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EDITORIAL

Trial of Economic Plants:

The scheme for the trial of exotic and indigenous plants of value which has been recently santioned by the Madras Government aims at the study of various useful plants and dissemination of definite knowledge about these plants to the public. Being a tropical country the floral wealth of India is immense but no definite and systematic study has so far been made in our Province on the more useful plants available. The scheme contemplates the growing of many useful plants like cacao used as a beverage but mostly imported, various species of Eucalyptus suited to both plains and hills for oil and fuel, Bassia latifolia useful in the manufacture of power alcohol, Acacia suma, Leucaena glauca which are quick growing trees of fuel value and many other plants yielding medicine, dye, oil, scents etc. India has been depending for a large proportion of her supplies of drugs and other vegetable products of economic value on imports from foreign countries. Now that the country is independent with a National Government in power it is imperative that we should take stock of our natural resources which have to a great extent been unexploited and try to build up our national wealth. The development of these resources will to a large extent determine the part that our country will be able to play in the future economy of Asiatic Nations.

It is well known that some of the commonly used drugs like *Camphor, Digitalis, Datura, Chiretea, Nuxvomica, Belladona* etc., can be produced in our country if only a thorough investigation is made. Further the cost of production of such drugs under tropical conditions may prove to be much cheaper, thus making the products within reach of the commoner. For example the percentage of active principle in *Pyrethrum*, an insecticide, is observed to be higher in the product cultivated on the Nilgiris as compared to that from Africa. It is likely that a fair trial of the

various economic plants might reveal that it would be highly profitable to cultivate such plants in lands that are not regularly cropped.

The scheme rightly contemplates the trial of local medicinal and other economic plants first before taking up the study of exotic plants. It is well known that in rural areas all over the Province various herbs are used for specific ailments. Though the healing properties of such herbs have been recognised from a long time, not much information is available on the active principles contained in them, as many of these herbs have been kept as closely guarded family secrets by the people administering them. It is upto the District staff and the public in particular to co-operate fully and bring to the notice of the Department about the existence of such economic plants in different tracts. Many valuable plants of this nature will also be found in the hidden treasures of our forests. We are quite confident that our sister Department will contribute her mite by bringing such plants to light and furthering the scheme. Once the local plants have been investigated thoroughly, useful plants from other tropical and subtropical countries could be tried for assessing their suitability to our conditions. What is necessary is a fair trial with a view to enriching our knowledge on the various useful plants their economic production and utilisation. Any success achieved in this direction is bound to lead to improvement in our economic and public health standards which are none too enviable at present.

A Review on Spurry (*Spergula arvensis*) and Possible Ways of Controlling it by Chemical Means.

By

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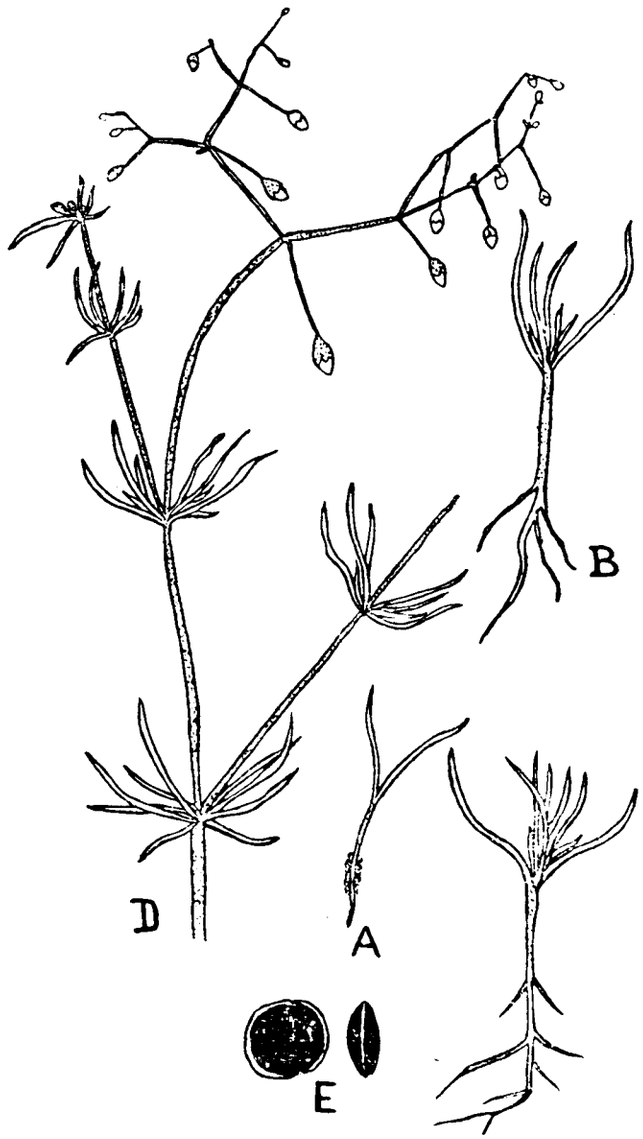
Introduction: The weed spurry (*Spergula arvensis*) which is native to Europe and later got established in U. S. A. (1) South Africa (2) Canada (3) India and other countries, has been reported in India even as early as 1874 by Bentham and Hooker (8). The authors do not describe it is an introduced weed, though it has been stated as a native of Europe, in the Bullettin of the Michigan State Agricultural College (1). Its introduction into India must have been long before 1874. No reference to it as an established weed in India, has been made either by Bentham and Hooker (8) or by Gamble (1928) (9) though both of them have described it as occuring in cultivated fields in the cool parts of India. In South India it is said to occur in the Kodaikanal and Nilgiri Hills (9) & (15). Hence it must have become a noxious weed through vigorous growth and effective self-propagation only recently. At present it has assumed threatening proportions especially in some tracts of upper Nilgiris, and according to an official report from Nanjanad, it is said to smother all the crops in the fields of the Agricultural Research Station there. Hence an attempt has been made in this paper to review the various chemical herbicides and to assess their usefulness with particular reference to spurry.

Spurry is generally found as dense growths in corn fields and other waste places. It is reported to be harmful to corn crops, root crops and clover crops. When plentiful it practically suppresses both spring and summer crops.

Botanical: *Spergula arvensis* is a member of the Pink family, *Caryophyllaceae*, which includes many weeds as chick-weed, *Stellaria*, *Agrostemma* and others. The plant is known as spurry or sand weed. It is an annual and is said to arise in sandy soils which are deficient in lime (4). In fact, the Ministry of Agriculture, England in one of its bulletins says that the presence of spurry is an indication of the deficiency of lime in the soils.

The plant is herbaceous and grows to a height of 6 to 8 inches. It is much branched and the stems bear two opposite leaves at the node. Actually however, more than two leaves are

found in the axils, but all of them except the primary leaves are the basal leaves of the axillary branches. These leaves arise between the primary leaves to give rise to a pseudo-whorl. The plant is sticky due to the presence of glandular hairs (Figs. A-E).



Explanation of Figures.

A—Young seedling of Spurry. B & C—Later stages of the seedlings. D—A flowering branch of the weed. E—Seeds as seen in two views (magnified).

The flowers are borne on loose terminal panicles. The seed capsules hang downward. Seeds are dull black, flattened or lens-shaped.

The seeds get dispersed more or less close by the mother plant and germinate during spring in profusion, forming seedlings with two green linear cotyledonary leaves. Thereafter their growth is very rapid and it is at this stage that it interferes with the nutrition of the crop plant and causes harm.

Control: Control measures aim at destroying the weed at its most susceptible stage. Generally the seedling stage is found to be most suitable one. As however, the plant thrives in lime-deficient soils, the Ministry of Agriculture, England (4) recommended thorough liming or chalking of the soil, followed by careful cultivation.

The possibility of chemical control of this weed has been investigated by Blackman (6). Among the chemical herbicides, the following have been tried for this weed 1. Sulphuric acid, 2. Copper sulphate, 3. Copper chloride, 4. DNOC (Dinitro-orthocresol), and the two growth hormones which serve successfully as weed killers, MCPA (2 methyl-4 chloro-phenoxyacetic acid) and DCPA (Dichloro-phenoxyacetic acid). All these six chemicals will be considered individually in detail.

