The Madras Agricultural Journal.

(ORGAN OF THE M. A. S. UNION)

Vol. XXX DECEMBER 1942 No. 12.

EDITORIAL

Soil conservation. To prevent soil erosion in the lands that will be cultivated hereafter, it is understood that the Government have extended to the district of Nilgiris certain rules applied earlier to the Palni hills of the Madura district. They give a direction that no land with a slope steeper than one in four should be assigned for cultivation and that in all future assignments the assignee shall adequately terrace the land for cultivation to the satisfaction of the Collector and plough it only along the contour on pain of resumption without compensation. This regulation has come none too soon.

As a result of increased demand for potatoes, one of the food materials much in demand for the troops abroad, there is a natural temptation on the hills to grow more of this commodity. Besides, it is understood that there is a scheme afoot to clear fresh areas and grow on a large area the vegetables that thrive best only on the hills. Consequent on the extension of the area under food crops, there will be fresh assignments of land for being brought under the plough. Potato growing as at present practised by the Nilgiri cultivator leaves much to be desired. To plant the seed potatoes he forms ridges and furrows down the slope. The young crop that has not spread its haulms over the soil offers little protection against the rains, with the result that a good amount of valuable soil is lost with the run off waters. This loss is accelerated by the furrows being down the slope. On the other hand if the furrows are formed along the contour and the crop rows are also across the slope, the soil loss is mitigated a good deal. The harmful effects of soil erosion go far beyond the removal of valuable top soil on which the crops depend for their nutrition. There will be a gradual decline in crop yields which more than off-sets any gain brought about by seed selection and manuring.

Soils protected against erosion may decline steadily in fertility as a result of improper cropping, but in that case the physical body of the soil remains intact and by the application of fertilisers its fertility may be restored. But if soil is stripped bodily from fields by rains or wind, this is usually lost for ever. Soil deterioration by the loss of plant nutrients may make farming temporarily unprofitable, but the soil depletion by erosion can render farming permanently impossible.

In order to effectively control soil erosion it is not enough if an isolated farmer is alive to its dangers for it is not easy to prevent the entry of the run off waters from a neighbour's holding. It is best handled by communal effort. Under existing conditions, there cannot be any other agency than the Government to take the initiative and start ameliorative measures at least with new lands. The control of erosion must be the prime concern of the State to avoid a situation in which the fertile lands are either denuded of their valuable soil, or are silted up with infertile sand. The U. S. A. and the Union of South Africa have arrived at this conclusion and are engaged in a systematic fight against erosion, by setting up departments for soil conservation which give advice to the farmers on the correct ways of utilising their holdings. The conditions in India are also such as to demand a similar organisation for soil conservation being formed. There are many areas in this country which have become waste lands because of the failure to handle them properly and in time. The Jumna basin in north India provides one of the best examples of the damage to land by erosion. A rough calculation of the total soil loss by erosion of the Jumna-Chambal basin is equivalent to the removal of half a ton of soil per second, day and night without stopping for the last 1,000 years. From this one can imagine how much more will be the loss if lands on the hill slopes are handled wrongly. The Government of Madras, are therefore to be congratulated on their prompt decision to enforce the rules regarding soil conservation in the Nilgiris.

"Pectin" from Tamarind Seeds. How tamarind seeds may supply a product of great industrial value not hitherto made in India is indicated in a leaflet published by the Forest Research Institute, Dehra Dun.

Of considerable importance in industry today is the jelly forming vegetable carbohydrate known as "Pectin". Besides being used in the manufacture of jams, jellies and confectionery, it is now employed increasingly for thickening and concentrating rubber latex as a filler for soap, for emulsifying perfumery and cosmetics, coating wall-paper and building board and in other industries.

The discovery of a very rich source of pectin in tamarind seeds, easily available points to a new and highly profitable use for what has hitherto been a waste product.

Cultivation of Tapioca in the Vizagapatam District.

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Introduction. The cultivation of tapioca is of importance at the present juncture, when the problem of food production is acute. Next to rice it is one of the staple food crops of the Travancore State and has largely contributed to the food supply there, specially among the poor. In the Presidency of Madras, its cultivation is chiefly concentrated on the West Coast and in the district of Vizagapatam, where it forms a cheap food of the poor class. It is also cultivated in parts of Chingleput, South Arcot, North Arcot and Tanjore districts. It possesses certain commendable features. "The plant is one of the most productive in the world and it has been claimed that an acre of cessava will yield more nutritive matter than six times the same area under wheat". Economically it is a paying crop and added to it the attention required for its cultivation is almost negligible. The green tops of certain varieties serve as fodder for the cattle.

