THE MADRAS AGRICULTURAL JOURNAL

Vol. XXXIX DECEMBER 1952 No. 12

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The Madras Agricultural Journal

Vol. XXXIX December 1952 No. 12

The Madras Agricultural Students' Union Showers on you its Seasonal Greetings and Wishes you a Bright Happy and Prosperous New Year.

Editorial

Giving publicity to findings and new discoveries in Science is an important public service. It is the sine qua non of extension service. Popularisation of science is the need of the hour and is indispensable for the general well-being and further prosperity of any nation.

The increasing emphasis is on the practical application of scientific theories for popularisation. The method fulfils two main objects, namely, (i) it keeps the ordinary citizen in touch with the research worker and (ii) the citizen sees further in the practical application the inestimable value of research.

Popularisation of Science and scientific methods are most needed in Rural India. The Community Projects and the Agricultural Extension Service have taken up this question in right earnest none too soon. Such service in its broadest scope aims to improve and advance farming conditions including the physical, mental, spiritual and social growth of all the members of the farming families. Though it is a Government agency, it is chiefly designed to enthuse people to increase their efficiency and to enhance their per capita income, besides helping to build them into a well knit unit of understanding, self-confident and capable men and women, with vision and high ideals.

The 4-H Club is a vital organisation in the United States of America, whose devoted function is active direct service to humanity with distinct educational objectives leading to high ideals of the head, heart, hands and health.

It was Sir John Russel, who made the clarion call for such service through the advocacy of what he aptly called the bridging of the gulf between the educated College Graduates, particularly the Agricultural Graduates and the common agriculturists. The rural credit societies and the village Panchayats have yet to fulfil their great mission in this behalf and even where no separate 4-H Clubs are felt necessary to rebuild our village economy these institutions of long standing can undertake to organise in their own auspices the four fold ideologies of these clubs to help to provide farm people with the latest findings of agricultural research that will equip them with all the technical knowledge in all successful methods of farming and home-making to make them all well informed citizens with their hearts and minds set right to find a way to get peace and plenty for all people of the free world.

Mr. E. J. Bell, Agricultural Division, Mutual Security Agency, Phillippines, has aptly summed up the attitude of the Extension Worker in the apt exhortation "I would like to suggest that you listen" as well as "tell". Not only do we learn by listening but we gain the confidence of the farm people when we let them tell us what they want to know. In other words, the true spirit of extension work is to talk and work with people in common partnership.

"By its very nature, an extension service works two ways — first, it takes new knowledge from, the laboratory and office to the farm and second, it brings new problems found on the farm back to the laboratory and office for study and solution".

The implementation of the Community Projects augers well for the dawn of a new era of plenty and prosperity for our country.

Addendum

Addendum to the article on **"Preliminary Studies on Raising Cardamom Nurseries Successfully"** by Sri V. Gomathinayagam Pillai, B. Sc. (Ag.), published in the October 1952 issue of Madras Agricultural Journal.

"The author also expresses his heartfelt thanks to the Indian Council of Agricultural Research for encouraging and financing the work of the Cardamom Scheme since 1944".

RETIREMENT

Sri V. T. Subbiah Mudaliar, L. Ag. (First Class), Lecturer in Agriculture, Agricultural College, Coimbatore retired from service on 27th December 1952. He joined the Agricultural College, Coimbatore in 1918 and took his certificate of prefienciency in Agriculture in 1920 and his diploma in Agriculture in 1921. He secured the Clogston medal in 1920, awarded to the best student taking the certificate and the Robetson Medal in 1921, for general proficiency in Agriculture. He was appointed in 1922 and served as Farm Manager at Koilpati and Coimbatore and as Agricultural Demonstrator in several taluks in the Madurai Circle, till 1929, when he was appointed as Assistant lecturer at the Agricultural College, Coimbatore. He was promoted as Assistant Director of Agriculture in 1937 and served in several districts till 1942, when he was taken back to the College as Junior Lecturer in Agriculture. He was Regional Deputy Director of Agriculture at Cuddappah and Madurai in 1946 and 1947. From 1948 till his retirement, he was Lecturer in Agriculture, first at Bapatla and later at Coimbatore, except for about 10 months when he was Headquarters Deputy Director of Agriculture, Madras.

Though Sri Subbiah Mudaliar was serving in the Districts off and on, a large part of his service was at the College. The experience gained by him in several districts as Extension Officer and as Farm Manager marked him out as an outstanding and successful lecturer at the Agricultural College. He was popular with the students. His spotless character, his erudition and knowledge, and pleasing manners endeared him to the Officers at the Agricultural College and the Agricultural Department, most of whom were his students.

He gave his spare time freely for the promotion of social and cultural activities in the College Estate. He was Secretary of the Agricultural College Officers' club and mess for two years and their

president for two terms. He served as Secretary of the Madras Agricultural Students' Union for a term and as Editor of the Madras Agricultural Journal during the years 1943—'44. His editorials were authoritative pronouncements on topical agricultural problems, eagerly awaited by many. They were highly esteemed and on certain occasions, on the day after publication, they were followed up in the editorials of 'The Mail' and supported by them. He served in the Managing Committee and the Editorial Board of the Madras Agricultural Journal on several occasions and the Union owes a debt of gratitude to him for his service and his ardent support of the Union through thick and thin.

We wish him health and happiness and a long peaceful retired life.

A Request

The mofussil subscribers of the Madras Agricultural Journal are requested to kindly intimate the Secretary, The Madras Agricultural Students' Union, Lawley Road P. O., Coimbatore, their correct address. Of late, some of the mailed journals are received back with the remark that the addressee is not traceable. Hence this request is made to the mofussil subscribers to avoid any disappointment to them due to the non-receipt of the Journal.

Survey of Fruit Growing in Madras State

By

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Introduction : Plant introduction and acclimatisation are two of the recognised methods of fostering plant industries and they have played a very important role in many lands with perennial crop culture, especially fruit growing. The diversity of fruit growing conditions as well as the vast range of varietal peculiarities in fruits necessitate a careful conduct of varietal tests in the main regions of every country. Where such variety testing grounds cannot be established in sufficient numbers, an investigation in the form of a survey to determine the varietal performance seems essential. In a State like that of Madras where the varieties and kinds of fruits are numerous, the variety testing grounds as well as the surveys have considerable value in delineating the optimum zone for each fruit. The survey can be relied upon to yield results of some value only when the varieties are true to name and the plant material is raised under known conditions and from trees of known parentage and performance. Such orchards which in the past were rare to find are now available for study after the advent of the nurseries managed by the Government. These nurseries have distributed in the past decade, known plant material of numerous kinds and varieties of fruits throughout the State, the orchards from which now yield reliable information on zonal preferences.

The object of the survey which was made during the course of the year in 1948–49 was to study the performances of known varieties and kinds of fruits in the various districts and to determine the optimum zones for their commercial cultivation.

The survey included visits to the orchards planted to material supplied by Government fruit nurseries and also to private orchards planted to material obtained from private nurseries. The particulars gathered could not be made exhaustive since most of the orchards were in the pre-bearing age. Moreover, due to lack of interest on the part of fruit growers amounting in many cases to gross neglect, as well as due to defective orchard practices the regional preferences of varieties could not be gauged as well as otherwise would have been possible. Nevertheless, the survey helped to bring out some of the out-standing defects in stocking and management of orchards and also yielded information of interest of practical value.

Kinds and varieties: From the enquiries and observations in several orchards of the state, supplemented by the information gathered from the performance at the Goverment Fruit Stations, it has been possible to draw up a list, showing the several kinds and varieties of fruits which are either promising or adaptable to the various regions in Madras State. The list is furnished in the enclosed statement.

Possibilities for extension: The possibilities for extension under each of the fruits or its varieties will depend not merely on the availability of suitable growing facilities but also on the market preferences. Taking the Madras State as a whole and judging roughly from the degree of dependence on fruit imports as well as on the nature of export trade, it seems possible to lay down a policy indicating broadly the targets for the extension in production of each of our commercial fruits. From a general consideration of the main features of fruit production in the State, a list of the more outstanding varieties and kinds of fruit that deserve special attention in the matter of increased production is presented in the enclosed statement.

Among the more important factors usually mentioned as affecting fruit growing are rainfall, soils, cultural and manurial treatments and pests and diseases. The survey has helped to bring out the role of each of the above factors in successful crop production and how the entire complex of the orchard undergoes a material change by a modification in any one or more of these. A number of instances of variable performances of orchards due to such influences has been recorded but since it is beyond the scope of this paper to deal at length on each of these, the salient features are summarised below :—

Effect of rainfall: From a study of the rainfall data collected in the State, it seems possible to state that mango is one of the most dependable of our commercial fruits, thriving in a rainfall range from about 20" to 150" per annum. Within this range, however, there is a difference in respect of varietal adaptability, varieties like Bennet Alphonso thriving in high rainfall areas while mid and late season varieties such as Baneshan, Bangalora and Neelum etc., being suited to rest of the State. In regard to Citrus, sweet oranges are definitely unsuitable to areas with a rainfall exceeding 100" while lemons are the most adaptable, being found to thrive in all parts of the State right from the sea level up to 6000' above sea level. The lime occupies an intermediate position between sweet orange and lemon being more accomodating than sweet oranges, though under heavy rainfall conditions it seems to show distress more than lemons. Banana is as adaptable as the mango and perhaps even more so, since this fruit thrives all over the State up-to an elevation of about 5,500' provided the sites are well sheltered on the higher elevations. Deciduous fruits like plums, pears and peaches are of commercial importance only at elevations above 5,000'.

Soils: In regard to soil, besides the observations recorded on the basis of rough study on texture of soils up to a depth of six feet in each of six feet in each of the orchards visited pH determinations were also made of soils in 49 orchards, with a view to correlate the tree performances of mainly Sathgudi orange. From the data collected, it appeared that soils which have pH of more than 8, are unsuitable for this fruit. The Citrus is more exactant in its soil requirements, requiring a uniform texture of soil of atleast six feet deep, with a water table, which is always below six feet in all parts of the year. It thrives best in loams preferably red, having a perfect drainage. Symptoms of water stagnation are determinental for this fruit. Mango is not so specific as that of Citrus, though it exhibits stunted growth in very shallow soils and delayed bearing tendencies in water logged padugai lands of deltaic tract. Grapes have been found to be remunerative in deep, well drained loams and facilities for good drainage are essential in soils of close texture Miscellaneous fruits such as sapota, pomegranate, guava etc., have got a wide range of adoptability and sapota in particular has been found to withstand a certain amount of alkalinity.

Water table: The depth of water table is well known to be an important factor in determining the suitabilily of any particular site for fruit-growing and particularly so in respect of the Sathgudi orange. From a study of 115 orchards, with reference to depth of water table from the surface during the wettest period of the year, it was found that most of the "failures" of orchards could be attributed to soils with a permanent or fluctuating water table higher than six feet from the surface.