1. *Sulphuric acid*: This is a contact herbicide and is useful for a variety of weed species belonging to several families. It is also known as Brown oil of Vitriol in its concentrated form, in which it is supplied by chemical firms. It is most suited to annuals which require only contact action. A 7 to 10 percent solution of the acid at the rate of 100 gallons per acre has been recommended by the Ministry of Agriculture, England. Blackman has recommended the use of this herbicide (5 and 6) and in the comparative study of the weed killers, has recorded that B.O.V (Brown oil of Vitriol) used as a 10 percent solution by volume at the rate of 100 gallons per acre destroys more than 90 percent of the spurry weed which is the maximum amount of control compared with all other herbicides (12). It can safely be used, with cereals and onion while the crops are young; in crops other than cereals the field should be sown late, after destruction of all the weeds that germinate in spring. This herbicide does not leave any harmful effects in the soil as it decomposes soon and hence sowing can be done immediately after spraying with this herbicide. Simple precautions, such as are necessary in handling strong acids need only be observed during its use.

2. *Copper sulphate:* is said to be effective when a 5 percent solution (20 pounds of the chemical in 40 gallons of water) is sprayed (4). The rate per acre is not given in the instructions, probably it is the same as for B. O. V.

3. *Copper Chloride*: This herbicide is said to be more effective than copper sulphate (5 & 6). With lower concentrations than is necessary for copper sulphate, more successful results can be got. As copper chloride acts quicker and acts on the weed irrespective of its stage of development it is definitely superior to copper sulphate. In Blackman's experiment a solution of cooper chloride at 20 pounds per 100 gallons, sprayed at the rate of 100 gallons per acre gave over 50 per cent control with spurry. Certain precautions are necessary with copper chloride. As dilute copper chloride solution is more corrosive to metals than dilute sulphuric acid all spraying machinery should be thoroughly washed *immediately after use.* Like sulphuric acid, copper chloride also does not leave any toxic residues and hence seeds can be sown immediately after spraying.

4. *Dinitro-ortho-cresol*-DNOC: The ammonium salt of this compound is found to be very effective in the case of several annual weeds in cereals at comparatively low concentrations. During the war a substitute for the ammonium salt was used, which is an activated sodium salt of the DNOC compound. It is prepared by mixing the required amount of the sodium compound (7—8 pounds) with 10 pounds of ammonium sulphate in 100 gallons of water. A wetting agent should always be used when this reagent is used. It is used in the form of pastes, which should be diluted with water after mixing with a wetting agent. Against spurry this herbicide gave over 80 percent control in concentrations of 6—8 pounds per 100 gallons of solution sprayed in an acre.

DNOC Compounds are poisonous to livestock and men when swollowed and hence no effort should be made to olean the nozzles and other parts of the sprayer by blowing into them. These impart an yellow stain to clothes, men's hair and skin. All these compounds are highly inflammable when dry, and therefore all machines used should be washed thoroughly before being dried. Clothes of operators which get saturated with the spray should also be thoroughly washed.

Unlike sulphuric acid and the copper herbicides, DNOC compounds leave toxic residues. Therefore when a field is sown after spraying it is necessary to wait at least for 10 days in the case of this herbicide.

5. *2–Methyl–4 Chloro phenoxy acetic acids:*—MCPA: This forms the active constituent of Methoxone, Agroxone, and CLC. With spurry, this gave the same amount of control as copper chloride. But there are many disadvantages attendant with the use of this chemical. The compound leaves toxic residues in the soil which affect the roots of the subsequent crops, if allowed to leach down into the soil. These residues remain for at least 6 weeks, and are equally harmful to germinating seeds. Blackman used a solution of 2 pounds of the substance per 100 gallons of solution sprayed in an acre, and got 50 percent control. Hudson (10) used a more dilute solution and did not get any decisive control over the spurry weed.*

6. *2-4-dichlorophenoxy-acetic acid, 2-4-D or* DCPA: This is the active constituent of Phenoxyl. The disadvantages of MCPA are applicable to this also. The exact herbicidal action is still not fully understood, and the strength of the solution that would effectively kill the weed without harming the crop is yet to be determined.

A comparison of the various herbicides described above reveals that sulphuric acid is the best as far as this weed is concerned. As this is not a perennial, and no root stock system is to be tackled, MCPA, and DCPA are neither necessary nor desirable. What is required is a suitable contact herbicide. Sulphuric acid has stood the test and gives the maximum amount of control. Its easy availability as a commercial product in South India (it is manufactured in Ranipet and Mysore) is an important consideration. All-copper rose-cans with a fine rose sprinkler could be got made locally. Next in importance comes DNOC compound. This can be experimented upon and the concentration of the herbicide to suit local conditions may be determined. But it has to be remembered that the use of a weedicide is not to be considered as an exclusive substitute for simple agricultural practices like scraping the surface of the soil with a Guntaka, working the cultivators between rows of crops and the application of these methods invariably before this shallow-rooted weed sets seed. A considerable saving in the quantity of weedicide can be made if the operation is done soon after the germination of the bulk of the weed seed.

* Recent experiments conducted at Ootacamund by the Government Mycologist have shown that the weed is easily killed in two weeks by spraying 0·2 percent MCPA at rate of 100 gallons per acre. This result indicates the superiority of MCPA even over sulphuric acid under conditions at Ootacamund.

My thanks are due to Mr. K. M. Thomas B. A., M. Sc., D. I. C., Government Mycologist, Coimbatore for helpful suggestions and valuable criticism.

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Performance of Canes under Restricted Conditions of Manuring and Irrigation

By

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In sugarcane culture it is well known that about 50% of the cost of cultivation is accounted by two items viz., irrigation and manuring. If an effective economy in either of the two or preferably both could be made without sacrifice of yield or crop quality it will be an achievement of far-reaching economic importance to the cane grower on one hand and the factory owner on the other. To this end experimental work on this crop was started at the Agricultural Research Station, Anakapalli. During the early part of such work the varieties of cane under cultivation were such that they did not lend themselves to any degree of restriction in either manuring or irrigation, to make cane culture a cheap proposition. Later, during the course of testing, at Anakapalli, of the seedling canes bred at the Imperial Sugarcane Breeding Station, Coimbatore, a differential degree of resistance to restriction in these two treatments was exhibited by a few of the cane varieties. Since then it was considered desirable to try the seedling canes under two sets of treatments designated as the "Normal" and "Restricted" for a study of their performance with special reference to growth and quality of juice. The results of such a study are presented in this paper.

Material and Methods:

As seedling canes are received in batches from the Imperial Sugarcane Breeding Station, Coimbatore, they are first multiplied to secure sufficient seed material to plant on a field scale in what are known as "Study Plots", under two sets of conditions of manuring and irrigation, denoted as "Normal" and "Restricted". The area of each plot was one cent under both the conditions of crop growth and Co. 419 was planted as control after every pair of varieties, the planting being done in the X A B X pattern, every year in first week of March. The varieties under this trial during the period 1941—44, reviewed in the paper were as follows:

1941—42 Co. 214, Co. 223, Co. 244, Co. 299, Co. 365, Co. 383, Co. 393, Co. 395, Co. 446 to 465, Co. 502, Co. 534 to 550, Co. 551 to 554. (Total 50 varieties).

1942—43 Co. 365, Co. 394, Co. 395, Co. 457 to 469, Co. 502, Co. 546 to 558. (Total 30 varieties).

1943—44 Co. 460 to 476, Co. 550 to 558, Co. 560 to 665 and Poj. 2961. (Total 32 varieties).

The crop under "Normal" treatment received five tons of farmyard manure as a basal dressing in addition to which 100 lbs of Nitrogen per acre, 2/3 as groundnut cake and 1/3 as Sulphate of Ammonia, were applied. The concentrated manure of 100 lbs of Nitrogen was applied in two equal halves, one at the time of planting in March, and the remainder at the time of trenching and earthing up in June. Irrigations were given to the crop once in a fortnight or whenever the crop needed it. The crop under "Restricted" treatment received only half the number of irrigations given to the normal and 50 lbs of nitrogen in the same form, proportion and instalments as for the normal treatment. Restriction in irrigation was enforced from the time of planting.

