS AGRICULTURAL DEPARTMENT .. Proceedings of the First Scientific Workers Conference held in Agricultural College and Research Institute, Coimbatore on August 1951. 1953. Superintendent, Government Press, Madras.

6. NAYAR (S. L.) and CHOPRA (I. C.) .. Distribution of British Pharmacopeial Drug plants and their substitutes growing in India. Ist Edn. 1951. Council of Scientific and Industrial Research India.

7. ROTHAMSTED EXPERIMENRAL STATION .. Results of field experiments 1951. Rothamsted Experimental Station.

8. STILES (Walter) and LEACH (William) .. Respiration in plants IIIrd Edn. 1952. Methuen's monograph on Biological subjects. Methuen & Co.

9. VIRGINIA STATE HORTICULTURAL SOCIETY .. Proceedings of the 57th meeting V. XXXXI. 1953. Virginia State Horticultural Society.

10. WASHINGTON STATE HORTICULTURAL ASSOCIATION .. Proceedings of the 48th Meeting 1952. Washington State Horticultural Association.

(T. S. R.)

MADRAS AGRICULTURAL UPPER SUBORDINATES' ASSOCIATION

The annual general body meeting of the Madras Agricultural Upper Subordinates' Association will be held on 16—8—1953 at 10 A. M. at the Agricultural College, Coimbatore, to consider the following :–

1. Adoption of the annual report.
2. Adoption of the audit report.
3. Any resolutions sent by members.
4. Election of office-bearers.

Members desirous of moving any resolutions in the meeting may kindly send them to the Secretary before 1—8—1953.

N. Ranganathachari,
Secretary.