Tapioca *(Manihot utilissima)* belongs to the family Euphorbiaceae and is a native of tropical America. It is a shrubby perennial growing to a height of 6 ft. to 8 ft. but an annual under cultivation. The crop is propagated by stem-cuttings which produce adventitious roots; these develop into tubers, enriched with starch, with the advance of age.

Soil and crop rotation. Tapioca thrives under varied climatic conditions and different soil types. It is a very successful drought resisting crop. Once provided with adequate moisture at the time of planting, it thrives well later on under adverse conditions of weather. Well-drained laterite and porous soils admixed with sand are considered to be ideal. Clayey and sticky soils subject to water logging are definitely unsuitable. In many of the taluks of the Vizagapatam district, where its cultivation is popular, it is commonly raised in garden lands and to a little extent as a rainfed crop in dry lands. On the West Coast it is mostly raised as a rainfed crop on all types of lands and occasionally in well drained wet lands in rotation with paddy. Even though it is not cultivated in the wet lands of the Vizagapatam district it is important as a bund crop around plots of sugarcane, paddy and plantain. Many of the market gardeners in and around Anakapalli raise this in the midst of other root crops like yams, colocasia, etc. In the garden lands, the crop comes in rotation with *ragi* or any vegetable crop like brinjal, *bendai*, etc. In the dry lands it follows dry paddy or a minor millet.

Preparatory cultivation and manuring. Moderately deep cultivation and fine tilth are desirable as would be obtained by four to six ploughings with a wooden plough. The ploughed field after manuring is thrown into ridges and furrows three feet apart and one foot high. Irrigation and drainage channels are formed at every 12 to 15 feet length of the furrow. Being

an exhaustive root crop it requires adequate manuring, which generally consists of 15 cartloads of cattle manure besides sheep penning.

Time of planting. The time of planting is largely determined by the local conditions of the monsoons. Adequate soil moisture is required at the time of planting and initial stages of growth. The best time will be soon after the break of the S. W. monsoon. In the garden lands of the Vizagapatam district planting in June, even under irrigation, is preferred as it is believed to encourage vigorous growth of plants resulting in heavier harvest of the tubers. Planting will commence in mid July on all types of dry lands. On the West Coast late planting at the end of the S. W. monsoon season (September) is sometimes necessary, but on dry lands planting can be done throughout the monsoon period.

Seed material and planting. The crop is raised from stem cuttings which are taken from the middle portions of healthy and mature main stems or branches. The setts used are usually 1 in. to $1\frac{1}{2}$ in. thick and nearly a foot in length having four to six nodes. The woody parts at the base of the plant and tender portions of the top branches are unsuitable for the purpose. The cuttings are planted in different ways. The common method in vogue in the Vizagapatam district is to plant the cuttings in a slightly slanting position, on the crest of the ridges at three feet apart; two to three internodes or 4 in. to 6 in. of the cutting is buried in the soil. This method is considered to give satisfactory results. On the West Coast besides this type of planting, setts are also planted horizontally on the sides of the ridges, and the planted fields are mulched with dry leaves and straw. The number of setts per acre depends upon the planting distance adopted. A close planting of 3 ft. apart either way usually adopted on soils of average fertility requires 4840 setts per acre; while a wide planting of 5' apart on rich soils takes about 1750 setts per acre. As a mixed crop, planted along with yams or colocasia, at spacings of 10 ft. to 12 ft., 300 to 400 setts may be necessary for an acre.

Irrigation. In the garden lands the field is irrigated before planting. Three days after planting a light irrigation is given and a week or ten days later another watering is necessary. Later on, the crop is treated as dry excepting for one or two waterings given as the crop is nearing maturity and prior to harvest. On the whole in the garden lands, besides the rainfall, five irrigations are sufficient to bring the crop to harvest. In the upland areas of the district it is raised entirely with the rainfall received; but the period of maturity is longer by about a month.

After-care. The cuttings sprout in the course of two to three weeks after planting. At this stage the gaps are filled with fresh cuttings. The after-care consists chiefly in keeping of the land free of weeds. Not more than two weedings are essential besides one hand hoeing.