Climatology:

An ideal climate for sugarcane culture in these parts seems to be one which is uniformly warm, with a well-distributed rainfall of not less than 40 inches annually. A climate with more of moisture and warmth during the grand period of vegetative growth followed by cool and dry winter to check vegetative development and ripen off the canes is the desideratum. On the whole these conditions are fulfilled over a large part of the Vizagapatam district, and the area under cane cultivation extending over 30,000 acres therefore occasions no surprise. The conditions obtaining at Anakapalli which are fairly representative of the major part of the cane-growing area of the district, are presented below:

Table I. Climatic Factors at the A. R. S. Anakapalli. (Average of ten years 1936—45)

Months	Rainfall inches.	*Rainy days.	Maximum Temp. of	Minimum Temp. of	Humidity at 8 A. M. %	Wind velocity M. P. H.
January	0·28	0·80	85·13	63·25	83	2·10
February	1·27	2·10	87·35	65·84	82	2·35
March	1·24	1·70	92·61	70·67	84	3·50
April	1·43	1·80	95·38	75·95	83	4·99
May	3·09	3·90	98·04	80·24	76	5·05
June	4·02	6·60	95·12	79·83	75	4·44
July	4·32	8·90	90·91	77·71	87	5·12
August	4·76	8·40	91·84	77·38	89	3·97
September	7·28	11·10	90·79	77·03	89	2·11
October	9·27	9·00	88·56	74·11	89	1·56
November	2·81	3·60	85·60	68·08	84	1·55
December	0·32	0·40	83·70	63·88	79	1·83

* Less than ten cents of rain is not counted as a rainy day
@ Average of five years only.

Crop-Performance:

The behavior of the crop under the two sets of treatments is described in detail below.

Germination and tillering:— Germination commences about two weeks after the planting of the cane sets and almost reaches completion by the sixth week. Germination counts are recorded once in a week from the third week to the sixth week and percentage germination is calculated from the number of buds germinated every week, the number of buds planted being known. Active tillering seems to set in by the middle of April and extends till the end of May. Tillering is largely confined to the pre-monsoon period and any factor or factors disturbing this phenomenon is naturally reflected in the final yield. As between the two treatments "Normal" and "Restricted" the former shows a general tendency to quicker germination, but in years of well-distributed rainfall there is hardly any difference between the two treatments. The percentage of germination is significantly higher under "normal" treatment.

Table II. Percentage of germination under Normal and Restricted Irrigations.

Year	Percentage of Germination Normal (N)	Restricted (R)	N—R	Significance	Rainfall during the period of germination March—April Inches.	Rainy days
1940—41	61·90	59·70	2·20	No.	4·86	7
1941—42	68·46	63·65	4·81	Yes	0·75	2
1942—43	60·02	52·97	7·05	Yes	0·34	1

Growth:

A study of the growth measurements of individual canes recorded at monthly intervals from June to March every year, in the studies of the crop under review, has shown that 72% of the total length of the cane is formed between June-October while only 10. 5% of the total growth is made in the subsequent four months. Good growth is therefore dependant on favourable climatic conditions in June-October.

Table III. Mean Height of canes in inches 1938–39 and 42–43.

Month	Mean height Normal (N)	Restricted (R)	Difference N-R	Significance	Mean rate of growth N.	R.	Rainfall in inches	Rainy days
			1938—39					
Up to June 38	27·34	28·58	1·24	Yes	—	—	8·44	17
July	49·79	50·74	0·95	No	22·45	22·16	3·53	17
August	75·53	76·64	1·11	,,	25·74	25·90	7·16	20
September	102·10	101·53	0·57	,,	26·57	24·89	15·16	20
October	118·59	117·52	1·07	,,	16·49	15·99	4·43	13
November	130·17	130·15	0·02	,,	11·58	12·63	8·16	5
December	135·59	135·12	0·47	,,	5·42	4·97	...	...
January 1939	138·23	136·83	1·40	,,	2·64	1·71	0·15	2
February	140·29	138·96	1·33	,,	2·06	2·13	...	...
March	142·37	140·48	1·89	,,	2·08	1·52	1·48	3

				1942—43				
Up to June 42	29·60	18·70	10 90	Yes	20·65	14·38	3·36	6
July	52·50	41·30	11·20	,,	15·98	17·39	2·30	13
August	75·70	60·50	15·20	,,	16·19	14·77	6·07	10
September	97·50	82·20	15 30	,,	15·22	16 69	4·69	15
October	115·10	101·40	13·70	,,	12·28	15·77	7.15	12
November	130·10	116·80	13·30	,,	10·47	11 85	3·35	6
December	135·50	123 00	12·50	,,	3·77	4·77	0 38	1
January 43	139·20	125·90	13·30	,,	2·58	2·23	0·98	3
February	141·30	128·50	12·80	,,	1·47	2.00	0·20	2
March	143·30	130·00	13·30	,,	1·40	1.15	...	...

Data recorded over fairly long period showed that the crop under "Normal" conditions registered a better vegetative growth during the pre-monsoon period and this initial advantage was maintained throughout the period of growth. The rates of growth between the treatments "Normal" and the "Restricted" did not reveal any wide variations during seasons of well distributed rainfall, but in years of deficient or unevenly distributed rainfall, the differences were more marked and the "Restricted" treatment showed a much lower growth-rate than the "Normal".

Quality of Cane Juice:

A picture of the progressive variations in the quality of cane juice under the two treatments was obtained by periodical chemical analysis of the cane juices. This study commenced from October and was carried on till the end of May. Its object was to assess the different periods of ripening of the cane varieties, with a view to classify them under three groups viz., early, mid and late sesaon maturing types. The chemical analysis data given in tables IV, V and VI (appended) show that:

(i) Juices obtained from "Normal" treatment tended to record lower values than those of the "Restricted" in respect of both sucrose and purity.

(ii) Varieties under the "Restricted" treatment matured earlier.

Summary:

The performance of a number of seedling canes under two conditions of manuring and irrigation was studied for a period of three years. During the period of study the crop growth and the seasonal conditions prevailing during each growth phase were recorded. The data showed that at every growth phase of the crop, differences were noticeable between the two treatments,

"Normal" being superior, but these differences were less pronounced in seasons of normal and well distributed rainfall. It appears as though crop performance is governed more by rainfall and its distribution coupled with irrigation, than by manuring. Increased manuring cannot invariably be depended upon for securing increased yields. The lower crop yields of certain years, despite heavy manuring, are to be explained by way of unfavourable seasonal conditions, more particularly dificient rainfall or uneven distribution.

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APPENDIX.

Quality of Cane Juice under Normal and Restricted Treatments of Crop Growth.

Table IV. Corrected Brix Values.

Particulars	Oct.	Nov.	Dec.	Jan.	Febr.	Mar.	Apr.	May.
				1941—42				
Normal treatment	12·42	14·47	15·94	17·35	17·66	17·54	17·24	16·47
Restricted treatment	13·17	15·66	16·65	18·19	18·69	18·51	17·97	17.19
Difference (N-R)	0·75	1·09	0·71	0 84	1·03	0.97	0·73	0·72
S. E. of Mean deffce.	0·098	0·098	0·104	0·115	0 123	0·109	0·105	0·189
Significance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
				1942—43				
Normal treatment	13 06	14·99	16·57	17·86	18 86	18·93	17 94	16·13
Restricted treatment	13·25	15 33	16·74	18 00	18·92	19 39	18·20	17·12
Difference (N-R)	0 19	0·34	0·17	0 14	0·06	0·46	0·26	0 99
S. E. of Mean diffce.	0·159	0·146	0·127	0 188	0 174	0·213	0·212	0·430
Significance	No	Yes	No	No	No	Yes	No	Yes
				1943—44				
Normal treatment	13·31	15 50	16·83	18·41	18·89	18·00	17·44	16·82
Restricted treatment	14·16	16·03	17·36	18·96	19·47	19·05	18·24	17·58
Difference (N-R)	0·85	0·53	0·53	0·55	0·58	1·05	0·80	0·76
S. E. of Mean diffce.	0·136	0 197	0·247	0 240	0·195	0 252	0·693	0 557
Significance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

Table V. Percentage Sucrose.

				1941—42				
Normal treatment	8·36	11·49	13·32	14·91	15·35	15·48	14·99	13·92
Restricted treatment	9·58	12 79	14·30	16 01	16·57	16·49	15.78	14·73
Difference (N-R)	1·22	1·30	0·98	1·10	1·22	1·01	0·79	0·81
S. E of Mean diffce	0·126	0·128	0.125	0·123	0·152	0·132	0·141	0·228
Significance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

				1942—43				
Normal treatment	9·39	12·11	13 77	15·75	16·59	16·70	15·74	14·56
Restricted treatment	9·30	12·39	14·05	15·67	16·61	17·16	16·08	14·75
Difference (N-R)	0·09	0·28	0·28	0·80	0·02	0·46	0·34	0·19
S. E. of Mean diffce.	0·167	0·189	0·150	0·239	0·201	0·225	0·191	0·284
Significance	No	No	No	No	No	Yes	Yes	No
				1943—44				
Normal treatment	9·43	12·40	14·25	16·22	17·12	16·51	15·19	14·18
Restricted treatment	10·37	13·08	14·99	17 01	17·72	17·76	16·22	14·97
Difference (N-R)	0·24	0·68	0·74	0·79	0·60	1·25	1·03	0·79
S. E. of mean diffce.	0·261	0·311	0·315	0·709	0·248	0·266	0·438	0·584
Significance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

Table VI. Purity %.