Cultural practices: The cultural practices in the orchard play the most vital role in influencing tree growth and bearing. The survey has emphasised an already well known fact that the existing orchard practices in private groves are, by and large extremely varied and unstandardised. Every aspect of orchard culture seems to be dependent almost entirely on the whims and fancies of the grower rather than on an intelligent under standing of the tree requirements. The aggregate loss from such avoidable mistakes seems to be assuming alarming proportions, recurring and multiplying all the while to the great detriment of the fruit industry. To add to this deplorable state of affairs is the ominous feature of the advice offered by unskilled touring parties of self-styled experts in fruit gardening.

Pest and diseases: Failure to take prompt and proper measures against pests and diseases has also been a known factor in reducing profits. Rational protective measures are conspicuous by their absence and this feature initiates against the usefulness of all the measures that the fruit growers may endeavour to put into practice.

New selections : The survey was also helpful to an extent in indicating some of the uncommon types of fruits which have originated as chance seedlings or as bud sports. Clonal progenies in a limited number of these have been raised in the Government Nursery, Kodur and distributed to different fruit centres in the districts. The following are the new selections made during the survey.

(1) A type of lime with pink flesh of fruit from Anantharajpet village, Cuddapah district.

(2) A type of lemon bearing bell shaped, medium sized fruits with a smooth skin and prolific bearer from Anantharajpet, Cuddapah district.

(3) A type of lime similar to number (1) from Kattamanchi village, Chittoor district.

(4) A pummelo reputed in quality, yielding about 250 fruits; pink fleshed from Hospet Taluk, Bellary Dt.,

(5) A pomegranate tree bearing about 400 fruits a year, pink fleshed of good quality from Yercaud, Salem district.

(6) A mango variety called "Salem Bangalora" of very good quality, mid season cropper and fibreless from Salem taluk, Salem district.

Conclusion : From the consideration of the facts set forth in the report, the following facts seem to deserve attention.

(1) Survey of this type at every five-year interval seem essential to appraise from time to time the changing features in fruit production.

(2) There is an immediate need for providing regularly well-informed technical guidance to the fruit growers, if the existing failures are to be prevented and the huge recurring loss from unsound methods of culture is to be avoided.

(3) Establishment of model orchards in a large number of fruit-growing centres to serve as visual demonstration centress will enhance the value of technical guidance provided by the regional fruit centres.

(4) Regulation and control of private fruit nursery trade is a paramount importance if the orchards are to be stocked with inherently high yielding trees of superior fruit quality.

Acknowledgment : The author's thanks are to Dr. K. C. Naik, Headquarters Deputy Director of Agriculture (the then Fruit Specialist) for his valuable guidance during the survey and to Sri U. Narasinga Rao, B. Sc, Agri., Fruit Specialist for the help rendered in preparation of this report.

Kinds and Varieties of Fruits Recommended for Different Districts in Madras State.

District	Mango	Citrus	Bananas	Hill Fruits
Vizag ..	*Banshan, Chinnaswarnarekha, Cherukurasam* and Dondakayalaumanu	Sathgudi and Batavian Loose jacket (Agency tracts). Limes. Lemons very successful at Araku	*Karpura Chekrakeli*, Mauritius, Komarati	
East Godavari ..	*Baneshan, Chinnswarnarekha, Cherukurasam*, Pankalu, Kothapalli Kobbari	*Batavian* and Sathgudi	Thella Chakrakeli, *Karpura Chakrakeli* and Mauritius	
West Godavari ..	*Baneshan, Chinnaswarnarekha. Cherukurasam*, Panakalu, Kothapalli Kobbari	*Batavian*	Thella Chakrakeli, *Karpura Chakrakeli* and Mauritius.	
Krishna ..	*Baneshan, Cherukurasam.* Peddarasam and Kothapalli Kobbari	Limes; Lemons may merit a trial	*Mauritius*	
Guntur ..	*Baneshan, Rumani*, Chinnarasam, Peddarasam, Firangiludwa and *Cherukurasam*	*Batavian* and Sathgudi	*Poovan*	
Nellore ..	*Baneshan* and *Neelum*	..	..	
Kurnool ..	*Baneshan*, Rumani, Kalepad, Neelum and *Peter*	Sathgudi and Mosambique	..	
Bellary ..	*Neelum, Peter* and *Baneshan*	..	Poovan	
Anantapur ..	*Baneshan, Rumani* Swarnarekha, Khader and *Neelum*	Sathgudi	..	
Cuddapah ..	*Khader, Baneshan, Neelum, Rumani*, Kalepad, *Alampur Baneshan*, Swarnarekha and *Cherukurasam*	*Sathgudi, Limes*, and lemon varieties	*Maruritius*, and Monthan	
Chittoor ..	*Baneshan, Rumani*, Kalepad and *Neelum*	Sathgudi	..	
Salem ..	*Gundu* (Alphonso), *Nadusalai* (Peter), Salem Bangalora, *Swarnarekha* and *Baneshan*	Sathgudi; Loose jacket on Yercaud	Rasthali, *Mauritius*, Monthan; Laden (for hills only)	
Chengleput ..	*Baneshan, Neelum, Rumani, Swarnarekha* and *peter*	..	..	

District	Mango	Citrus	Bananas	Hill Fruits
Coimbatore ..	*Baneshan*, *Nadusalai*, *Gundu* and *Swarnarekha*	Lemon varieties	*Poovan*, Mauritius and Monthan	
North Arcot ..	*Khader*, *Peter*, *Neelum*	*Sathgudi* and limes; Lemons may merit a trial	*Mauritius*, Poovan and *Rasthali*	
South Arcot ..	*Baneshan* and *Neelum*	..	*Mauritius*	
Tanjore ..	*Rumani*, *Alphonso*, Kalepad, Padiri and *Neelum*	Limes in Ayyampet area	*Poovan*, Rasthali, *Mauritius* and Monthan	
Trichy ..	*Alphonso*, *Peter*, *Neelum*, *Rumani*, Baneshan	..	*Poovan*, Rasthali, *Mauritius* Monthan and *Nendran*	
Madura ..	*Baneshan*, *Swarnarekha* and *Neelum*	Sathgudi; Loosejacket between 2,000—5,000 Ft.	Poovan, Rasthali, Mauritius and Monthan. Sirumalai and other hill bananas on hill slopes	
Ramnad ..	Baneshan, Rumani, Swarnarekha, Neelum, Panchavarnam	Sathgudi	Mauritius	
Tinnevelly. ..	*Neelum* and *Alphonso*	*Sathgudi;* Loose jacket in high elevations Limes; Lemons merit a trial	*Mauritius*	
Malabar ..	Mundappa, *Bennet Alphonso*, Olour and Kalepad	Loose jacket in Wynad area only	*Nendran* and Neypoovan	
South Kanara ..	*Bennet Alphonso*, Mundappa and *Pairi*	Lemon varieties	*Nendran*, Poovan, Rasthali, and Mauritius	
Nilgris ..	..	Loose jacket on the hill slopes and in Nilgiri and Wynad	Laden and Durai Vazhai upto 3,000′ elevation	*Above 6,500′ :* Plums—Hale, Alu Bokhara, Shiro and Gaviota Pears—English pear varieties. Peaches—Red Shangai, Shah Pasand and Killikrankie

District	Mango	Citrus	Bananas	Hill Fruits
				Apples – Irish Peach, Signe Tillish and Allsops Early *5,000 to 6,000 :* Plums — Hale, Alu Bokhara, Shiro, Gaviota, Kelsey and Satsuma Pears—Keiffer Peaches — Red Shanghai, Shah Pasand and Killikrankie Apples — Irish Peach, Rome Beauty and Allsop's Early *3,000 to 5,000 :* Pear—Keiffer Avocado, Litchi, Passion Fruit, Tree tomato, cape goosberry, jack and Mandarins *1,200 to 3,000 :* Mandarins, Pummelo, Annona sp, Litchi, Jak and Avocado

N. B :— The varieties in italic type are to be specially adopted for extended production.

A Note on the mealy Bug — Pseudococcus virgatus Cockerell, on Gliricidia maculata H & B and its Control

By

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Mealy bugs belong to the family - 'Coccidae' - a category which includes some of the most serious pests of crops, ornamental plants and particularly of fruit trees also. As implied in the name, most of the species are provided with a mealy covering all over their body. The life history and habits in general are briefly as follows. The full grown females are mostly stationary, fixing themselves more or less permanently to their feeding spots on their host plants. The eggs are extruded below the body of the female. The nymphs hatch out in due course, crawl about upto a certain stage of their development and in their turn establish themselves in suitable parts. The adults and young are provided with needle-like mouth parts with which they pierce the plant tissue and suck up the juice. They occur in small groups or colonies, invariably on the tender and succulent shoots, but a good many forms are also found on other parts of the plants, like the stem, fruits, etc. The damage caused by the bugs is often serious, since the heavy drain on the cell sap would naturally reflect on the health of the host, if not kill it outright.

The approved method of control advocated, so far, is the application of frequent and copious washes of contact insecticides like Fish oil rosin soap, Crude oil emulsion, etc. But their efficacy has been only partial, due to the fact that the mortality is effected only by contact and that the spray fluids are generally unable to permeate into the mealy covering, with which most of the members of this group are provided. The incidence of these Coccids, in some cases, is so wide-spread and serious, that mechanical and insecticidal methods are well-nigh impracticable. More novel methods like biological control are resorted to under such conditions. The classical example of this method in the Madras State, is the practical extermination of the cottony cushion scale – *Icerya purchasi Maskell* — by its predator – *Rodilia cardinalis* Muls —.

The Pest: (Pseudococcus virgatus –): This bug, besides having profuse mealy covering over its body, is also characterised by the presence of a pair of long waxy, tail – like appendages. It is distributed practically all over the world. Coming nearer home, Green (1) has recorded it on a

number of hosts like *Talinum, Calliandra sp, Castilloa elastica, Sagitaria sp, Thunbergia sp, Asparagus, Lilium,* crotons and tomato in Ceylon. Ramakrishna Iyer (2) records it on crotons, tomato, cambodia cotton, *Lantana*, custard apple, *Sesbania* and pepper vines in South India. From the wide array of the alternative hosts, some of which are crops of economic importance, it is evident that the potentialities of this mealy bug are immense, as it may at any time develop to uncontrollable limits on the hosts already known or take to newer crops not recorded so far.

Nature and extent of damage: This mealy bug occurred in a very serious form on a plantation of *Gliricidia maculata* H & B – raised within the premises of the Agricultural College, Coimbatore, which incidentally forms a new host of this pest. This shrub is, of late, gaining considerable importance as a good source of green manure, by virtue of which it is being exploited on an extensive scale in the present intensive drive for producing more food. As is characteristic of these bugs, hundreds of them were found clustered in small colonies towards the tender portions of the plants. Due to their destructive activity, the plants first exhibited an unhealthy appearance. With the progressive increase in the bug population and the consequent damage, there was a wholesale shedding of the leaves, thus defeating the very object for which the plantation is being maintained.

The incidence of this Coccid in such a severe form was an experience by itself, and the opportunity was availed of to try some of the recent synthetic and systemic insecticides against this pest.