Harvest and yield. The plants will be ready for lifting after seven to eight months, i. e., in January. In the garden land it comes to harvest early

in December. The maturity of the crop is indicated by the formation of flowers and shedding of the leaves. The cracking of the surface soil is an additional sign of the full development of the roots. The maturity can well be tested by lifting a couple of plants to observe the stage of development. The harvest consists in lifting the plants after careful digging of the soil around the plant with a small hand crowbar, to minimise the damage to tubers. The tubers are kept in the shade for some time when the soil adhering to them crumbles into powder and drops off. The *ryots* who grow it on small holdings of 25 to 50 cents of land do not engage any labour for harvest. A plot of 3 to 5 cents will be harvested by the *ryot* and his family just before market days for immediate disposal of the produce as otherwise the tubers get spoilt on storage. The yields are very varying depending on a variety of conditions like the fertility of the soil, manure, irrigation, variety, etc. Taking 4000 plants per acre and calculating an yield of 4 lb. per plant, on the average, a total yield of 16,000 lb. of tubers can normally be expected out of an acre. Still higher yields are not uncommon. The raw produce finds a quick sale in the weekly markets as well as local markets. Roasted and boiled tubers are also offered for sale. Its export outside the production zone is almost negligible except in the West Coast.

Pests and diseases. The tapioca is comparatively free from pests and diseases. In the early stages the planting setts are found to be attacked by white ants in certain fields. On the West Coast it is a common practice to put a handful of ashes in the planting holes to ward off vermin of all sorts. Cattle browse on the tender shoots and leaves: wild pigs, porcupines and bandicoots damage the roots in a standing crop to a considerable degree.

Food value and uses of tubers. The tuber is a pure starchy food. The tubers are generally obtained cheap and tapioca may be considered as the cheapest food stuff. "The starch is used under the name of Brazillian arrow root and when made into pellets forms the tapioca of commerce. Cassarup a powerful antiseptic is a by-product." The tubers are roasted or boiled and eaten. The flour made by slicing and drying the tubers is used for preparing bread. The preparation of tapioca flour is a simple process. After the removal of the outer skin, the tubers are sliced $\frac{3}{4}$ in. to 1 in. thick, washed clean and dried in the sun until crisp. The dried slices can be stored in air tight tins and at times of need the flour can be obtained by pounding them in a mortar. Some varieties are known to develop poisonous substances. These can be rendered fit for consumption by thorough scraping of the rind and washing in water. Later the root slices are boiled in water for 10 to 15 minutes, water being changed twice or thrice. Tapioca starch is in great demand for sizing purposes.

Varieties. In the Vizagapatam district there are two important varieties distinguished by the stem colour and duration of the crop. The red-stemmed variety has a shorter duration and its tubers possess finer taste, than white-stemmed variety with a longer duration. A pure white variety

known as "Butterstick" is introduced from Cochin. The writer of this note had occasion to observe at the Hebbal Farm, Bangalore (Mysore), a giant variety of tapioca grown in the poultry runs for providing shade. The plant was about 12 ft. high and each was reported to yield several maunds of the roots. It is worth a trial in other parts of this presidency.

Economics of cultivation. The cost of cultivation comes to Rs. 75 per acre. Taking the average yield to be 14,000 lb. per acre which valued at 2 ps. per lb. gives a gross income from an acre of Rs. 145—13—4 or Rs. 145, and the net gain Rs. 70 per acre. Under the contract system of disposing off the crop, the contractor pays Rs. 120 per acre, the harvest charges being borne by the contractor himself, and the net gain for the *ryot* in this case will be Rs. 60 per acre.

Cost of cultivation per acre—details.

Preparatory cultivation	Rs.	10—0—0
15 cart loads of cattle manure, sheep penning and application of cattle manure,	»	15—0—0
Cost of 5000 setts @ Rs. 2 per 1000	»	10—0—0
Planting 8 Men @ 4 as. each	»	2—0—0
Irrigation—five	»	15—0—0
After-care (one hoeing and two weedings)	»	5—0—0
Harvest and cleaning—60 men	»	15—0—0
Assessment, etc.,	»	3—0—0
Total cost of cultivation per acre	»	75—0—0
Yield—14,000 lb. valued at 2 pies per lb.	»	145—0—0
Net gain per acre	»	70—0—0

Note:—Of the above items under cost of cultivation a farmer has to incur only Rs. 25 per acre as cash expenditure towards planting, after-care, harvest and assessment. Even this amount is not required for farmers who grow it on small holdings (25 to 35 cents) as the labour of the farmer and his family is more than adequate for successful cultivation. Planting material is invariably got from a previous crop or almost free from an obliging and friendly neighbour.