				1941—42				
Normal treatment	66·73	78·32	83·32	85·71	86·80	88·13	86·97	84·46
Restricted treatment	72·28	81·36	85 68	87·79	88·59	88·93	87·66	85·43
Difference (N-R)	5·50	3·04	2·36	2·08	1·79	0·80	0·60	0·97
S. E. of mean diffce.	0·624	0·733	0·454	0 359	0·388	0·391	0·302	0·673
Significance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
				1942—43				
Normal treatment	71·60	80·55	82·91	88·10	87·83	88·10	87·45	85·04
Restricted treatment	69·99	80·64	83·71	86·97	87·70	88·44	88 09	85·09
Difference (N-R)	1·61	0·09	0·90	1·13	1·13	0·36	0·64	0·05
S. E. of mean diffce.	0·813	0 636	0·341	0·684	0·442	0·299	0·415	0·674
Significance	No	No	Yes	Yes	No	No	Yes	No
				1943—44				
Normal treatment	59·95	79·54	84·29	87·88	90·60	91·60	86·72	83·92
Restricted treatment	74·17	81·26	86·11	89·44	91·03	93·10	88·66	84·78
Difference (N-R)	4·22	1·72	1·82	1·56	0·43	1·50	1·94	0·86
S. E. of mean diffce.	1·330	0·708	0·794	0·493	0·479	0·456	0 656	1·369
Significance	Yes	Yes	Yes	Yes	No	Yes	Yes	No

STORAGE EXPERIMENTS WITH SWEET POTATOES

By

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The sweet potato has long been known in this Presidency as a useful tuber crop. The tubers are consumed in a variety of ways. The crop has come into prominence at the present time as an alternative foodcrop due to the shortage of cereals. Early this year (1946) the Government ordered that its culture and use be encouraged and popularised to provide people with a carbohydrate—rich food supplement. While information is available on the methods of propagation and cultivation of the sweet potato crop, no information is available as to the best methods of storage and the keeping quality of the tubers on storage.

A scheme of experiments was therefore drawn up to study the various methods of storage suitable for rural conditions and with facilities available with every cultivator. This scheme was communicated to selected Agricultural Research Stations and to the Central Farm at Coimbatore and the Agricultural College at Bapatla. The methods of storage were as follows:

i. Usual heap method (control).

ii. Storing in racks.

iii. Storing in pits lined with straw and vegetable refuse.

iv. Storing over a bed of sand completely covered with sand.

v. Smearing the tubers with a coating of mud and storing in heaps after the surface is dried up.

There were six replications of each treatment and identical quantities by weight, 20 lbs each, constituted the units. Monthly examination of the tubers stored, weighments to determine the loss in storage and elimination of the material that got diseased and rotten, were asked to be carried on regularly *for twelve successive months*. The experiments went on for six months, and the data collected are summarised and given below:

Table I.

Central Farm, Coimbatore—Expts. started 22—3—47 (Initial weight 20 lbs.)

Average weight of six replications in each treatment.

Treatment No.	after 1 month lbs. ozs.	after 2 months lbs. ozs.	after 3 months lbs. ozs.	after 4 months lbs. ozs.	after 5 months lbs. ozs.
I	10 7	5 3	4 6	4 1	3 11
II	9 15	6 0	4 9	4 2	3 11
III	17 12	15 4	8 13	4 4	2 10
IV	18 6	17 8	13 15	11 15	10 3
V	8 9	5 3	4 14	4 4	3 12

Insect attack (weevil) and decaying of tubers were greatly in evidence in the case of treatments I, II, & V and to a lesser extent in Treatment III. Only treatment IV i. e. storing over a bed of sand (completely covered over with sand) was definitely better, but here almost all the tubers sprouted. Samples of such sprouted tubers were analysed by the Government Agricultural Chemist and found to have undergone no deterioration from the nutritional point of view (food value and minerals)

Table II.

College Farm—Bapatla Expts. started 8—4—46 (Initial weight 20 lbs.)

Average weight of six replications in each treatment.

Treatment No.	after 1 month lbs. ozs.	after 2 months lbs. ozs.	after 3 months lbs. ozs.	after 4 months lbs. ozs.
I	13 10	* Nil	Nil	Nil
II	13 15	2 5	3 " 10	"
III	17 15	8 13	9 11	* Nil
IV	19 15	17 5		3 2
V	13 12	* Nil		

* got diseased and decayed.

In treatments I, II & V the keeping of the tubers during storage was very poor. Treatment IV was better than the rest, but sprouting tendency was high.

Table III.

Agricultural Research Station, Gudiyatham (Expts. started 23—3—46) Initial weight 20 lbs.

Average weight of six replications in each treatment.

Treatment No.	after 1 month lbs. ozs.	after 2 months lbs. ozs.	After 3 months lbs. ozs.	after 4 months lbs. ozs.	after 5 months lbs. ozs.
I	10 8	1 10	0 5	0 5	* Nil
II	11 6	6 12	4 14	1 3	"
III	15 7	5 4	0 5	* Nil	
IV	16 7	14 3	12 4	9 14	7 10
V	10 13	3 1	0 7	0 7	* Nil

* got diseased and decayed.

Only treatment IV was found to be the best method at every stage of storage, but sprouting of tubers was very high.

Table IV.

Agricultural Research Station, Taliparamba (Expts. started 14—3—46) Wt. 20 lbs.

Average weight of six replications in each treatment.

Treatment No.	after 1 month lbs. ozs.	after 2 months lbs. ozs.	after 3 months lbs. ozs.	after 4 months lbs. ozs.
I	13 14	5 2	* Nil	—
II	14 3	6 11	* Nil	—
III	15 5	9 10	5 12	* Nil
IV	17 2	15 1	14 1	—
V	13 3	3 6	—	—

* diseased and decayed.

Sprouting occurred in treatment IV to a very great extent.

Table V.

Agricultural Research Station, Koilpatti (Expts. started 25—4—46 initial wt. 20 lbs)

Average weight of six replications in each treatment.

Treatment No.	after 1 month lbs. ozs.	after 2 months lbs. ozs.	after 3 months lbs. ozs.	after 4 months lbs. ozs.
I	4 7	* Nil	—	—
II	0 7	* Nil	—	—
III	15 3	10 5	1 9	* Nil
IV	16 2	5 6	2 9	0 12
V	5 12	* Nil	Nil	Nil

* diseased and decayed.

Sprouting was noticed in IV to a large extent after 2 months.

Table VI.

Agricultural Research Station, Anakapalli.

Average weight of six replications in each treatment.

Treatment No.	After 1 month lbs. ozs.	After 2 months lbs. ozs.	After 3 months lbs. ozs.
I	*Nil	Nil	Nil
II	0 11	0 1	Nil
III	*Nil	Nil	Nil
IV	7 15	5 5	3 10
V	*Nil	Nil	Nil

*All diseased and decayed.

(Sprouting was pronounced in Treatment IV)

Table VII.

Agricultural Research Station, Pattukottai.

Treatment No.	After 1 month		After 2 months		After 3 months		After 4 months	
	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.
I	16	2	13	0	2	15	Figures not yet received.	
II	14	4	7	10	4	1		
III	17	15	15	9	8	5		
IV	18	13	15	8	8	1		
V	16	9	11	9	2	6		

2. The experiment has been in progress for six months now and the results obtained from the monthly weighments of the tubers and observation on the sprouting and decaying of the tubers give the following indications:

i. Of the five treatments, that with the pit completely covered over with sand is the best.

ii. The ordinary heap method of storage is the least efficient.

iii. The pit system of storage is attended by the sprouting of the tubers even in a fairly dry climate like that of Coimbatore and vary markedly so in damp places like Taliparamba. Sprouting of the tubers however has been found not to detract from its food value as recorded by chemical analysis of the tubers, and there is no deterioration in quality.

iv. The damage from insect attack by weevils and fungus and hardening and drying up of the tubers was reported in all treatments except method IV.