Material and Methods: The following variants, viz – sprays of HETP 0·15% and 0·1%, Parathion 0·025%, Gammalin 0·1%, DDT emulsion (Psyloxtox -250), 0·02 and 0·04, DDT suspension 0·2%, BHC suspension 0·1 and 0·2%, dusts of BHC 5% and 10%, DDT 5%, Agrocide cotton dust and Parathion 2% – and sprays of the systemic chemicals, Isopestox, Pestox, Sytam and Tetrax at 0·15% were tried in three sets of experiments. The results were compared with those of the standard insecticide – Fish oil rosin soap – (1 lb. in 4 gallons). Initial and post treatment population counts were recorded 48 hours, and a fortnight later on random samples of ten twigs (each six inches in length) per treatment. The details are furnished in Statements I, II and III appended.

Results: The data furnished in Statement I, indicate the high efficacy of BHC spray 0·2% as the percentage of reduction in population was 94·8 in the course of 48 hours. Sprays of DDT emulsion (Psylortox 250) 0·04%, DDT suspension 0·2%, HETP 0·15%, Parthion 0·025% and

BHC 0·1% come next in the respective order of efficacy, all of them causing more than 50% reduction.

In the second set of experiments (Statement II), where the dusts were used, the best results were obtained in Parathion 2% and the percentage of reduction in 48 hours was 98 4. BHC dusts 5 and 10% and Agrocide cotton dust also gave a reduction of more than 50% in the population, within the same period.

As may be seen from Statement III. the systemic chemicals also have been quite efficient as the reduction ranged from 80·2% to 95·2% in the course of 48 hours. Despite the slight variations in the immediate effects of these chemicals, the bugs were practically exterminated in all the treatments in about a fortnight, while the population has gone on increasing in the controls. Compared with the performance of the different variants, Fish oil rosin soap spray has exerted a reduction of only 42·7% and has had little or no residual effects.

Conclusion: The above data show the higher efficacy of the synthetic and systemic chemicals over Fish oil rosin soap for the control of this mealy bug. The results of BHC spray 0·2% Parathion dust 2% and sprays of Isopestox, Pestox, Sytam and Tetrax at 0·15% were particularly convincing.

NOTE: Due to the limited material and the large number of the variants, the experiments had to be conducted on a small scale, more on an exploratory basis and the calculation of the economics of the difierent chemicals was. therefore, not possible. A word of caution is also necessary about the use of these chemicals. Some of them, especially Parathion and the systemic insecticides are somewhat dangerous to handle and should, on no account, be allowed to come in contact with the body. Further, they are also likely to be absorbed and retained by the plants. This phenomenon often results in ruining the edible qualities of the produce, particularly in the case of BHC. Besides these, the possible hazards to man and other animals consuming the produce is another but more serious aspect. The chemicals have, therefore, to be used with extreme care on crops like vegetables, fruits, etc. If their application is inevitable, it should be stopped by four to six weeks before harvest.

Acknowledgement: The authors wish to express their thanks to Sri S. Ramachandran, Government Entomologist for his guidance in the work and in the preparation of this note.

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STATEMENT I.

Spraying Formulations.

No.	Treatments	Initial population			Population after 48 hours			Percentage of reduction in the total population by 48 hours	Population after a fortnight			Percentage of increase or decrease in the total population over the initial count
		Adults	Nymphs	Total	Adults	Nymphs	Total		Adults	Nymphs	Total	
1.	H. E. T. P. 0·15%	48	465	513	5	194	199	61·2	15	157	172	66·5
2.	H. E. T. P. 0·1%	78	345	423	20	246	266	37·1	9	96	105	75·2
3.	Parathion 0·025%	132	281	413	16	155	171	58·6	24	77	101	75·5
4.	Gammalin 0·01%	78	262	340	27	218	245	27·9	7	58	65	80·9
5.	DDT (Psylortox – 250) – 0·02%	103	527	630	52	466	548	43·0	43	175	218	65·4
6.	DDT (Psylortox – 250) emulsion 0·04%	43	1192	1235	20	332	352	71·5	51	234	285	76·9
7.	DDT suspension 0·2%	81	914	995	33	251	284	71·5	75	185	260	73·9
8.	BHC suspension 0·1%	14	535	549	1	247	248	54·8	23	52	75	86·3
9.	BHC suspension 0·2%	57	655	712	..	37	37	94·8	2	15	17	97·6
10.	Fish Oil Rosin Soap (1 lb. in 4 gallons)	97	676	773	59	394	453	42·7	82	330	412	46·7
11.	Control	4	515	519	7	623	630	plus 21·4*	54	603	657	26·6*

* Increase in the percentage of population over the initial count.

STATEMENT II.

Dust Formulations.

No.	Treatments	Initial population			Population after 48 hours			Percentage of reduction in the total population by 48 hours	Population after a fortnight			Percentage of increase or decrease in the total population over the initial count
		Adults	Nymphs	Total	Adults	Nymphs	Total		Adults	Nymphs	Total	
1.	BHC 5%	52	285	837	37	228	265	68·3	12	53	65	92·2
2.	BHC 10%	150	472	622	32	232	264	57·6	8	5	12	98·1
3.	DDT 5%	48	371	419	29	347	376	10·3	82	86	168	59·9
4.	Agrocide cotton dust	132	212	344	29	128	157	54·4	7	212	219	36·7
5.	Parathion dust	53	386	439	..	7	7	98·4	..	..	..	100·0
6.	Control	56	459	515	66	494	560	8·7*	22	207	229	55·5

STATEMENT III.

Systemic Insecticide.

1.	Isopestox 0·15%	166	234	400	2	17	19	95·2	4	1	5	98·7
2.	Pestox 0·15%	96	1174	127	16	165	181	85·7	4	..	4	99·7
3.	Sytam 0·15%	56	428	484	33	63	96	80·2	7	2	9	98·1
4.	Tetrax 0·15%	131	636	767	37	106	143	81·4	12	30	32	95·8
5.	Control	4	515	519	7	623	630	21·4*	54	603	657	26·6*

* Increase of percentage of population over initial

The Occurrence of Barren Tillers in a Heterozygous Rice

By

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Introduction: The formation and emergence of panicles is a season bound character in some varieties of rice. However, there is some evidence that it is also genetically controlled. Anandan and Krishnaswamy (1934) have recorded the occurrence of earless or 'Barren-Sterile' type of plants occurring as a segregant in a culture of Muthusamba. They found that one of their cultures was heterozygous and that in a population, the number of plants without panicles was nearly one-fourth of the total representing an approximate 3 : 1 ratio. In confirmation, they found that some of the apparently normal looking plants segregated similarly in the next generation. Therefore there is a probability of a single mendalian factor being concerned, the heterozygous normal being phenotypically indistinguishable from the homozygous normal plants. This type of inheritance in rice has not been recorded elsewhere and is of extreme interest. Therefore the segregating culture was kept alive at the Paddy Breeding Station, Coimbatore and study continued. The present paper deals with some new observation made in the course of study.

The cytology of this segregating form has been studied. From a study of mitotic divisions Sampath and Krishnaswamy (1948) found out that the somatic chromosome number of the barren plant was 22 and pointed out that this could only arise out of a 23 chromosomed plant. Also that the 23 chromosomed plant itself should have arisen from normal 24 chromosomed plant by non-disjunction of a pair of chromosomes and the formation of a 11 chromosomed gamete and its subsequent fertilization by a 12 chromosomed gamete. This 23 chromosomed (monosomic) plant would give rise to 24, 23 and 22 chromosomed plants in 1 : 2 : 1 ratio. By securing a 23 chromosomed plant both the type of plants could be maintained. Barren plants could be morphologically distinguishable from the apparently normal plants only after a growth period of 125 days. From the remaining population a random selection of 10 – 15 single plant selections has to be made. When these are sown next season, on probability, at least one selection will give rise to a segregating population. The method is wasteful and a simple method of selecting heterozygotes in the field, would be a great convenience. Pollen grain studies of the monosomic plant did not reveal dimorphism of grains. Therefore the method of identifying the heterozygotes by pollen grain size is not available. An alternative method is to study the 'root tip

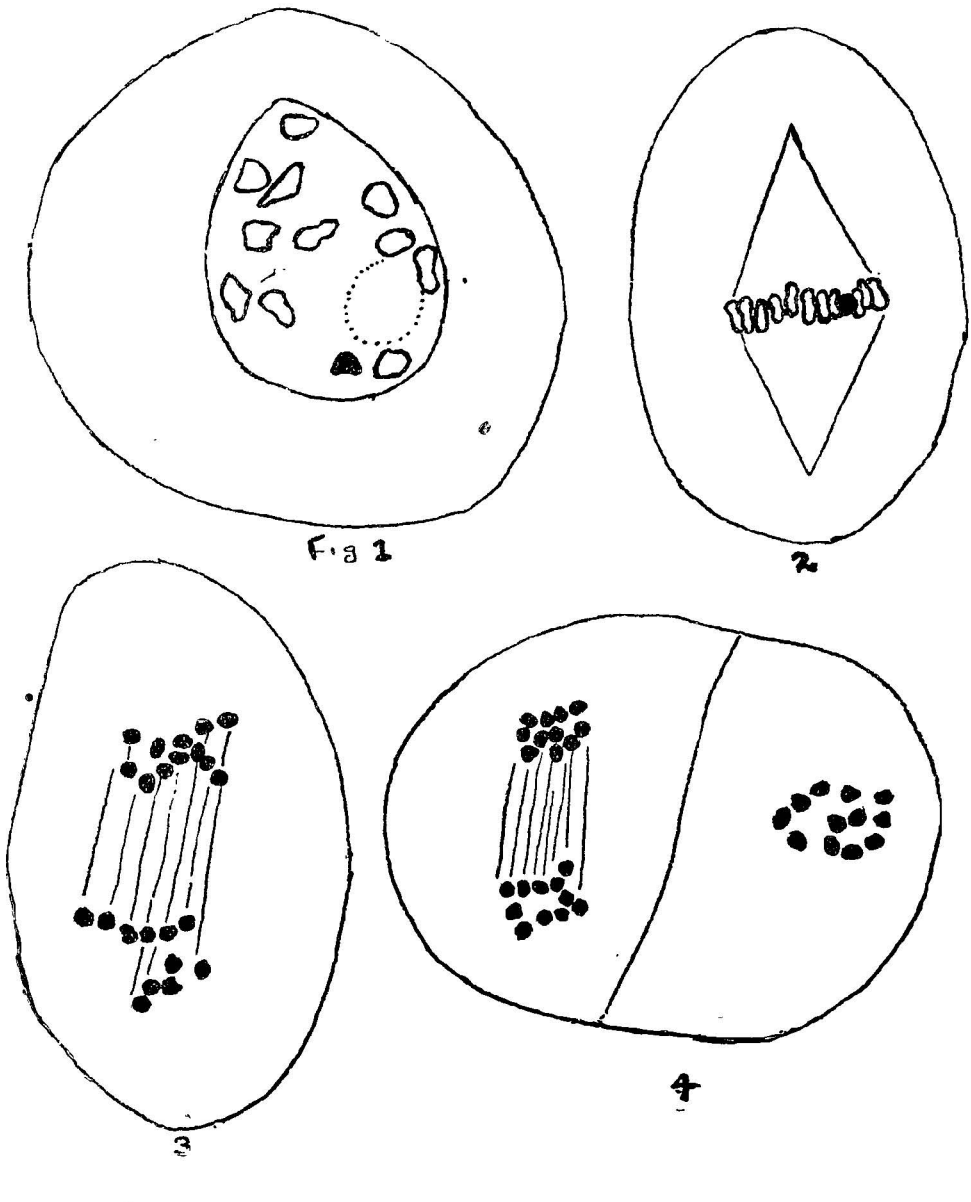
mitosis of a number of plants and pick out the 23 chromosomed plant. By chance an easier method of solving this problem arose and is given below.