Conclusion. The crop is grown by a large number of *ryots* on small holdings varying from 25 to 35 cents or more and only a few farmers raise it on an acre scale. In view of the minimum cash expenditure necessary to raise this crop coupled with the attractive profits and fair demand for the produce it deserves encouragement in many parts of this presidency.

Bionomics and control of Nephopteryx eugraphella Rag.—A pest of Sapota.

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Introduction. Sapota *(Achras sapota)* is subject to the attack of a number of insect pests such as *Nephopteryx eugraphella* Rag. (fam. Pyralidae), *Metanastria hyrtaca* Cr. (fam. Lasiocampidae), *Phenacoccus iceryoides* Gr., and *Pseudococcus lilacinus* F. (fam Coccidae). Of these the first mentioned is the most important. It occurred in a pest form in Coimbatore in 1938 and again in 1941. As details about the pest are lacking studies were undertaken and the results thereof are recorded.

Nature and extent of damage. Damage is caused to leafbuds, flowerbuds, tender fruits and leaves in varying degree by the caterpillars feeding on them. It is less pronounced at the beginning of the season and becomes conspicuous as the fruiting season advances when the pest increases in number. Flower and shoot-buds are bored in by young caterpillars and the injured buds either drop or wither. The caterpillar has the habit of moving on from one bud to another and in doing so injures a good many resulting in considerable loss of buds. The leaves are also in their turn attacked. The caterpillar constructs a tunnel of webs and frass and then feed on the green matter from within this shelter. The tunnel is extended as the caterpillar moves to fresh areas. In cases of severe damage a number of leaves are scraped and eaten likewise and are reduced to papery skeletons. They develop subsequently the brown appearance which is so characteristic of damaged leaves. The caterpillars have also a tendency to clump together the leaves by silken threads and feed on them from within the folds. Sometimes as many as 3 or 4 caterpillars may be found in a tunnel.

Distribution. In India the pest is reported from the Punjab, Bengal, Bihar and Madras Presidency.

Alternate host plants. Hampson (1896) has recorded the insect on cured tobacco and on *Mimusops elengi.* Fletcher (1920) has recorded the same on *Mimusops elengi* in addition to sapota.

Life history and habits. *Moth.* Hampson (1896) has given a brief description of the moth. It is about 17 – 18 mm. in size and grey in colour. The female is slightly bigger than the male and has an yellowish brown brush-like projection at the tip of the abdomen. The moths pair end to end in a day or two after emergence and the female begins to lay eggs immediately after. The moths fed on sugar solution under laboratory conditions

are known to live for periods ranging from 3 to 18 days. The number of eggs laid by a female varies a good deal; the maximum is 226 distributed over a period of seven days.

Egg. Eggs are laid singly or in groups of 2 or 3 on any part of the tender shoot either in close proximity or in scattered portions and are without a covering of scales. In nature eggs are even found suspended on the silken strands connecting the folded leaves. On the leaf the eggs are laid on both the surfaces and are placed more towards the mid-rib. The egg, when freshly laid, is broadly oval in shape measuring 0·75 mm. by 0·5 mm., pale yellow in colour without any artistic markings or ridges. It turns slightly pinkish on the second day, is more deeply pink coloured on the third day and hatches on the fourth day. The pinkish tint is due to coloured irregular lines on the developing embryo seen through the egg shell.

Larva. The newly hatched caterpillar is about 1·5 mm. long with its body showing a slight pinkish tint especially at the sides and between segments. The head and pro-thorax are pale blackish. Soon after hatching the caterpillar is very active and wanders about from leaf to leaf and over buds to fix up a suitable spot for its feeding. The feeding habits of the caterpillar have been given in paragraph two. The full grown larva is about 25 mm. long, slender and of pinkish colour. There are a few longitudinal close-set lines on the dorsal side. The head is flattish and the head shield is mottled with brownish black patches or irregular lines. The ventral surface and ventro-lateral borders are greenish pale. The body surface is smooth and glistening with only isolated hairs. The five pairs of prolegs are pale white, long and slender and have their hooks in a circle. The pink coloured thin lines in the later stages get suffused into broader bands, disposed, one as a dorsal median band and three to form lateral bands. Just before pupation the pink caterpillar turns yellowish.