In general it may be said that the sweet potato does not lend itself to prolonged storage and is best utilised within two or three months even when stored under the best conditions, in pits covered over with sand.

THE COUNTRY POTATO

By

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Botanical names:

Coleus tuberosus, Benth; Coleus parviflorus, Benth; Plectranthus tuberosus, Bl. Family—Labiatæ or the Tulasi family.

Local names:

Tamil-Kurka or Chiru-Kizhangu; Malayalam Koorkan Kannada—Sambrani gadde.

The plant is a small herb growing to a height of about a foot in good soils and characterised by a bunch of small underground root tubers. The leaves are dark green, round and thick. They are said to be somewhat aromatic and used for flavouring. The plant as grown in Nileshwar has no perceptible aroma though the tubers and roots when freshly pulled out are faintly aromatic. This plant is not related to the ordinary potato in any way except that the tubers resemble small potatoes to some extent.

This is a less known vegetable of South India cultivated in Tinnevelly, Travancore, South Malabar and in parts of South Kanara. Outside India it is found in cultivation in Africa, Ceylon, Malaya, Cochin-China and in Java where it is said to be plentiful. Though the plant has been known to have been cultivated in India and far Eastern countries, for many centuries it is considered by botanists to be a native of Africa.

The tubers are tasty when made into curries and are fairly rich in protein (about 2 % on wet basis and 8% dry basis) the tubers can also be used for many purposes to which the potato is put. There is always a good market for the tubers in South Kanara and in season they fetch about Rs. 2—8—0 per maund of 28 lb. whole sale, while retail they are sold at anything from 2 to 4 annas per pound. Considering the fact that the sweet potato during the same season rarely sells for more than Re. 1/- per maund, this is an attractive price; and it leaves a very good margin of profit over the cost of cultivation. This paying crop can be easily raised even in the barren sandy soils of the West Coast as I have done on my farm. It can also be grown on the laterite gravelly soils of the west coast hills as a monsoon crop.

But strangely enough, this useful crop is not known and grown as widely as it deserves to be. Therefore, the object of my writing this note is to bring this food-cum-vegetable crop to the notice of the public in the hope that more people may take to its cultivation in these days of food scarcity. Further the size of the tuber as obtained at present is rather small, although by light manuring, on my sandy soil I have raised much bigger tubers than I have ever seen in the market. I should therefore like to draw the attention of plant breeders to this useful crop so that they may improve the quality and size of the tuber by selection and breeding and make it more attractive to the public.

Cultivation:

The details furnished here refer only to the sandy soil of the Nileshwer coastal strip. The soil of my farm is practically pure sand and consequently very porous. The annual rainfall is about 140 inches of which about 100 inches are received during June, July and August. During the rainy months, the water table is high, just a few feet below the ground level. In summer the water table goes down to about 20 feet below the ground level. Due to the open nature of the soil there is never any water stagnation in the field.

Seeds and sowing:

The plant is propagated either by planting the tubers or by vegetative cuttings. Seed tubers picked at the harvest are generally preserved till the time of sowing in the following season. It is necessary to keep only a small quantity of seed tubers for starting a fresh crop.

No special methods are necessary for preserving the seed tubers; they can be kept in straw or in gunny bags so as to prevent excessive drying. This way they can be kept for several months without deterioration.

In stiff soils, seed tubers and cuttings are planted on tops of raised bunds a few inches high. The bunds may be a foot apart and tubers or cuttings are planted 8 to 10 inches apart in a row. In sandy soils, I have found it best to plant them in level plots. The planting is done with the onset of the South west monsoon in June. Germination takes place within 10 days after planting. The tubers often sprout before planting just-like a potato. As the plants grow rapidly if well

manured, three or four cuttings may be taken in the first month. Therefore only small nursery of three or four cents is necessary for planting an acre. Cuttings or setts are obtained by nipping off the tips of the branches with a couple of nodes and the leaves at the top. The setts are planted with the lower nodes in the soil. They strike root in 3 to 4 days.

Manuring:

In the sandy soils, with the heavy South-west monsoon rains, manuring has to be done a little at a time, but often. I used a basic dose of cattle manure while making the beds and later applied ash, and a mixture of groundnut cake powder and superphosphate, three times at intervals of a fortnight or three weeks.

The best manure for the crop or the dosage are not known. In the first trial plot on which the crop was grown and for which I kept accounts the manure and cost per acre worked out as follows:

		lb.	Rs. A. P.
Cattle manure	....	5000	50—0—0
Ash	....	1000	6—0—0
Groundnut cake meal	....	1050	54—0—0
Superphosphate	....	112	10—0—0
			Rs. 120—0—0

After Cultivation:

No special after-cultivation was done except a little weeding. The trailing branches may be lifted up once or twice a month during the first two months to prevent them rooting at the nodes which results in the formation of small tubers. When planting is done on ridges, earthing up has to be done as the plant grows, to widen the ridges so as to provide sufficient space for the formation of tubers.

Watering:

The monsoon crop does not require any watering. Also the subsequent crops grown in rice fields after the harvest of rice are not watered as the moisture in the soil is found sufficient for the good growth of the crop.

Harvest:

In four months after planting the setts, the crop is ready for harvest. Yellowing of the portions of the plant is a sign of maturity of the tubers. In sandy soils no implements are required for lifting the tubers, but in heavier soils a digging fork or mamooty will have to be used. An yield of about 3000 lbs. cf tubers per acre can be expected.

The vegetative cuttings obtained from the crop can be utilised for planting in single crop wetlands of the tract after the harvest of the rice crop.

Cost of cultivation:

Initial cost of seed tubers 20 lbs. @ 4 annas per lb.	Rs.	5—0—0
Ploughing twice for preparing beds and ploughing in cattle-manure	Rs.	3—0—0
Planting tubers, preparing and planting cuttings 10 women @ 4 annas each	Rs.	2—8—0

After cultivation:

Two weedings 10 women	Rs.	2—8—0
Lifting branches, if necessary	Rs.	2—0—0

Manures and Manuring:

Cost of manure	Rs.	120—0—0
Application of manure	Rs.	5—0—0
Harvesting 100 maunds at one anna per maund	Rs.	6—4—0
Assessment on land	Rs.	1—0—0
Total	Rs.	147—4—0

Receipts:

The yield is taken as only 100 maunds (2,800 lbs. per acre) This is a very modest estimate. The lowest wholesale price is Rs. 2—8—0 per maund. This makes the gross receipts Rs. 250/- per acre. An earlier or later crop will easily sell for twice that price. But even at the lower figure the net income works out to over Rs. 100/- per acre. When it is considered that the land on which this crop is grown was purchased outright for an average price of Rs. 50/- per acre in 1943—'44 the net income of Rs. 100/- per acre is not too bad.

On the West coast there are tens of thousands of acres of this type of sandy soil lying uncultivated. At least part of this vast area can be brought under this paying and useful food crop in these days of food scarcity. I may add that the country potato is said to do better in drier tracts than in the coastal regions with high humidity. As such it appears desirable to try it in the central districts also.

Acknowledgement:

It conclusion, I have to offer my thanks to Sri G. V. Narayana, Superintendent, Agricultural Research Station, Nileshwar for the valuable help he has given me in preparing this note.

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EXPERIENCES OF AN EDUCATIONAL OFFICER IN FRUIT FARMING

By

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(Sri. R. M. Savur on his retirement from the Indian Educational Service about six years ago, took to commercial fruit growing. He chose for his venture a sandy soil belt on the west coast where fruits had never been grown commercially before. Although the department cannot agree with his views on the excellence of the site chosen by him, his success in the fruit-growing field is indeed a tribute to his intelligent and all-absorbing interest. He has selected most of the varieties for his orchards in consultation with the fruit section of the department. His experiences are sure to be read with great interest by the readers as they show the great success an interested and educated person can achieve in the fruit farming line in spite of some natural handicaps such as adverse soil and climatic conditions-(Editor)

After three years of work on my soils, I am fully confirmed in the opinion with which I started that this sandy coastal belt of the West Coast ought to grow plants for more valuable than cashew, casuarina and cocoanut. It is, par excellence an ideal land for fruits. My farm is now a little bit of California. The whole coastal belt from Baindur to Ponnani could be made into a California. When I started people fell over one another to sell their land to me because they thought that no other fool would buy this land, even at the price which I was willing to pay viz., Rs. 30/- to Rs. 50/- an acre. To-day it is just the reverse. The same people after seeing my farm and my lemons want to buy a few acres but cannot. No body is willing to sell even to me.