Materials and Methods: The segregating culture was carried over year after year by single plant selections. These were sown during the main season (August – December). When necessary stubbles were planted in pots for further observation. Regarding cytological methods Craf A & B mixture was used for fixing root tips and Bouin's fluid for flower buds. Infiltration and embedding was done in paraffin. Staining was done in Newton's Iodine Gentian Violet. In this connection a definition of the term used may be made. Krishnaswamy and Anandan described the barren plants as 'Barren Sterile'. Instead of this, the term 'Barren' is preferred and used here to describe earless plants This is because the words Barren Sterile are repetitive and the word Sterile may be used to describe unsetting in formed panicles only. In this case there are no panicles to show sterility.

Observation: In studying these segregating cultures, a plant was observed to have a few tillers producing fertile panicles and the remaining tillers were barren, the phenotype being 'Normal - Barren' (Fig. 5 a). There were two such plants and seeds from these were collected and grown next season.

The progeny showed segregation into normal and barren plants. A few Normal-Barren plants were also observed. The two types of tillers were separated and chromosome numbers were counted in secondary root tips. The mitotic count from the fertile tillers gave the number $2n=23$ and that from the barren tillers $2n=22$. The occurrence of nullisomic ($2n=22$) tillers in the heterozygous normal ($2n=23$) plants is interesting and reveals the rare phenomenon of somatic elimination of a chromosome.

A check of this observation was made by the study of meiotic chromosomes in the fertile tillers of this Normal-Barren plant. It confirmed that these tillers have 23 somatic chromosomes. In the meiotic division at Diakinesis, 11 bivalents and 1 univalent were formed. Two of the bivalents from the nucleorar chromosomes. Hence the deficient chromosome could not be from the nucleorar chromosomes (Fig 1). A compact metaphase plate and a bipolar spindle were formed at Metaphase I. The univalent was seen lying along with the bivalents and move to one of the poles (Fig. 2). Anaphasic separation was clear and $\frac{12}{11}$ distribution most frequent (Fig. 3). The second division was normal, the univalent dividing equationally (Fig. 4). Tetrads were regularly formed. From this it is seen that 12 and 11 chromosomed gamets are formed and the progeny would consist of 24, 23 and 22 chromosomed plants.



Meiotic Divisions in Monosomic Rice

Fig. 1: Diakinesis—11 bivalents and 1 univalent.

Fig. 2: Metaphase I, side view univalent remaining at the euqator.

Fig. 3: Anaphase I, 12 and 11 distribution.

Fig. 4: Division II, Metaphase in one daughter cell (12 chromosomed) and anaphase in the other (11 chromosomed). Fig. I × 3150 and the rest × 2200. The univalent is shaded.

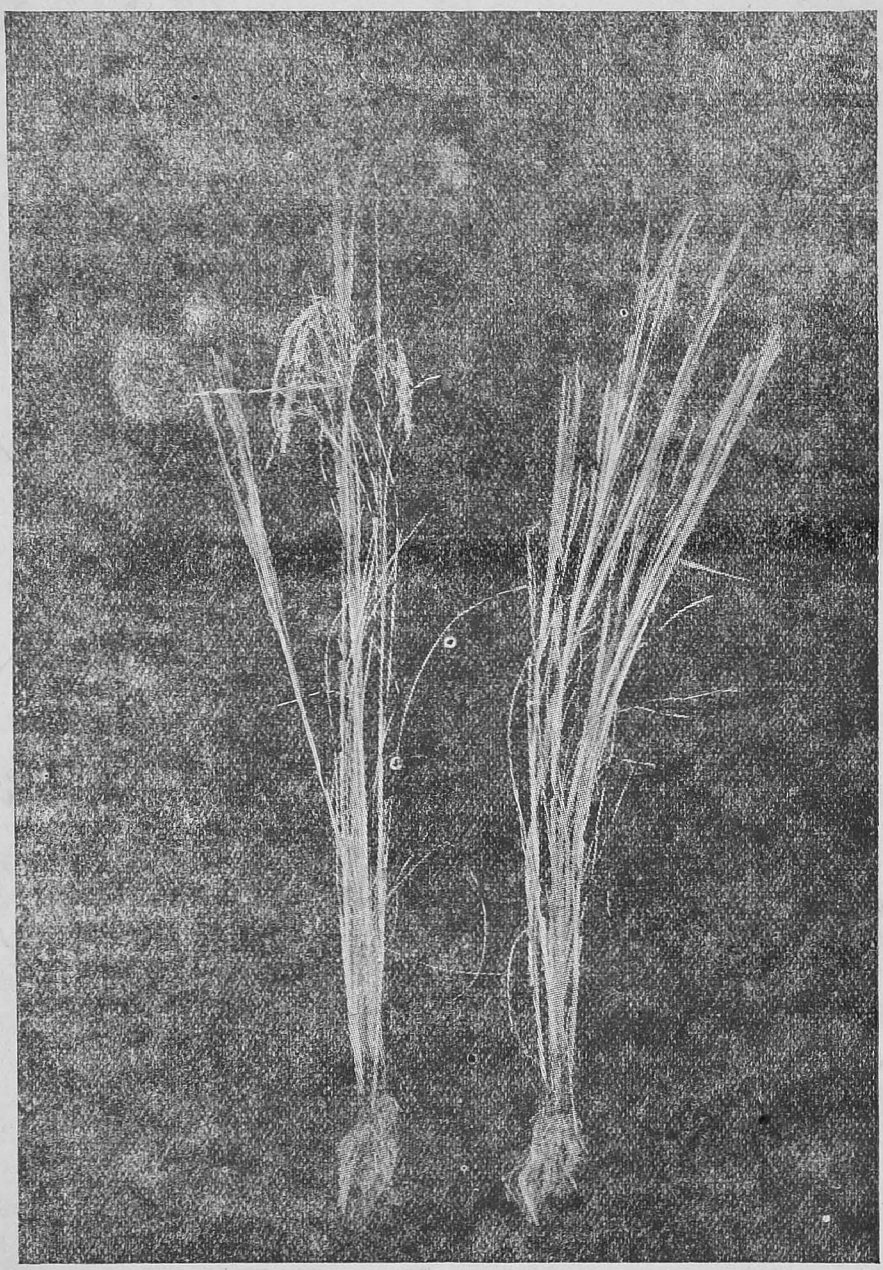


Fig. 5: Photograph showing (a) 'Normal Barren' plant and (b) Barren plant.

The genetic behaviour of seeds from 'Normal-Barren' plants were studied. The progeny showed segregation. From the two families of 855 plants, 676 were normal and 179 plants were barren. Amongst the apparently normal plants 26 had barren tillers also.

Discussion: The segregation requires comment. Theoretically the monosomic (2n=23) plants should be numerically twice as the normal (2n=24) as well as barren (2n=22). But the monosomic plants are indistinguishable from the normal and therefore the phenotypic ratio is 3 : 1. In the 3 : 1 ratio for the normal and barren plants there is a deficit in the recessive phenotype. From the study of nursery where some of the seedlings die, it is considered possible that the recessive condition namely nullisomaty is semi-lethal in effect. This mortality may account for the deficit. Amongst the normal looking plants two thirds of the population should be monosomic. Only about one-sixteenth of the population of the probable monosomics gave rise to barren tillers. The reason for this is not understood. It is probable that somatic elimination of a chromosome in tiller formation is not very frequent. Even where it occurs there is some variability in the number of barren tillers formed. Therefore the process of somatic elimination by which barren tillers are produced is an exceptional occurrence during mitotic division. The fact that it occurs is of practical use. The use is in the easy way in which 23 chromosomed (monosomic) plants can be picked out. Seeds collected from Normal-Barren plants will give rise to normal, monosomic and nullisomic plants in the next generation and the strain can be kept alive. The barren plants will not give rise to seeds, and seeds from normal plants may be homozygous for *normalcy*. In addition, pollen from 'Normal-Barren' plants can be used to hybridise other short duration varieties carrying anthocyan pigment or known linkage groups Theoretically half the hybrids will be monosomics and by further genetical analysis it may be possible to find out if the missing chromosome carries a known linkage group.

Further study of the 'Normal-Barren' plants and its segregation may be instructive and the work is being carried on. The two problems being investigated are the following: (1) The deficit of nullisomics in the total population could be due to death in the seedling stage or due to 'Certation' the 12 chromosomed pollen being faster in tube growth and has an advantage over 11 chromosomed pollen in fertilisation, (2) some environmental factors may affect production of barren tillers.

Summary: A segregating culture in the long duration rice variety Muthusamba was studied. In this culture which segregated for normal and barren plants, a few plants with both fertile and barren tillers were picked. Cytological study showed that this new type was a monosomic,

add that barren tillers arose by somatic elimination of a chromosome. This work confirmed the cytological explanation for barrenness and gives a simple method of picking out 23 chromosomed plants in the field.

Acknowledgements: I am indebted to the Cytogeneticit and Paddy Specialist for help and guidance during this study.