Pupa. The larva constructs a cocoon of silk and frass within which it pupates in a day or two. In the field, cocoons are found on the leaves. The pupa which is at first green and soft turns brown in two days. It is short and thick measuring one c. m. in length.

Life cycle The egg, larval and pupal periods were 3 to 5, 17 to 32 and 7 to 11 days respectively. The total life cycle varied from 32 to 45 days. The life cycle records of 20 moths selected at random and reared from June to September, 1941 are given below.

No.	Egg period in days.	Larval period in days.	Pupal period in days.	Total life-cycle in days.
1	3	20	10	33
2	3	26	8	37
3	3	27	8	38
4	3	28	9	40
5	5	17	10	32
6	5	22	10	34
7	5	23	10	38
8	5	28	7	43

No.	Egg period in days.	Larval period in days.	Pupal period in days.	Total life-cycle in days.
9	5	32	8	45
10	3	22	7	32
11	3	22	9	34
12	3	23	10	36
13	3	25	10	38
14	3	27	10	40
15	3	24	11	38
16	3	26	9	38
17	3	25	10	38
18	3	26	10	39
19	3	26	10	39
20	4	26	12	42

Natural enemies. A Braconid larval parasite and a Chalcid pupal parasite were recorded from the field material.

Control. Sapota does not admit of any costly control measure. Spraying with Calcium arsenate at a strength of ½ ounce in one gallon of water gives effective control. Spraying with a decoction of *Thevetia neriifolia* kernels at a strength of one ounce in one gallon of water was tried and the caterpillars which got a direct hit of the spray died in a few hours but those which kept inside the webs escaped injury. As a single caterpillar attacks a number of buds and leaves and since moths lay eggs purposely in old frass and webs, it is desirable to remove and destroy all infested material to minimise injury and reinfestation.

Literature.

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Experiments on Ergot production in Madras.*

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Introduction. Ergot is the hard violetish-black sclerotium of the fungus *Claviceps purpurea* produced on the earheads of certain cereals and grasses. The fungus infects the young ovary and finally replaces the grain with the sclerotium. Ergot is a valuable source of medicine recognized alike in *British Pharmacopoeia* (B. P.), *Pharmacopoeia of the United States of America* (U. S. P.), *Prescriptio Internationalis* (P. I.) etc. The ergot of commerce is chiefly obtained from rye, crops of which get natural infection from year to year. The ergot of sheep's fescue grass, though very much less abundantly obtained, is valued very much higher by manufacturing

* Paper read before the Association of Economic Biologists, Coimbatore—November 1942.

chemists by virtue of its high alkaloid content. There are about 10 alkaloids known to occur in ergot, of which ergo-metrine B P. (called ergonovine in U. S. P.) is reported to be the most valuable. Ergotoxine and ergotamine are other valuable alkaloids (Cunningham 1941). Ergot contracts the arterioles and unstriped muscles and is a powerful ecbolic (agent which accelerates labour) and a haemostatic (agent which arrests bleeding). It is used in obstetrics, migraine spinal and cerebral congestion, internal haemorrhage, in paralysis of the bladder and *diabetes mellitus* (Dorland 1935). Besides these peace time uses, it is largely required during war for the treatment of wounded personnel of the fighting forces and air-raid victims.

The present supply position. The demand for ergot increases enormously during war. The world's supplies used to come from continental European countries like Spain, Portugal, Russia, Poland, Hungary and the Baltic States, where the fungus is endemic and produces natural infection of rye. The sclerotia are collected at harvest time. The present war has cut off Great Britain and most non-European countries from their usual sources of supply. British requirements which are reported to be 50 tons per year are in extreme deficit. Last year the British Health Ministry appealed for large quantities of ergot for the treatment of war casualities (Hynes 1941). In the years preceding 1921 the United States of America used to import 58-112 tons of ergot annually from Europe (Bonns 1922). The annual requirements of chemists and pharmacists in Germany in the last decade was about 40,000 kilograms (about 40 tons) (Jaretsky 1935). India like Britain has in the past depended entirely on foreign sources for her civilian and military needs. At the moment there is a dearth for ergot preparations in India and issues from medical stores to hospitals and veterinary institutions are severely restricted. Prices of ergot preparations have soared high and the production of ergot in India in the immediate future will therefore be a substantial contribution to the Empire War Effort. Large-scale production within the country would be helpful not only to meet the urgent needs of India's fighting forces and civil population, but also to relieve Great Britain and the allied countries of their difficulties in obtaining an essential war commodity. New Zealand had set apart a substantial sum in 1941 for the purchase of ergot to be exported to Great Britain (Bell 1941). Any effort to make India self-sufficient and independent of foreign supplies would help the country to win the peace that follows the war. Moreover, ergot deteriorates in storage and the great variations recorded in the alkaloid contents of apparently identical samples, suggest the need for a home-grown produce of reliable quality from which standard preparations of known potency could be prepared and made available at a price which suits the pockets of the poorer classes.