The period (1945—46) was characterised by the extraordinary and prolonged drought from the second week of September till the end of April 1946. Owing to the failure of the North-East monsoon there was not even one drop of rain during this period with the result that the water-table went much lower than it had done in any previous year. In spite of this there were negligibly few casulties viz., only 13 mango plants, mostly under two-years old. Probably this drought was a blessing in disguise as it must have resulted in the roots going deeper in a shorter time than they would otherwise have done.

The orchard now contains

Graft mango plants	622	
Citrus varieties	652	including 225 lemon layers planted this June-July.
Sapota	48	
Guava	25	
Custard apple	84	

Mango plants:

The cost of maintenance of the now three-year mango plants works out to Rs 4—1—0 per plant excluding the price of the plant.

Over Rs. 50/- worth of mango fruits were borne during the year 1945 and as there is no apparent difference in growth and vigour between the bearers and non-bearers I expect a greatly increased output during the next bearing season. I propose therefore, in the case of the three-year old plants to debit to the "revenue account" all future expenditure. All varieties including Pairi have fruited. The fruits were of excellent quality and size.

Lemons:

All the varieties excepting the ones with very long spines (Eureka) have been bearing. In the last 15 months the sales of lemons amounted to Rs. 150/- excluding several hundreds consumed at home and presented to friends. All these sales were local and none were sent even to Mangalore as the local demand far exceeded the production. Owing to the low standard of earnings of the public, Malta lemons, particularly the smaller ones, were mostly in demand. The large lemons like Nepali are in less demand chiefly because the fruits are too large and each large fruit is more than the family could consume in a day. I am glad in more ways than one that I have such a large proportion of Malta lemon plants for I am able, to however small an extent, to meet the poor man's demand for a small and cheap lemon.

Bearing:

The larger varieties, Nepali etc., averaged 3 or 4 to a pound while the Malta lemons averaged twice that number to the pound. Upto the present the Malta lemon plants are undoubtedly superior in bearing both by count and by weight to the varieties supplied from Kodur of which one variety, long spined, has not yet come to bearing.

I have not made any statistical study but judging merely from two to three seasons of bearing, I fail to see any difference in the number of fruits borne or in their size between budded plants and layers (suckers).

During the summer months I made Gooty layers of mature-flowering branches of Nepali and other varieties and planted them out in June. I was hoping that such layers made from branches which had developed the necessary food material and hormones for flowering would bear earlier than just natural suckers or cuttings. I find that my hope has been justified because the layers that received the least shock of transplanting started flowering within a month or two of being planted out.

Manuring:

I had feared that owing to the soil being so porous and poor, there may be too limited vegetative growth owing to the early exhaustion of the minute traces of food material in the soil. Experience has proved that I am right. Bearing has been early and good. But after the excellent growth of the past 12 to 18 months deficiency symptoms began to appear and rapidly assumed alarming proportions. It was obvious that the symptoms were due to deficiency in more than one element. As it was more my business to save the plants I did not waste time in trying one element after another but made up mixtures supplying all deficiencies including calcium and the minor elements. This had a remarkable effect and excepting about six plants, all the others revived and are now doing very well. The limiting factor was still potash, but this year I have been able to secure a good supply of potassium nitrate and Kainit. I now no longer depend upon the limited quantities of ash of very doubtful quality that is the only potassic manure available in the locality.

Among the mangoes Pairi and Kalapadi were the most susceptible and suffered the most. I can understand the Pairi being susceptible to deficiency diseases owing to its rapid growth and its being a bigger tree; but the susceptibility of the Kalapadi is surprising. The Alphonso showed scarcely any trace of being affected.

Similarly the lemons were affected and recovered with the same mixture. The order of susceptibility from most to least was Sathgudi, Eureka (long-spined), Nepali and Lucknow. Malta lemon did not show any signs of deficiency and has proved very hardy and fruitful.

Sathgudi:

Unfortunately the idea of a deficiency disease did not enter my head until other plants began to show them eighteen months after their first appearance on Sathgudis. By that time most of the Sathgudi plants had suffered beyond the limit of recovery. A few revived remarkably with the complete mixture and made more growth in three months than they had done in the previous thirty months. The recovered ones are maintaining their health now.

Some time back I had suggested the budding of Sathgudi on Malta lemon stock for the West Coast, because, while the Sathgudi from Kodur failed badly, the malta lemon was thriving very well. As my budding did not succeed I grafted some of my moribund Sathgudi on Malta lemon stock. These were planted out some six months ago in various locations. Some were not manured at all; the others got only a small dose of cattle manure. Yet all are so far thriving and showing no sign of deficiency or die-back as the original Sathgudi did.

All these experiences point to one and only one thing, the need for controlled manurial experiments on Indian fruit trees to discover what are the limiting factors other than the usual N. P. K. deficiencies. Undoubtedly my observation goes to prove that the plant needs calcium and magnesium; boron; iron and sulphur have been completely neglected.

Another pointer indicates the need for separate studies on stock suitable for S. W. monsoon conditions for fruits like Sathgudi which are native to the East Coast if they are to succeed in the West Coast.

Miscellaneous Fruits:

Sapotas are doing well and bearing well. So are the guavas. Lichi bushes are progressing.

Grapefruit plants are thriving, all except the one that died during transit. As these were given the complete mixture from the start nothing can be said about their manurial needs.

Mangosteen proved a complete failure and, in spite of the greatest care, only one is surviving but that has not added ½ an inch to its height and it still has only two leaves though not the original two. Avocado pear—only one plant is surviving but I think the deaths were due to want of care. Probably some shading in summer might have saved the rest.

Custard Apple:

This has distinct possibilities and seems worth cultivating as another poor man's fruit. My plants have been bearing heavily fruits of excellent size, flavour and sweetness. Many of the plants have been bearing continuously for the last few months. They are, however, susceptible to a fungus disease which attacks and destroys the branches. This attack began in the unusually heavy monsoon this season though the few old trees in the adjoining Government Farm have been severely affected year after year for the last three years that I have seen them.

I am trying a Bordeaux paste application. No other fungicide is available. Even the I. C. I. which has some proprietory ones and is selling them in Australia and other countries does not stock them in this country.

As the demand is negligible no firm is even likely to import any. Under these circumstances I think it is the duty of the Agricultural Department to see that fungicidal and other spray materials manufactured by firms like I. C. I., Du-pont Chemical Works etc., are imported and made available for orchardists like myself.

Grapes:

I have also tried grape vine cultivation on these soils. Contrary to expectations the crop has done well. The fruit has an excellent taste and the quality is far better than the best that Penukonda or Krishnagiri has ever produced. The size of the fruit was however small. I feel that there is a great future for grapes on the West-Coast, especially for a seedless variety.

Observations on Deep Ploughing in the Black Soils of the Bellary District*

By

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In the black soil areas of the Bellary District, farmers do not as a rule plough their land very deep, except once in six or seven years. The conditions that influence the adoption of this practice at such long intervals are summarised below.

Deep ploughing cannot be given in the heavy black soils of this tract as and when the cultivator likes but has to be done only between the months of December to March. The period is determined by the rainfall of the tract and the nature of the soil. The normal distribution of rainfall in the tract is as below.

January	....	0·02 inches.
February	....	0·25 „
March	....	0·20 „
April	....	1·20 „
May	....	1·90 „
June	....	1·95 „
July	....	1·90 „
August	....	3·68 „
September	....	4·50 „
October	....	3·00 „
November	....	1·16 „
December	....	0·24 „
Total for the year	....	20·00 inches.

The rainfall is very low in the first half of the year. As such, deep ploughing has to be done early i. e. in January or February, so that sufficient time is available to get the land in proper tilth with the aid of the sporadic showers received in April and May. With the cessation of North East Monsoon rains the soil begins drying up from December onwards but sufficient moisture is retained in the soil to permit ploughing to a depth of 10 inches if necessary. After March, the soil would have dried up and become so hard that ploughing becomes impossible unless some rains are received. If, for some reason deep ploughing is delayed until May or June, the result is a loss of crop, if the rainfall in the subsequent months happens to be

* Condensed by the Editor.

below normal. As would be evident from the table above the main rainfall is received in this tract during the months of August, September and October. In case deep ploughing is delayed until June, the large clods that are thrown up by the heavy plough do not have sufficient time to get fully weathered by the subsequent rainfall and the soil does not get into good condition for sowing cotton by September, with the result that the yields are very poor.