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Distribution of Rhizophora Mucronata, Lam., in the 'Back-Water' of the West Coast and its Economic Importance *

By

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Introduction: India possesses nearly a third of the cattle wealth of the world. Though it is far behind other countries regarding its dairy products, it stands in the forefront in the manufacture of skins and hides. In the early days, before the advent of the wattles, several indigenous tanning materials were used, namely barks of *Cassia auriculata*, L; *Cassia fistula*, L; *Acacia arabica*, Willd; pods of *Caesalpinia digyna*, Rottl. and *Caesalpinia coriaria*, Willd. and fruits of myrobalans (*Terminalia chebula*, Retz.). Prior to the first World War (1914—1918) South African wattle bark was unknown to the tanning industry of India. The war made a very big demand on the Indian tanning industry, with the result investigations were taken up at various Leather Research Institutes

* Presented to the Indian Science Congress; Calcutta, January 1952.

to explore the possibility of finding out a suitable tanning material for manufacturing large quantities of tanned leather. During an experiment conducted in Madras in 1917 with wattle bark received as a trial consignment from South Africa, it was found that satisfactory results were obtained; from that time onwards the use of wattles for tanning purposes increased at a very rapid rate and within a period of about 25 years indigenous tan stuffs were practically eliminated. The wattles were first introduced in 'Tea Estates' about the middle of last century as shade trees, but their importance as tanning material was realised only when the 'South African bark' became popular. Two species of wattles, namely *Acacia mollissima* and *Acacia decurrens* were found to be most successful, as they contained 32 to 38% of tannin; the area under these two species is now increasing in the Nilgiris and Kodaikanal. It is now estimated that nearly 4 to 5 lakhs tons of wattle barks are required annually for tanning purposes (K N. Nair, 1950). Regarding the use of the mangrove barks as tanning material, preliminary investigations have been carried out in other countries. Brown and Fischer (1918) quoted by Villanuera (1926) report that the mangrove bark constitutes the greatest single source of tanning material in Phillipines and that *Rhizophora candelaria*, D. C., *R. mucronata*, Lam., *Bruguiera conjugata*, Merr, and *Ceriops* Sp. etc, are the most important of the mangrove trees which furnish the greatest amount of tanning materials. Das (1944) records that *Ceriops roxburghiana*, Arn, of Sunderbans, *Rhizophora mucronata*, Lam. *Bruguiera conjugata*, Merr. and *Ceriops candolleana*, Arn, of the Andamans tried at the Bengal Tanning Institute, have proved that they can be satisfactorily used for tanning purposes. Tardinot F. (1922) reports that barks of *Rhizophora*, *Bruguiera* and *Kandelia* were tried for tanning purposes in Tonkin (Hanoi) and that though the tanning was satisfactory, the colour of the skin was not attractive. Chevalier (1924) states that in Indo-China, the barks of *Rhizophora*, *Bruguiera*, *Ceriops* and *Carapa* were successfully used for tanning purposes.

The occurrence of *Rhizophora mucronata*, Lam, along the salt marshes, tidal creeks, estuaries of rivers and 'Back-waters' has been recorded in the tropical belt of the world by Gamble (1915), Hooker (1859), Cook (1903), Trimen (1894), Watt (1892). The same authors also mention about its high calorific value and of having extremely hard heart wood, giving charcoal of high calorific value. A preliminary survey of the 'Back-water' flora of the West Coast has been recorded by Chandrasekhara Ayyar (et al 1949), wherein they have mentioned about the occurrence of *Rhizophora mucronata*, Lam and the possible uses of the plant and how some of the 'Back-waters' of the West Coast could be profitably planted with this plant.

Material and Methods: In the present investigation, one of those 'Back-water' areas was taken up for detailed study and the distribution

of *Rhizophora mucronata*, Lam along the whole length of the 'Back-water' was studied. This 'Back-water' is known as Karinghote river and situated near Nileshwar (South Kanara). This river extends from the sea coast to a distance of about 12 miles to the interior. *Rhizophora mucronata*, Lam was found to occur only up to a particular distance from the sea-coast, and thereafter not a trace of this plant could be seen. It was therefore, decided to test the salt content of the 'Back-water' to see if any relationship exists between the salt content and the distribution of this plant. Water samples were taken in the middle of February, at intervals of about one or two miles throughout the course of the 'Back-water' to see if any relationship exists between the salt content and the distribution of this plant. Water samples were taken in the middle of February, at intervals of about one or two miles throughout the course of the 'Back-water' and simultaneously the occurrence of this plant was recorded. The water samples were analysed by the Government Agricultural Chemist and the results are given in Table No. 1.

TABLE I

Sample No. & Stage	Name of place & distance from sea coast	Total solids at 105° C	Chloride (Cl)	Sodium chloride (calculated)	PH	Occurrence of Rhizophora
		Parts per 100,000				
I	Near Nileshwar (4 miles)	2048	1036	1707	6·70	Yes
II	Chattoth (6 miles)	2003·4	1050	1730	6·47	Yes
III	Kayyar (7 miles)	1150·8	658	1084	6·77	No
IV	Thalampadh (9 miles)	408·0	210	346	6·80	No
V	Kunnan Kayi (11 miles)	16·4	8·4	13·85	6.90	No

It will be seen from Table No. I that from the 6th mile (Stage II) onwards, *Rhizophora* gradually disappears until at the 7th mile (Stage III) it is practically absent. The total solids at Stage II is 2,003·4 parts in 100,00 ; chloride 1,050; and sodium chloride (calculated) 1,730; while at stage III the total solids are 1,150 8; chlorides 658, sodium chloride (calculated) 1,084. The minimum solids required for the growth of this plant, therefore, appears to be a little above 1150 8, but it is clearly seen that this plant never thrives if the salt-content of the 'Back-water' is less than 1,150. It will be also seen from the table that there is no appreciable change in the PH value throughout the length of the river.

To evalute the percentage of tannin in the barks of *Rhizophora*, bark were taken from medium sized trees at different intervals to see whether any variation in total solids in the 'Back-waters' affected the

tannin content. In Table No. II, the total solids at definite intervals of the 'Back-water', are given for the months of February and May. It is seen from the Table that the percentage of tannin is not affected even if the total solids in the water fall down.

TABLE II

Tannin content of Rhizophora mucronata

Date of sampling	Tans.	Non-tans	Moisture	In. Sols.	Colour ½% tan. Sol. ½ cm. all
February, 1950	11.3	16·9	10·2	61·6	Y–16·2 R–15·0
May, 1950	15·3	14·0	..	..	Y–12·0 R– 6·2

From the tannin content, it is seen that *Rhizophora* barks collected at Nileshwar contain on an average 12 to 15% of tannin, it is reported by the Leather Technologist that this quantity is enough to carry out trials in leather tanning.

Discussion: It will be of interest to note that the distribution of *Rhizophora* seems to depend upon the presence of certain amount of Chlorides particularly Sodium Chloride; and in the particular area selected for trial, it has been found to range from 1150 to 1730 parts per 100,000. It was also thought that the pH of the 'Back-water' may vary at different intervals and this may affect the distribution of mangrove plants but from the results obtained, it will be seen that there was no change in *pH* value, all along the course of the "Back-water". This aspect of the distribution of mangrove plants in relation to the total solids of the "Back-water" has not been recorded so far. Regarding the the tannin content of the barks of mangrove plants, some work has already been done. In the present investigation, dry barks only were analysed, and according to Villanuera (loc. cit) these barks on drying, lose a certain percentage of tannin and that it increases with the size and age of the tree; the same author quotes that in Philippines, species of *Rhizophora* and *Bruguiera* possess an average of 28 to 30% of tannin on the dry weight and that the mangroves constitute the greatest single source of tanning material Das (1944 – loc cit) states that though mangrove bark had been unpopular in tanning, on account of the ugly red colour and the harsh gained leather it produces, ways have been devised for minimising the defects. The same author is of the opinion that not only mangrove barks should be used for direct tanning but an extract should be made from Indian Mangroves just as in British North Borneo; this extract blended with those of babul and myrobalans produces a good quality tanning material In the present investigation the authors found 12 to 15% tannin in the barks of *Rhizophora mucronata*,

Lam., occurring in Nileshwar, but according to Das (1922) the tannin content of this plant in Borneo was recorded as 20·5% and that from Malaya as 30 to 40% and that it may vary in different places. Apart from *Rhizophora mucronata*, Lam., species of *Ceriops*, *Kandelia* and *Bruguiera* have been recorded by Gamble (1915) to occur in the tidal forests of Quilon in Travancore, Godavari and Krishna deltas. Das (loc. cit) is of opinion that both in yield of extract and pertentage of tannin, barks of *Rhizophora mucronata*, Lam., *Ceriops roxburghiana*, Arn., and *Bruguiera Conjugata*, Merr., stand out conspicuously. The authors are of the opinion that this material wealth, hitherto untapped can be turned the best advantage and to a certain extent, meet the deficit which the State is now experiencing with regard to the tanning materials. No estimate has, however, been made of the extent of the mangroves in peninsular India; apart from tidal forests of the estuaries of big rivers, "Back-waters", no systematic efforts have been made to plant them along the sides of the "Back-waters". In the West-coast, coconut plantations have encroached to the very edge of these "Back-waters" and already some reports have been recorded as to how best to check the erosion along the sides of the "Back-waters". The authors are of opinion that planting the mangroves trees upto a depth of 6 to 10 feet on either embankments will be the most promising method of preventing erosion of the sides of these "Back-waters". The authors have noticed that wherever such thick belts of mangroves occur as in Gangolly river of Coondapur (South Kanara) erosion is practically eliminated; and that on a conservative estimate 150 to 200 miles of this foret can be developed in the West Coast alone. The yield of bark that can be expected, may be roughly estimated at 5,000 tons. Chevalier (loc. cit) is of opinion that "*Rhizophora* can be cultivated and subjected to extensive exploitation as is already being done in other countries"; the same author considers that it is an "important reserve of firewood which is precious in a country where wood is often scarce". Watts (1892) also has recorded that it is good for purposes of firewood and the charcoal made out of it is also of good quality. The authors are of opinion that in the coastal districts where forests are rare, exploitation of the mangroves for fuel purposes also, is well worth a trial.

Since presenting this paper to the Science Congress the authors have found that some more plants along the "Back-waters" of the *East-Coast* have a good percentage of 'tannin' in their bark; these are under investigation.

Summary and Conclusions: 1. *Rhizophora mucronata*, Lam., gradually disappears from the 6th mile of Nileshwar river upto 7th mile and thereafter it is completely absent. This plant flourishes when the total solids in the "Back-water are 2003·4 (in 100,000) parts which includes chlorides to the extent of 1050. The minimum solids (chlorides)

required for the growth of this plant appears to be a little above 1150·0 and if the chlorides are below this level this plant does not appear to thrive.

2. In the whole length of the "Back-water" no variation in *pH* value was recorded.

3. The tannin content from the barks of middle aged trees varied from 12 to 15% and the variation in the total chlorides of the "Back-water" in different seasons of the year did not affect the tannin content.

4. It is suggested that sides of "Back-water' can be planted with mangrove trees, for obtaining the valuable 'tannin' which is in short supply and, incidentally, to protect the sides of "Back-water" from erosion.

5. The mangrove trees may also serve as good fuel especially in coastal tracts where forests are rare.

Acknowledgements: The authors acknowledge with thanks the help rendered by the Government Agricultural Chemist, Agricultural College, Coimbatore, in analysing the water samples of the "Back-water".

They are also thankful to the help rendered by the Principal, Government School of Technology, Madras, in estimating the "tannin" content of the bark samples, and testing their suitability for tanning purposes.