Records of ergot in India. *Sphacelia sorghi* which causes the sugary disease of sorghum is prevalent in Bombay and Madras provinces. This fungus is believed to be the conidial stage of a species of *Claviceps*.

Typical sclerotia (or the ergot stage) of the fungus have not been observed nor has any attempt been made to determine the alkaloid content of the sphacelial stage. *Sphacelia* sp. has been recorded from other grasses also. Pushkarnath and Padwick (1941) have reported the occurrence of ergot sclerotia in the neighbourhood of Simla on *Brachypodium sylvaticum*, *Oplismenus compositus* and *Andropogon* (*Gyrillo ?*) sp. in 1941. For want of the ascus stage, they were not able to determine the species, but opined that it may be *C. purpurea* or *C. pusilla* though the measurements of conidia did not quite agree with those of *C. purpurea*. No attempt has been reported to determine the alkaloid contents of the sclerotia, so that the value of the indigenous fungus is still unknown.

Ergot culture in the Nilgiris. Following the appeal of the British Health Ministry in 1941, several empire countries made trials in ergot culture by the artificial inoculation of rye flowers. The rye fungus not being recorded in India, cultures of the fungus were obtained in April, 1942 from Australia and exploratory experiments were carried out at the Agricultural Research Station, Nanjanad. The fungus was multiplied on a variety of natural and synthetic media. Over 2½ acres of rye were sown from April onwards. The earliest sown crop came into ear early in July. The field was divided up into several blocks and spraying trials were conducted in mid-July as per a schedule. The weather was very wet with frequent drizzles of rain or heavy mist. Examination of the fields made at the beginning of August failed to show any signs of infection. A second series of sprayings was started on the 11th of August. This spraying was done when most flowers were open and the anthers extruded. Fifteen days after the second spray several sclerotia were observed. Closer examination revealed the 'honey-dew' stage on several earheads. House-flies were attracted to the 'honey-dew.' Infection started spreading over the whole field including the unsprayed blocks. There was, however, a great variation in the intensity of infection and in the number of sclerotia formed per head. Fields which flowered last showed the heaviest infection. Spray inoculations done on a crop of rye which flowered in a drier period (October) were comparative failures. Mature sclerotia were dark in appearance with a violet tinge at the base, curved or straight and with a longitudinal fissure on the side. Those formed in singles or twos on an ear were bigger in size (28—40 × 3—8 mm.) than those which were formed in larger numbers (11—25 × 2—5 mm.). The maximum number so far observed on a single ear is 14. The usual number is very much less. Harvest figures from these blocks showed that up to 120 lb. of sclerotia (wet weight), equivalent to 95 lb. of sun-dried sclerotia, could be produced per acre under favourable conditions. The following statement summarises the results of spraying experiments :

Statement showing the results of infection experiments on rye with *Claviceps purpurea* (average of six estimations).

Field No.	Date of spraying	No. of sprays.	Area marked out	Average no. of tillers.	Average no. of infected tillers.	Percentage of infection	Average no. of sclerotia per earhead	Maximum no. of sclerotia per earhead
21	14th July	1	¼ cent.	2732	27	0 98	3	4
22	18th July	1	,,	1221	43	3·52	4	6
21	13th and 18th July	2	,,	2093	24	1·14	3	5
16	11th and 14th August	2	,,	1324	93	7·1	6	14
21	12th, 15th & 18th July	3	,,	2164	57	2·63	4	8
21	12th, 14th & 18th July 11th & 14th August	5	,,	2106	198	9·4	6	9
22	Control		,,	1634	15	0·91	3	5

Quality of Nilgiri produce. Ergots are known to vary in their alkaloid contents. The minimum standard prescribed in *British Pharmacopoeia* is 0·05 per cent of the alkaloids. A recent report from New Zealand (Neill 1941) stated that a strain of the fungus obtained from Hungarian commercial ergot gave heavy infections on rye blossoms and produced up to 176 lb. of air dried ergot per acre, but the produce was entirely lacking in alkaloids. We were however, fortunate that our produce has been much above the standard. The following is the report from the Research Officer, Madras Medical College on Nilgiri ergot.