The removal of troublesome perennial weeds like Hariali (Cynodon) is one of the problems of the tract particularly where lands are extensive and occupy the lower rigions of a catchment. In such regions the moisture content is higher thereby affording facilities for the rapid spread of such weeds. When extensive areas are infested by such weeds, hand weeding becomes too expensive an operation and the cultivator therefore goes in for deep ploughing with a heavy plough, drawn by five or six pairs of bullocks. As cattle too are not very plentiful in this tract, there appears to be a good scope for popularising the use of tractors for deep ploughing once in four or five years.

The ordinary cultivation practised in this area is of the extensive type. The blade harrow (Guntaka) is the only implement used for preparatory cultivation.

An attempt was made at the Agricultural Research Station Hagari, to see if deep ploughing was really essential in well-kept black soil fields free of weeds. The experiment was laid out in 1942 in a field where the soil was nearly four feet deep and the treatments were as follows:—

(A) Control — Guntaka (blade harrow) alone used.

(B) Shallow ploughing — by the wooden country plough.

(C) Shallow ploughing — by an improved type of light iron plough.

(D) Deep ploughing with a heavy iron plough to a depth of seven inches.

The four treatments were in randomised plots replicated six times. Three crops, two of cotton and one of sorghum were grown and the results are summarised below:—

Table I— Deep Ploughing Experiment—Summary of Results of Three years 1943 to 1945.

Treatment	1943—44 Cotton	1944—45 Sorghum. Grain	1944—45 Sorghum. Straw	1945—46 Cotton
A. No ploughing — working Guntaka alone	313	764	3071	227
B. Light ploughing with country plough before cotton	318	641	2822	310
C. Light ploughing with a small iron plough before cotton	290	715	3099	305
D. Deep ploughing— with a heavy iron plough (in 1942)....	299	730	3157	239
General Mean	305	712·5	3037·3	270·0
Standard Error	13·95	27·2	123·3	16·3
Significant or not by "Z" test	No	Yes	No	Yes
Critical difference	—	82	—	49

Conclusions:

1943—44—Cotton—Treatment differences not significant.

1944—45—Sorghum—grain—A, D, C, B.

1945—46—Cotton—B, C, D, A.

It will be seen from the above data that in all three years the yields from deep ploughed plots are more or less equal to those from plots not ploughed at all, indicating that there is no real necessity for deep ploughing in the black soils of this tract. At the Research Station, the fields are invariably kept clean of weeds and under such conditions there is no need to give any deep ploughing. Deep ploughing would become necessary only as an economical weeding operation, when the land becomes choked up with deep rooted perennial weeds like *hariali*.

The primary object of ploughing being to expose unweathered subsoil from the lower levels and thus maintain soil fertility it is likely to be useful only on soils where the texture and composition vary considerably between the top and lower layers.

The black soils of the Bellary district are remarkably uniform in texture and composition between the different layers (see table 2) and it is not surprising that deep ploughing failed to induce any increase in yields as compared to mere surface harrowing.

Table II. Mechanical Analysis of Black Soil at the Hagari Farm to a Depth of three Feet.

	First Foot	Second foot	Third Foot
Clay	46·2 %	48·2 %	47·8 %
Silt	25·1 %	23·5 %	24·8 %
Fine sand	18·2 %	17·6 %	17·8 %

Note:— Analysis made by Dr. A. Subba Rao, Soil Physicist.

It is remarkable that the black soils of this trac (except those foul with weeds) do not require any deep ploughing. In this connection it may not be out of place to quote a local saying " that black soils plough themselves ". These soils begins to develop cracks towards the middle of January and as the soil dries up with the advancing summer months the cracks become deep and extensive so as to honey comb the soil mass to its entire depth. Such opening up of the soil due to natural agencies appears to provide the necessary aeration and weathering which could otherwise be secured by ploughing only.

Summary:

In the black soils of Bellary District (situated in a low rainfall area) deep ploughing is not commonly done. It is resorted to as an economical device for eradicating weeds when the land becomes foul with deep rooted perennial weeds. If deep ploughing is necessary it must be given in January—February so that there is sufficient time for the big clods turned over to weather before the sowing time in September. In a three year experiment conducted on the Agricultural Research Station, Hagari to see weather deep ploughing was really essential in well kept black soils it was observed that the yields obtained from the deep ploughed plots were equal to other treatments like shallow ploughing or working the blade harrow. These soils develop heavy cracks during summer and the necessary aeration and weathering appear to be obtained thereby. Further the soil profile is uniform in texture and composition throughout its depth and as the lower layers are practically the same as upper layers there is no need to adopt deep ploughing as a routine operation in these soils.

ABSTRACTS

The Land of Rich Rice Crops (Mizuhoni Kuni).

Tht origin of Rice Culture in Japan had an unmistakably geographical back-ground. The prime problem of the early invaders from the chinese mainland was to provide a maximum of food from minimum of area, a food suited to the climate for its production and to the population for their nourishment in such a climate; and as there was no pasture in such a climate and in such mountainous terrain, it had to be a vegetable product.

Chen Meng (2800 B. C.) founded the spring rite of planting staple crops, with rice taking the first blessing form the Imperial lips; for rice was and still is the only valuable food crop capable of being grown successfully just where vegetation is most favouired, i. e. on a rich and damp plain in a hot and damp season; it is also a very quick grower, immensely prolific and the only one that can be stored in such a climate. The soil was easy to work and so could be worked with the simplest implements; and if man needed the aid of beasts, such soft wet soil was the playground of the water buffalo. Every thing was simple so far, but the crop needed such a mentality in its cultivators that the idle, the careless, the insubordinate would have no food and would thus be bred out of the race. The survivors would be those of industry intlelligence and foresight; and they would have to co-operate for the necessary irrigation, for various other cultural processes and for storage and fair distribution. In other words Rice was the only basis for a dense population dependent on a subsistence agriculture i. e. with self-interest as its motive-an agriculture possible only with orderly co-operation with a sedentary population unanimously interested in a strong government. There can be little doubt that such a rice civilization though it makes for immobility, economic as well as political, has the three merits of a wide uniformity of interest and status among its followers, a relatively high standard of civilization and enough variety of work to supply all the needs of the feudal units that formed the main part of the early settlers in these Japanese island. *(The continent of Asia-Lyde).*

GLEANINGS

As a Chemist Sees Her.

Analysis of the creature known as woman as seen through the eyes of the chemists:

Symbol: Wo

Accepted Atomic Weight: 120.

Physical Properties: Boils at nothing and freezes at any minute. Melts when properly treated. Very bitter if not well used.

Occurence: Found wherever man exists.

Chemical Properties: Possesses great affinity for gold, silver, platinum, and precious stones. Voilent reaction if left alone. Able to absorb great amount of food matter. Turns green when placed beside a better looking specimen.

Uses: Highly ornamental, useful as a tonic in acceleration of low spirits and an equalizer in the distribution of wealth. Is probably the most effective income reducing agent known.

Caution: Highly explosive in inexperienced hands. (Better Crops with Plant food, Volume XXXI, June – July 1947).

(T. R. N.)

The Moon and Plant Growth:

Dr. C. F. C. Beeson C.I.E., Imperial Forestry Bureau, Oxford. Beliefs that the phases of the moon have a defferential effect on the rate of development of plants are both ancient and world-wide.

The literature on the moon and plants can be assigned to two groups: one comprising reiterations of peasant beliefs, myths and rules, both ancient and modern, and similar unsubstantiated statements; the other comprising experiments supported by numerical data capable of statistical analysis.

Only experimental data need be considered now; they may be briefly summarized as follows:

(a) *Kolisko's work.* According to the investigations of L. Kolisko in Stuttgart during 1926—35, particular phase of the moon at the time of sowing does influence the period and the percentage of germination, as also the subsequent growth of the plant. The most favourable date to sow is two days before the full moon for leaf-and fruit-bearing garden crops (such as cabbages, peas, tomatoes), for root-crops (such as radishes, beetroots, carrots), for flowering garden annuals, and for wheat, maize, etc. In general, these plants show better germination, more vigorous growth, and greater yields than those sown just before the new moon. Kolisko affirms that the lunar influence is not fully effective unless there is rain or artificial watering during the germination period, but the stimulus once acquired remains decisive throughout the periods of growth, flowering and fruiting. As regards growth during a lunar phase, she found that on the whole the response of wheat is greater during the waxing than the waning phase.