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Economic Possibilities of Lemongrass Oil Industry on the West Coast

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Fifty years ago cultivation of this grass was practically unknown on the West Coast. Today it is cultivated in an area over 30,000 acres about 85% of which being in the State of Travancore Cochin and the rest in Malabar district. The industry originally started with the distillation of oil from Lemongrass growing wild on the hill slopes and the product was mostly used for medicinal and perfumery purposes. Gradually this oil found its way to Foreign markets like New York and London and began to attract better prices. Within the past 25 years the foreign demand for this oil, which has come to occupy an important place in foreign trade of India has increased progressively which in its turn has resulted in a corresponding increase in the production of this commodity. When the demand for oil outgrew the supply from natural growth, regular cultivation of the crop was started first in Travancore Cochin and later on in Malabar and still later in parts of South Kanara bordering on Malabar. In the wild state two distinct types of grasses were found one having a whitish stem and the other pinkish one. It was soon found out that the grass with pinkish stem (Cymbapogon flexuosus) yields an oil of much better quality than the one with whitish stem (Cymbapogon Citratus), the difference being mainly in the Citral Content of the oils which determines the prices in the foreign markets. While the pink stemmed grass gives an oil containing 75 to 83% citrical, the oil from the white stemmed grass contains hardly 10% citral. As a result of this discovery and the Foreign markets fixing a definite standard which insist on a minimum of 78% Citral in the oils for export, care is now being taken to eliminate the white stemmed grass from cultivated fields. The oil from C. Citratus growing wild is, however, extensively used for mixing with oils of higher Citral Content than the required minimum so as to bring the same to the minimum level. Its economic importance can be seen from the fact that next to the Mysore Sandal Wood Oil, the Cochin Lemongrass Oil occupies the foremost place among the Indian essential oil exported to foreign countries. It has also turned out to be one of the important dollar earning commodities along with the other West Coast products like pepper, tea, rubber and cashewnut-oil and kernal. In India the cultivation of this grass is confined to the West Coast regions of Travancore Cochin and the districts of Malabar and parts of South Kanara. It is a crop that is admirably suited to the waste lands and hill slopes of the West Coast where no other annual crops would grow

so satisfactorily. As the distillation requires large quantities of water and firewood, it would not pay to cultivate this crop where water facilities are lacking and firewood is scarce.

Methods of Cultivation: The land is cleared of scrub jungle by burning the area in February – March and dug once or ploughed two or three times with the help of summer showers and got ready for sowing in in the beginning of the South West Monsoon rains. Seeds collected from plantations having only the pinkish stemmed variety is sown broadcast at 15 to 20 lbs. per acre with the first soaking rains in April – May and lightly covered by a brush harrow. Germination is complete in about 10 – 15 days. One combined operation of weeding, thinning and filling up gaps with the thinned seedlings is done a month after germination. No further cultural or manurial operation is done to this crop except burning the stumps during summer once in 2 or 3 years with a view to rejuvunate the crop. The life of the crop varies from 5 to 8 years according to the fertility of the land.

The first cutting can be taken 3 to 4 months after sowing according to the fertility of the soil. In no case should the crop be allowed to flower before cutting as the oil yield of leaves is reduced considerably after flowering. Normally 5 cuttings can be taken from the crop in a year at intervals 6 to 8 weeks. The crop yields practically no cuttings from January to May due to the drought conditions prevailing on the West Coast during this part of the year. From one acre 12 to 18 bottles of oil can be obtained in the first year and 30 to 36 bottles in the 2nd and 3rd years. The yield of oil goes down progressively in the subsequent years.

Distillation: The oil is distilled in crude country stills made of copper by direct firing method. One charge in the standard still takes about 300 lbs. of fresh grass cuttings which yields 8 to 10 oz. of oil. The distillation takes about 4 hours in all and therefore 3 or 4 charges are distilled per day in a still during busy seasons. The work starting with cutting and transporting of the grass and finishing with the separation of oil is mostly done on contract basis which helps in promoting efficiency and reducing cost. The oil which floats on water is carefully separated and filtered through fine filter paper before despatch. The containers used for despatch to foreign markets are 40 – 60 gallon steel barrels.

The place of Cochin Lemongrass oil in the world market: The world production of Lemongrass oil is estimated to be about 60) tons of which nearly 80% is produced in the West Coast states and districts of South India. Though this industry is faced with competitions from other countries like Indo-China, Java, Sumatra, Eretrea, Madagascar and the Central American States, the Cochin oil continues to get high preference in

the world market due to its higher Citral content. The chief importing countries of Cochin lemongrass oil are U. S. A, U. K., France and Germany. The production and export of lemongrass oil reached their peak level in 1951 due to the high prices offered by American purchasers as can be seen from the following statements :-

Export of Lemongrass oil from India to Europe and U. S. A.

Years	*Export in gallons*	*Value in Rupees*
1944—'45 ..	1,21,629	32,12,243
1945—'46 ..	1,50,790	70,13,862
1946—'47 ..	1,33,390	1,07,45,131
1947—'48 ..	84,053	36,56,595
1948—'49 ..	95,824	24,07,677
1949—'50 ..	82,166	42,07,165
1950—'51 ..	1,09,762	1,13,42,668
1951—'52 ..	1,25,600	1,60,00,000 (approximately)

Price fluctnations of Lemongrass oil in Cochin Market

Year	January	February	March	April	May	June
1949 Rs.	66—3	66-13	69—8	70—2	67-10	70-15
1950 ,,	153—2	147—4	144—0	126—8	117—9	104-13
1951 ,,	310-10	319-13	324-11	293—3	265—7	211-13
1952 ,,	127—8	126—7	90-13	85-13	82—5	84—1

Year	July	August	September	October	November	December
1949 Rs.	78-14	89—7	100—4	146—6	136-15	144-12
1950 ,,	117—1	151—8	179—8	174—0	184—8	250—8
1951 ,,	198—2	235—0	250—0	226—5	197-11	148—8
1952 ,,	79—1	70—1	65-20	..	..	..

The price which is usually expressed in terms of a unit of 12 bottles of 22 oz. each was the highest over recorded in 1951 due to the American stock piling said to be for synthesising of vitamins. The price of oil has since come down still further to the present level of about Rs 66/- per doz. bottles. Due to the comparatively low cost of cultivation even Rs. 80/- will be an economic price for the oil. The fluctuations in the prices of Lemongrass oil in Cochin market have been quite remarkable, the variations within recent years being between Rs. 60/- and Rs. 325/- per doz. bottles. These wide fluctuations have been due to the variations

in foreign demands and the somewhat artificial slump created from time to time by the Exporters who are mostly European Firms like Messrs Pierce Leslie & Co., Messrs Volcart Brothers, etc. The export trade has been the monopoly of these big Foreign Firms till recently and the producers were kept in complete ignorance of the foreign market trends. Of late, however some Indian Firms have also come into the picture to the advantage of the growers Organisations of Growers Co-operative Societies in the important centres may go a long way in saving the producers from the tyranies of the wholesale exporters who often manipulate prices to their advantage.

Mal-Practices in Trade: Mixing of inferior oils from white stemmed varieties and even Kerosene oil with oils of high Citral Content, till the same is brought to the minimum level, is being resorted to by unscrupulous producers and petty traders. In addition to this, colouring of oils with artificial dyes to give appearance of superior oils is also reported to be in vogue in recent times as the American buyers who were purchasing the oil for synthesis of vitamins were particular about the colour of the product. There have also been a few cases of absolute duping by filling part of the drums with water before exporting to give the weight. Such malpractices are sure to spoil the reputation of Indian oils in foreign markets and ought to be prevented by the State exercising some sort of quality control.

Uses of Lemongrass Oil: In early days the oil was mostly used as a cheap soap perfume and for pharmaceutical preparations like pain balms and disinfectants. Later on separation of 'ionons' from the oil with the aid Electrical appliances was discovered, the ionons being 4 to 5 times more costly as perfumes than the original oil. The latest use, however, is reported to be for the manufacture of vitamins and this was presumably the main purpose with which the American had purchased this in such large quantities at extraordinarily high prices during the stock piling period following the out-break of hostilities in Korea in 1950. Thus lemongrass oil has transformed itself into a strategical War material from the position of a cheap soap perfume.

Scope for Extension of Cultivation: There is almost an unlimited scope for the expansion of this industry on the West Coast as this crop is particularly well suited to the extensive waste-lands of those regions including hill slopes of comparatively shallow soils of low fertility. As the oils produced in the other parts of the world do not come up to the standard of the oil produced in this region the West Coast of India almost enjoys a monopoly of this product in the world market.

As setting up of a pilot plant in Travancore-Cochin for the separation of ionons is under contemplation of the Government of that State,

there is likely to be better demand for the oil in the home market also. Above all, its potential value as a basic raw material for the manufacture of vitamins holds out new promise for the future of this industry. The Indian Council of Agricultural Research has also of late bestowed some thought on the development of this industry along with the other important dollar earning commodities like pepper, cashewnut, ginger, etc. and their detailed investigations are in progress. All this should encourage the expansion of this industry in the West Coast as well as other suitable regions.

Summary: Lemongrass oil Industry has a good future and rather wide scope for expansion on the wastelands and hill slopes of the West Coast States and districts. The lemongrass—Cymbapogon flexuosus—comes up well even in comparatively shallow and poor soils and hill slopes, even in places where other crops like modan paddy or tapioca fail to grow well.

The cultivation methods are comparatively easy and less expensive than other crops and a crop once raised remains in the field for 5—6 years giving 25 to 30 cuttings in all. Care has however to be taken in selecting the right type of seed material for eliminating the admixture of the inferior white stemmed variety of grass c. citratus which yields an oil of very low citral content. As C. flexuosus grown in India gives a superior oil with high citral content ranging from 75 to 85% compared with the oil produced in other countries like Central American States, Indonesia, Eretrea, Madagaskar etc. Indian oil is likely to get preferential claims in U. S. and continental markets for a long time to come. The periodical slumps often artificially created by vested interests and the consequent wide fluctuations in the market rates can be combated to a great extent if the producers and local merchants organise themselves properly and improve their staying power. Above all the prospects of development of 'ionon' and other industries in India with the help of the Central and State Governments following the investigations by the Indian Council of Agricultural Research should enthuse and encourage the producers to increase their production.

Weed Control by Chemicals Trails with Extra "A" (Sandoz)

By

K. SAPTHARISHI

AND

M. D. AZARIAH

Agricultural Research Station, Nanjanad

Introduction: Control of weeds in cultivated crops by the use of selective herbicides has become increasingly popular. A good measure of success in this direction has been reported by workers in India and elsewhere. The active chemical ingredients of the many commercial formulations in the market mainly consist of 10% of sodium –4 chloro–2 methyl phenoxyacetate, 80% of the sodium salt of 2·4–D, 40% of the butyl ester of 2 4–D, sodium and ammonium trichloracetates and dinitro - ortho - cresol.

Samai (Panicum miliar, Lam) is an important goodgrain crop raised on the Nilgiri hills in rotation with potato and forms the staple diet. Being a slow - growing millet it is overpowered very quickly by spurry *(Spergula arvensis)*, a pernicious weed of the region. Very often the entire crop succumbs to this and other common local weeds like *Oxalis* and *Polygonums* Handweeding is not always possible, due to scarcity and high cost of labour.

Materials and Methods: During the year. 1949, a supply of EXTRA "A" (Sandoz) was received from Messrs. Shaw Wallace & Co, Ltd., Madras, for trials. This water - soluble preparation, containing dinitro - ortho - cresol as its active ingredient, was claimed to be very effective as a weedicide in cereal fields.

In the same year a 1% aqueous solution of the chemical was sprayed, purely as an observational measure, on bulk fields of *Ragi* and *Samai* infested with spurry. During harvest, it was found that there were appreciable yield increases for grain and straw in the sprayed treatments.

For the next two crop years, 1950—'51 and 1951—'52, the treatments were enlarged to four in number as follows:

A: Control (Unsprayed).

B: 1% of the chemical applied as a single dose, 50 days after sowing *Samai.*

C: 1% of the chemical applied twice, 50 and 75 days after sowing.

D: 2% of the chemical applied as a single dose, 60 days after sowing.

The treatments were run on replicated basis over randomised plots. Detailed field observations were maintained, the effect of the chemical on the crop and the weed critically studied and the yield data statistically examined.

The percentage increases for the spray treatments, over the unsprayed control, for both the yields of grain and straw, were spectacularly high ranging from 38–583 and 400–997 respectively.

Conclusion: The chemical proved very useful not only for the total destruction of weeds, but also in returning very high values for yields of grain and straw. Within eight hours after the sprayings, it was found that the weeds had wilted off. They were dead in 24 hours and, after three days, completely dried up. The preparation did not in any way affect the growth and yield of the potato crop that succeeded the treated *Samai*. It was further found that treatment B (spraying with 1% of the chemical once) was enough to give an effective kill of nearly 80% of the weed populaiion, the total cost of chemical and labour amounting to only Rs. 34/- per acre as against Rs. 50/- that will have to be spent for hand-weeding, which would not be so effective.

Summary: The results proved that EXTRA "A" is a handy and effective weedicide and may be very usefully employed in cereal fields, The destruction of broadleaved weeds is thorough, quick and complete and it does not leave any deleterious residual effects on the soil for the next crop. Its use is also cheaper when compared with charges of hand weeding.

Acknowledgment: The thanks of the authors are due to P. Uthaman, who initiated and guided the conduct of the investigations, while he was the Superintendent of the Station in the year 1950—'51.

Research Note

A Note on the Use of Cotton Flower as a Vegetable

The petals of cotton flower are used as vegetable in some parts of this State. The cotton flower after fertilization withers away and the petals are practically of no value for the plant. These petals could be collected as soon as they commence to wither and used as a vegetable. About hundred pounds of these petals may be obtained from an acre which could be very well as a vegetable instead of being wasted. The food value of the material is given below.

Food Value of the petals

Moisture	.. 84·88%	Calcium	.. 0·062%
Ether Extract	.. 0·876%	Phosphorus	.. 0·05%
Ash	.. 1·62%	Fibre	.. 1·19%
Total Protein	.. 2·17%	N-free extract	.. 9·15%

Food value of other vegetables similarly used are given below for comparison.

Food value in 100 gms. of the material

	Gogu.	Agathi.	Plaintain flower.	Letuce.
Moisture ..	86·2	76·7	90·2	92·9
Ether Extract ..	1·1	1·4	0·2	0·3
Protein ..	1·7	8·4	1·5	2·1
Ash ..	1 0	3·1	1·2	1·2
Calcium ..	0·18	1·13	0·03	0.05
Phosphorus ..	0·04	0·05	0·03	0·03
Fibre ..	..	2·2	1·90	0·5
N-free extract ..	10·0	8·2	5·00	3·00

It is seen that cotton flower compares favourably with plaintain flower and Lettuce, except that the fibre content of letuce is less and it is more succuelent.

The material is found suitable for the preparation of Indian dishes like chutny and sambar. Older flowers are better which can be removed by boiling with water after addition of salt or sodium bicarbonate. The bitterness is due to Gossypol.

Acknowledgments: My grateful thanks are due to the Principal, Agricultural College Bapatla, and the Lecturer in Chemistry for their kind encouragement and to the Assistant Cotton Specialist, Agricultural Research Station Lam, for kindly supplying the samples.

Agricultural College,
Bapatla.

B. APPAJI RAO, B SC. (HON).,
Asistant in Chemistry.

Students' Corner

Agricultural College, Bapatla

1. **Literarty Activities:** Dr. V. S. Krishna, Vice-Chanceller of Andhra University visited the College on 21st October. He was entertained to tea by the members of the staff. He latter addressed the students on the importance of Agriculture and intensive practical training in agriculture. United Nations Day was observed on 24th. A debate was held under the auspices of the Student's Club on the subject "that peace can be maintained by the United Nations only by force but not by love". Sri B. Appajirao presided and the Vice-President of the Students' Union Sri B. Appala Naidu served as an observer. Several students took part in the debate. The motion was lost when it was put to vote.

2. **Sports:** Two foodball matches were played against local football team. In the first match the college team won and in the second match the local team. One cricket match was held and the College students were leading in the beginning but finally the Chirala I. L. T. D. eleven won the game.

3. **College Extension Service:** During October two batches of students of the Second year and Final year classes visited the 'Villages of Buddam and Jammulapalem on 11—10—1952 and 25—10—52 respectively. In Buddam the holdings of Sri Manthera Rangaraju were tackled and plantings of seedlings of Thespesia, peltopherum and Leucena Glauca were done while in Jammulapalem, holdings of Sri P. Venkatappaiah were tackled and an area of 12 acres of paddy seed plots was rogued.

Gleanings

Need for Geophysical Research in India: Any number of instances may be given to prove that rich natural resources are not in themselves a guarantee for a nation's prosperity. California a century ago was a decadent Spanish colony of extremely poor and superstitious famine-sticken farmers. Under American flag, its rich resources in gold, oil and water have been harnessed to make it the most proserous State of the American Union. Kuaitt was an arid desert a decade ago; but with the discovery there of the richest oilfield in the world, large cities have sprung up overnight as it were with all modern amenities including a water supply system based on the distillation of 2 million gallons of sea-water per day. Modern Geophysics gives to the initiated a vision of underground structures even to depths of 5,000 ft. It has given a clue to the discovery of oil, lignite, gold, nickel, chromite ores in the snow-capped regions of the Arctic, placer gold and borax in the

western deserts of the United States, underground water in the table land of South Africa. The Standard Oil Company is now carrying out a geophysical survey of the rocks underlying the Bengal alluvium by airborne magnetometer; and the results appear promising enough for this company to start delicate negotiations with the Government of India regarding terms and conditions for exploratien of oil in that region.

It is time that a Geophysical Research Institute on an adequate scale is established in India to follow up this adventure of the Amercian Oil Company. The greatest resources of a nation is its storchouse of scientific knowledge and technical skill, because without it, the storehouse of raw meterials which might be in the country as a gift from Nature remains buried or unused and is not harnessed for better living. A Geophysical Research Institute may well be the principal key for unloeking and developing for human betterment, the buried resources of India.

[Current Science. September 1952]

Planning of Scientific Research in Relation to National Reconstruction.

In the course of his Acharya Profulla Chandra Ray Memorial Lecture, Dr. K. G. Naick, Rector of the Gujrat University, observed :—

The U. S. S. R. has surpassed all other countries in the co-ordination of scientific research, by organizing three kinds of institutes, namely, (i) The Main Institute undertaking industrial as well as pure fundamental research work, in connection with the problems passed on to them by (ii) The Branch Institutes which in their turn test, on a semi-manufacturing scale, the results of research arrived at by the Main Instltutes and then only they pass them on to (iii) The Subsidiary Institutes which are the ones directly in touch with agricultural farms, factories, mills, etc.

Here is something which India should pause to study and translate into practice, No research worker should be allowed to do what he likes, when India is facing a plethora of problems in industry, agriculture, health, social psychology, social economics, etc. The country should plan out schemes for research, as based on its socio-economic needs. To work out the solutions of problems immediately facing the country, all the scientific research institutions as well as trained scientific man-power must be well organised all over the country, with a view to putting into practice what has already been discussed, or improving old methods or replacing them by new ones.

According to one of the members of the Cultural Mission which recently returned from China, most of the scientific and technical institutes in China are concentrating on practical applied work of immediate urgency and interest. There appears to be some liaison agency between the Government and the institutes whose job it is to sift out immediate practical problems for research and pass these on for investigation by the institutes. The advantages of similar co-ordinating agency in India, linked perhaps to the Planning Commission, can hardly be exaggerated.

[Current Science. September, 1952.]

The Languaee of the Bees: Bees have worked out a language which tells them all they need to know about the best places for obtaining nectar and pollen from flowers, says Professor H. Munro Fox, of London University.

But the language does not consist of words. Instead, information is conveyed by complicated dances which not only tell other bees how far they have to travel, but also just how rich the supply is and the direction to go in order to find it.

What is more, the direction is worked out in relation to the position of the sun in the heavens-

The bees' language is described in the revised edition of Professor Fox's book, "The Personality of Animals".

Bees, he says, know the countryside around their hives in a radius of at least two miles. When one finds nectar or pollen, it returns to the hive and dances.

When the source is over 100 yards away, the bee dances in the shape of the figure 8. For food 300 yards away, the worker bee makes 28 turns per minute, If it is 3,000 yards away, the dancer turns only 11 times a minute. The further away the food, the fewer number of turns are made.

The direction of the food is indicated by the dancer cutting accross this figure 8 in a straight line. "If the run is, say, 60 degrees to the left of the vertical, the flowers are in a direction 60 degrees to the left of a line from hive to the sun", writes the Professor. "And so on for all other possible angles".

Other bees know which type of flower to look for by smelling the nectar and pollen adhering to the body of the original finder.

The eyes of bees introduce them to a world which we shall never see. Although red and black are almost the same to them, they can perceive ultraviolet colours outside the range of human vision.

[Indian Express dated 20—11—1952]