In later experiments to determine the depth to which the action of the moon penetrates the soil, Kolisko found that at a depth of one metre, the effect on wheat is nearly identical with that at the surface; at 2-3 metres the maximum growth is generally reached in a full-moon period; between 5 metres and 16 metres the influence is weaker but is still shown by greater growth at the time of the Easter full moon. She considers that each year has a certain dominating lunar period, and the Easter full moon has a special significance for the whole year. E. and L. Lolisko's recent book, "Agriculture of Tomorrow", reviews cosmic influences on plant growth.

(b) *Other investigator's work. Germination.* Experiments on the germination of garden crops have been done by Becker (1937—38), Bergdolt and Spanner (1937—39) at Munich; by Mather and Newall (1940—42), at the Jone Innes Horticultural Institution; similar experiments with spruce seed were done by Rohmeder (1935—37) at Munich. All these investigators agree that no consistent effect of the moon is observable, and that all chance variations possibly assignable to any one of the moon's quarters are evened out with an adequate number of repetitions.

Reproduction. Periodicity in the production of sexual cells of the marine alga, Dictyota dichotoma, has been demonstrated by Williams (1905), Hoyt (1907) and Lewis (1910), but the period is fortnightly on the coast of Wales and Naples, and four-weekly in new Carolina, and the phase dates differ.

Polarized light. Semmens (1923) showed that moonlight is plane-polarized and increases hydrolysis of starch with diastase. Esenbeck and Suessinguth (1930) and Macht (1926) showed that polarized light of low intensity may produce a very slight increase in growth in length of plants. Wrigt (1927) found the highest degree of polarization of moonlight at the ends of the first and third quarters. The anthroposophists consider that the moon's influence works in darkness and below ground.

Felling dates and seasoning of timber. Moisture content is the most important physical condition influencing the rate of decay of wood. The amount of water in the wood of a living tree is known from many careful determinations to differ with the species of tree, and for some species to vary seasonally, for others to be fairly constant throughout the year. No variation related to lunar phases is known for any tree, but Beeson and Bhatia (1936) found a regular lunar rhythm of sap increasing from the full to the new moon and decreasing from the new to the full moon in Dendrocalamus strictus in India.

Borer damage. Beeson and Bhatia (1936) and Gardner (1945) have proved that the intensity of Dinoderus damage to bamboos in India depends on the amount of starch present in the felled culm; the starch-content of the living culm varies seasonally, not according to the lunar phase, and no advantage is obtained by feeling in relation to the phase date.

Lunar periodicity exists in some animals, but they are marine or aquatic species (Fox, 1924; Hora, 1929).

Yield of resin, latex, etc. Variations in the yeild of resin, latex, maple syrup, gums and tannin are explicable in terms of tapping systems, genetic factors, weather, and environmental conditions; experience is very considerable, but in no case has any advantage attributable to the moon been discovered.

Summary. The only experimental evidence for the existence of lunar influence on the growth of land plants is that published by L. Kolisko. All other investigators in many parts of the world have been unable to discover any consistent correlation between the moon and the vital processes of land plants; some admit that if a lunar effect does exist it is so obscure as to have no value in agricultural practice. (Nature Vol. *158*, p. 572).

(T. R. N).

College and Estate News

Student's Club:

Under the auspices of the agricultural college students' club, a meeting was held on 22—8—1947 when Mr. Mohan Kumar-mangalam delivered a lecture on "Attainment of Independence and future of India". Sri K. C. Ramakrishnan, Lecturer in Agricultural Economics presided over the meeting.

Lecture by Sir C. V Raman:

The great enthusiasm of the students coupled with the valuable help rendered by the members of the staff, was fruitful when Sir C. V. Raman in the midst of his crowded programme accepted to deliver a lecture to the students of this college on 18—10—1947. The distinguished speaker thrilled the audience with a most interesting and instructive lecture.

Dr. Thirumurthy, ex-principal Stanley Medical College, Madras who presided over the meeting observed in his concluding remarks that the whole speech of Sir C. V. Raman could be said to be woven round the saying. 'Uzuthundu Valvara Valvar' (i. e. Persons who live by cultivation are the persons with the best of lives).

A. Debate by the Students.

The subject "Dictatorship is the only way for national reconstruction in India at present" was well debated by the students on 29—10—1947. Mr. Ratnakar Batkal of final year class acted as the speaker. Sri S. N. Chandrasekara Iyer, Government Lecturing and Systematic Botanist was the observer. Sri. Chandrasekara Rao of class II moved the resolution which was seconded by Sri. A. K. Rajapadmanaban of class III. Sri. Ramachandra Marar of class III opposed the resolution and was seconded by Miss Kunjamma Kettikaran of the same class.

Messers R. S. Ernest, Swaminathan, Bhaskara Rao and Manickya Rao also took part in the debate. After a most interesting and enthusiastic debate the proposition was put to vote and was carried by an overwhelming majority.

Next day after the debate, the second year students left for an educational tour to Nilgiris and returned on the evening of 5th November.

Lecture By U Thet Su Esq.:

U Thet Su Esq. Senior Deputy Director of Agriculture, Burma, delivered, a lecture to the students of this college on 7—11—1947 on the subject 'General Agriculture prevailing in Burma' Sri M. B. V. Narasinga Rao, Paddy Specialist Madras Agricultural Department, presided.

B. Sports Section.

1) Cricket: The first match of the term was played against Salem College in the inter-collegiate tournament. The arrival of the final year students from tour only on the morning of the match and the absence of two of our regular players resulted in giving the Salem college a big first innings lead. Our players did not however lose heart and going in for the second time scored 170 runs in about 1½ hours before declaring for the loss of six wickets. Left with 2½ hours play the Salem team collapsed before our determined attack. Our victory was mainly due to the creditable bowling performance of Sri. S. Sitaraman.

After this glorious victory our team had two set backs. We lost in the second round of the same tournament to the Arts College and this was followed by a defeat at the hands of the Cosmopolitan Club in the Y. M. C. A. tournament. These failures are mainly due to the lack of restraint on the part of our batsmen in critical situations.

2) Foot Ball:

In the Inter Collegiate Foot Ball Tournament our college won over Victoria College, Palghat and Arthur Hope Engineering College to enter the finals, inspite of the absence of the third students on tour. In the finals however we lost to the Arts College under very adverse circumstances.

3) Hockey:

In the first round of the Inter Collegiate Tournament we defeated the Arts College by a narrow margin of one goal. This victory enabled us to play the finals against the Engineers whom we beat by a flattering margin of five goals to nil. Having won the A Zone finals our players will be proceeding to Bangalore to play the Zone finals towards the end of the month.

4) Tennis:

Thomas Mathew our singles champion encountered little opposition in winning the singles finals of the A Zone, Inter Collegiate tournament. We also followed up this victory by winning the doubles finals for which Thomas Mathew and C. V. Jacob represented the college. The team will be proceeding to Bangalore to play the Zonal finals against Madanapalli's Team.

5) Basket Ball:

In basket ball we registered a creditable victory in first round of the Inter Collegiate Tournament against Arts College. In the finals we however lost to the Salem College team due mainly to lack of practice.

DEPARTMENTAL NOTIFICATIONS.

Gazetted Service-Postings & Transfers:

Sri N. Subramania Ayyar, D. A. O., (on leave) to be D. A. O., Tanjore vice Janab S. M. Sulaiman applied for leave.

Sri T. Venkataramana Reddy, Gazetted Assistant Lecturer in Botany Agricultural College, Bapatla to be Lecturer in Botany, Agricultural College, Bapatla.

Sri B. Appala Naidu, Lecturer in Botany to be Gazetted Assistant Lecturer in Botany, Agricultural College, Bapatla.

Sri L. Narasimha Acharya, Senior Lecturer in Agriculture on leave to be Dy. Director of Agriculture, Guntur.

Sri V. K. Subramania Mudaliar, Dy. Director of Agriculture, Guntur to be Dy. Director of Agriculture, Coimbatore.

Sri K. Jagannatha Rao, Dy. Director of Agriculture, Coimbatore to be Dy. Director of Agriculture, Vizagapatam.

Sri R. Vasudeva Rao Naidu, Dy. Director of Agriculture, Vizagapatam to be special Dy. Director of Agriculture for procurement of groundnut cake with headquarters at Guntur.

The Madras Agricultural Students' Union.

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