Weather Review — For November 1952

RAINFALL DATA

Division	Station	Total rainfall for the month	Departure fromnormal in inches	Total since 1st January in inches	Division	Station	Total rainfall for the month	Departure fromnormal in inches	Total since 1st January in inches
Orissa & Circars	Gopalpur	0·0	—3·9	41·1	Central Contd.	Vellore	0·1	— 7·6	17·7
	Calingapatnam	0·0	—3·4	38·2		Gudiyatham*	0·5	— 4·0	15·2
	Visakhapatnam	0·0	—4·7	30·4		Salem	0·0	— 3·8	32·4
	Arakuvalley*	0·0	—1·8@	45·4		Coimbatore (A. M. O.)*	0·4	— 4·3	10·0
	Anakapalle*	0·0	—2·9	37·4		Coimbatore	0·1	— 3·9	7·5
	Samalkot*	0 0	—2·9	32·7		Tiruchirappalli	1·1	— 5·9	15·6
	Kakinada	0·0	—5·6	43·6					
	Maruteru*	0·0	—3·6	32·1	South	Nagapattinam	5·0£	—12·5	24·3
	Masulipatnam	0·0	—5·8	28·6		Aduturai*	4·5	— 0·4	24·1
	Guntur*	0·0	—2·0	19·2		Pattukottai*	5·6	— 1·9	27·9
	Agrl. College, Bapatla*	0·0	—3·8	28·5		Mathurai	1·8	— 3·9	18·8
						Pamban	5·0	— 6·7	16·8
	Agrl. College, Farm, Bapatla*	0·0	X	25·3		Koilpatti*	3·2	— 3·2	13·0
						Palayamcottai	3·4	— 4·0	12·0
	Rentachintala	0·0	—1·9	21·0		Ambasamudram*	2·9	— 7·2	18·8
Ceded Districts	Kurnool	0·0	—1·2	31·3	West Coast	Trivandrum	3·9	— 3·1	54·5
	Nandyal*	0·0	—1·3	31·4		Fort Cochin	0·6	— 6·1	92·4
	Hagari*	0·0	—1·8	15.1		Kozhikode	0·1	— 7·3	89·7
	Siruguppa*	0·0	—1·3	19·9		Pattambi*	1·3	— 3·8	67·8
	Bellary	0·0	—2·0	11·1		Taliparamba*	0·0	— 4·8	108·6
	Cuddapah	0·0	—3·5	21·5		Wynaad	0·8	— 3·6	54·4
	Kodur*	0·3	—7·2	26·4		Nileshwar*	0·0	— 6·2	132·0
	Anantapur	0·0	—2·4	12·3		Pillicode*	0·0	— 4·9	113·4
						Mangalore	0·0	— 3·9	110·1
Carnatic	Nellore	0·1	—11·6	25·2		Kankanady*	0·0	— 2·9	114·5
	Buchireddipalem*	0·3	—11·6	19·8	Mysore & Coorg	Chitaldrug	0·8	— 1·6	20·6
	Madras (Meenambakkum)	2·1	—11·9	31·0		Bangalore	0·0	— 2·7	28·8
						Mysore	0·0	— 2·7	24·6
						Mercara	0·0	— 3·0	109·4
	Tirurkuppam*	0·9	—9·2@	28·7	Hills	Kodaikanal	3·9	— 6·3	36·6
	Palur*	0·6	—11·1	18·1		Coonoor*	1·8	—13·0	28·8
	Tindivanam*	1·9	—5·5	20·6		Ootacamund*	0·5	— 4·8	23·2
	Cuddalore	0·8	—14·7	22·5		Nanjanad*	0·3	— 4·7	27·1
Central	Arogyravaram (Chittoor dt.)	0·0	—4·1	18·1					

Note :—

1. * Meteorological Stations of the Madras Agricultural Department.
2. @ Average of nine years data for Tirurkuppam and seven years data for Arakavalley is given as normal.
3. Average of ten years' data is taken as normal.
4. X The Farm was started only last year.
5. £ Upto 07·30 hours on 30—11—1952 at Nagapattinam.

Weather Review for November, 1952.

The seasonal trough persisted over the Central and South-east Bay on Bengal during the beginning of the month. On 2—11—1952 a shallow low appeared over the Gangetic West Bengal and on the same day another trough of low pressure existed in the South-east Arabian Sea off the Malabar Coast, which became unimportant on the following day. The former became unimportant on 5—11—1952. The seasonal trough became well marked on 4—11—1952 and concentrated into a depression and by within a degree of Lat. 14½° N. and Long. 87½° E. at 03-00 hours G. M. T. on 8—11—1952. This depression in the Bay of Bengal intensified into a cyclonic storm on the next day, moved towards North-East, weakned and crossed the Chittagong Coast on 12—11—1952. In the meanwhile on 11—11—1952 a shallow trough of low existed over the Andaman Sea. This persisted upto 15—11—1952 and became less marked. A low pressure wave moved west-wards across the South Bay of Bengal on 17—11—1952 causing a fresh incursion of maritime air over the Peninsula south of Lat. 14° N. A shallow low pressure area lay over Sind and the adjoining West Rajasthan on 19—11—1952 and became less marked on the very next day. A shallow trough of low pressure which existed over the Commorin area on 20—11—1952 moved away westwards on the succeeding day causing weak North-East Monsoon conditions over Tamil Nad. A low pressure area was moving west-wards across Ceylon on 22—11—1952, causing local showers in Tamil Nad. A fresh low pressure wave was moving across the South Andaman Sea on 23—11—1952. On the following day a well marked trough of low formed over the South-East Bay of Bengal and the adjoining south Andaman Sea. This trough of low concentrated into a cyclonic storm, centred near ½° of Lat. 8½° N and Long. 87° E. at 08 30 hours I. S. T. on 28—11—1952, became severe with an inner core of hurricane winds while moving towards North-west and lay 100 miles South-East of Nagapattinam at 08 30 hours on 30—11—1952, causing widespread rains with locally heavy falls along the Coromandal Coast on the last day of the month.

Four Western disturbances with their associated secondaries passed over the North-East and North of the country during the month.

Night temperatures were generally above normal over Tamil Nad except on a few days.

The noteworthy falls and the zonal rainfall for the month are furnished hereunder:—

Noteworthy falls during the month.

S. No.	Date	Place	Rainfall for past 24 hours
1	3—11—1952	Alleppey	2·9″
2	20—11—1952	Pamban	1·7″
3	30—11—1952	Nagapattinam	2·0″

Zonal Rainfall.

S. No.	Name of Zone	Average for the month	Departure from normal	Remarks
1	Orissa and Circars	0·00	− 3·52	Far below normal
2	Ceded Districts	0·04	− 2·59	do.

S. No.	Name of Zone	Average for the month	Departure from normal	Remarks
3	Carnatic	0·96	–10·80	Very far below normal
4	Central	0·31	– 4·80	Far below normal
5	South	3·93	– 5·00	Far below normal
6	West Coast	0·74	– 4·64	do.
7	Mysore and Coorg	0·20	– 2·50	do.
8	Hills	1·63	– 7·20	Very far below normal

Agricultural Meteorology Section,
Lawley Road Post, Coimbatore,
Dated: 11—12—1952.

M. B. V. N., C. B. M. & M. V. J.

Departmental Notifications.

GEZETTED SERVICE

Posting and Transfers.

Name of Officers	From	To
Sri A. Alagiamanavalan	D. A. O., Vellore	Posting will be issued separately
,, A. K. Annaswami Iyer	D. A. O. Guntur	Granted leave
,, Bushanam	Spl. D. A. O., Araku, Visakapatnam	Posting will be issued separately
,, T. N. Balasubramaniam	Addl. D. A. O. (Manuring Scheme) Madurai	Superintendent, Central Farm Coimbatore
', L. Krishnah	Addl. D. A. O. (Manuring Pattukottai	D. A. O. Nellore
,, N. V. Kalyanasundaram	Addl. D. A. O. (Manuring scheme) Eluru	D. A. O. Nellore
,, J. H, S. Ponnaya	D. A. O., Trichy	D. A. O. Srikakulam

Name of Officers	From	To
Sri N. G. Narayanan	Asst. Cotton Specialist Tiruppur (on leave)	Asst. Cotton Specialist, Siruguppa
,, A. Raghavan	Asst. Cotton Specialist, Siruguppa	Asst. Cotton Specialist, Tiruppur
,, G. V. Ratnam	D. A. O. Nellore	Spl. D. A. O., Araku, Visakhapatnam
,, C. Raman Moosad	Superintendent, Central Form, Coimbatore	Asst. Marketing Officer, Coimbatore
,, Ramdoss	Asst. Marketing Officer, Coimbacore	Suspended
,, S. V, Ramachandran	Addl. D. A. O. (Manuring Scheme) Tirunelveli	D. A. O., Vellore
,, P. Somayajulu	D. A. O., Srikakulam	The Madras Subordinate service
,, K. H. Subramania Iyer	Addl. D. A. O. (Manuring Scheme) Trichy	D. A. O., Trichy
,, N. Srinivasalu	Asst. in Oil Seeds, A. R. S. Tindivanam	In full additional charge of the post of Superintendent, A R. S. Tindivanam

ON LEAVE

Name of Officer	Designation	Leave
Sri M. Bhavanishanker Rao	Superintendent, A. R. S. Tindivanam	Earned leave for 30 days from 15—11—1952
,, S. Sundaram	Asst. Cotton Specilist (on Foreign Service under the Indian Coffee Board)	Leave on average pay for three months

SUBODINATE SERVICE

Posting and Tranfers

Name of Officers	From	To
Sri S. Appa Rao Reddy	Chemistry Asst. Coimbatore	Transferred to Mayavaram
,, K. K. Anantha-narayanan	Addl. A. D. Shoranur	A. D. Cuddapah

Name of Officers	From	To
,, C. P. Balakrishnan	A. D. Ponnani	Addl. A. D. Shoranur
,, B. Chandrasekaharan	Spl. A. D. (Manure) Tiruchy	A. D. Ariyalur (Tiruchy Dt.)
Janab Mohammad Fathuddin	Asst. in Chemistry (Marine Section) Coimbatore	Asst. in Chemistry, Soil Survey Scheme, Coimbatore
Sri D. Ganapathy	A. D., Ariyalur Tiruchy Dt.	Ousting from the service
,, Kutti Mudaliar	Spl. A. D. Community Project Scheme, Gobichettipalayam	A. D., Tiruchirapalli
,, M. S. Kolandaiswami	A. D., Tiruchirapalli	Community Project Scheme, Gobichettipalayam
,, K. Murthi Raju	A. D., Kandukur (on leave)	A. D. Kavali
,, S. C. Marimuttu	Spl. A. D. (Manures) Musiri	Addl. A. D. Avanashi, Coimbatore Dt.
,, K. Narayana Rao	A. D. Kavali	A. D. Cuddapah
,, S. M. Ramayya	Addl. A. D., Ambasamudram	A. D. Nanguneri
,, T. R. Srinivasan	Asst. in Chemistry Compost Scheme, Coimbatore	Asst. in Chemistry Coimbatore
,, T. R. Subramaniam	Asst. in Chemistry, Compost Scheme, Coimbatore	Asst. in Chemistry Coimbatore
,, Subba Rao, V. V.	Asst. in Chemistry, Soil Survey Scheme Coimbatore	Transferred to Tanjore
,, P. V. Suryaprakasa Rao	on leave	Reposted as Canning Asst. Kodur
,, S. Subramaniam	P. P. A. (Myco.)	Spl. A. D. Community Project, Shalavandan
,, T. Varaprasada Rao	A. D. Chipurupalle	A. D. Salur

ON LEAVE

Name of Officers	Designation	Leave
Sri K. Bhaskaran Nambiar	Asst. in Oil Seeds Nileshwar	Granted Extra-Ordinary leave for 30 day
Kumari Girija Lakshmanan	Asst. in Botany Coimbatore	Granted earned leave for 30 days

Name of Officers	Designation	Leave
Sri D. John Durai Raj	Asst. in Chemistry Coimbatore	Granted earned leave for 30 days from 16—12—52 to 14—1—1953
,, Kannan Thathachari	Addl. A. D. Thiruturaipundi	Granted on extension of extra-ordinary leave without pay for 42 days
,, P. S. Mani	A. D. Nanguneri	Granted earned leave for 30 days from 19-11-1952 to 18—12—1952
,, G. Mahadeva Iyer	Farm Manager Thimmachipuram	Leave an average pay for one month
,, P. Somayajulu	D. A. O. Srikakulam	Granted earned leave for 30 days
,, Y. Shiva Rao	Asst. in Mycology Coimbatore	Extension of extra-ordinary leave from 21—11—52 to 15—1—53
,, P. S. Suryanarayana Iyer	P. P. A. (Myco.) Shoranur	Granted leave for 62 days on medical certificate