"The sample sent by you has been chemically assayed by the method described in *The British Pharmacopoeia* and the total alkaloid content of the sample compares very favourably with the best European specimens of ergot. Biological assay also confirms this finding".

Cultural studies. A number of natural and synthetic media were used to grow the fungus. The growth was poor on Quaker oats agar and scanty on French bean agar. It produced a fair mealy white growth on a medium containing maltose, peptone, malt extract, potassium di-hydrogen phosphate and magnesium sulphate, but sporulation was poor. The best medium proved to be that recommended by Kirchhoff (1929). On this a thick white profusely-sporing growth is produced which changes to cream with age and develops several folds on the mat of mycelium. The spores are oval or oblong, hyaline and one-celled. Some spores were abnormal in length and showed curvature. When the culture was about 2 months old, the substrate developed a violet colour and the fungal growth became greyish white. Sclerotia were never produced on agar media. On a similar medium in which KNO_3 replaced asparagin, the growth was fairly good and spores abundant.

Trials were made to grow the fungus on sterilized plant tissues. It makes a satisfactory though slow growth on sterilized rye grains. Different proportions of rye to water were tried. Among three proportions tried (viz. 1:1; 3:2 and 2:1) the best growth was in the 1:1 ratio. Another medium tried was that recommended by Kreitmair and Kussner (1931) consisting of rye meal, asparagin, glycerine and water. This medium produces a good matty growth and sporulation. The fungus grows fairly well on crushed grains of malted sorghum, but not to the same extent as on rye grains. Sterilized bits of sugarcane made alkaline by the addition of potassium hydroxide, produced a slow but thick white growth, but sporulation was scanty. Sterilized immature panicles of sorghum, *Setaria italica* and *Pennisetum typhoides* form a good medium for the cultivation of the fungus. The optimum temperature for growth was round about 20°C.

Cost of production. It is not possible to furnish correct figures of the cost of production from experimental fields where sub-plots were variously treated. But judged from the results of preliminary experiments conducted this year, it may be estimated that the cost of production of ergot under optimum conditions on the Nilgiris will work to about Re. 0—4—0 a pound of dried ergot. The following data give an idea of the cost of production.

Cultivation expenses for rye per acre	...	**Rs.**	**16.**
Labour for conducting 3 sprayings (6 men @ 0—8—0 each)	...	,,	**3.**
Labour for hand-picking ergot (12 boys at 0—4—0 each)	...	,,	**3.**
Labour for cleaning the ergot	...	,,	**1.**
Total	...	**Rs.**	**23.**

At 95 lb. of ergot per acre the cost per pound will be nearly four annas. The value of rye grain and straw harvested have not been taken into account in estimating the cost of production.

Possibilities for ergot production in South India. The suitability of South Indian hill tracts for growing rye, the excellent quality of the product obtained from Nilgiris, the availability of a good strain of the ergot fungus, and the valuable knowledge now gained from exploratory experiments, open out possibilities for large-scale production. The chief obstacle facing us at the moment is the limitation of rye seed. But this can be remedied in the course of six to nine months. Ergot fetches a price of about 11 sh. per lb. (Hynes 1941). At an average price of Rs. 6 per lb. and a conservative yield of 50 lb. per acre, the gross return from an acre would be Rs. 300. Apart from profit, the urgent needs of the country and the Empire are sufficient incentives for immediate action.

Acknowledgments. The authors wish to express their indebtedness to Dr. C. J. P. Magee of the Department of Agriculture, New South Wales and Mr. I. A. Watson of the Sydney University without whose prompt assistance in the supply of the ergot fungus, these experiments would not have been possible; to Dr. K. Venkatachalam, Research Officer, Madras Medical College for the chemical and biological assays of ergot samples; to Mr. P. A. Nathan, District Agricultural Officer, Nilgiris and his staff for their

co-operation and willing help in the conduct of the experiments; and to Sri I. L. Narasimhalu of the Mycology section for helping in the spraying and harvesting operations.

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A Proliferation of the Sorghum Spikelets.

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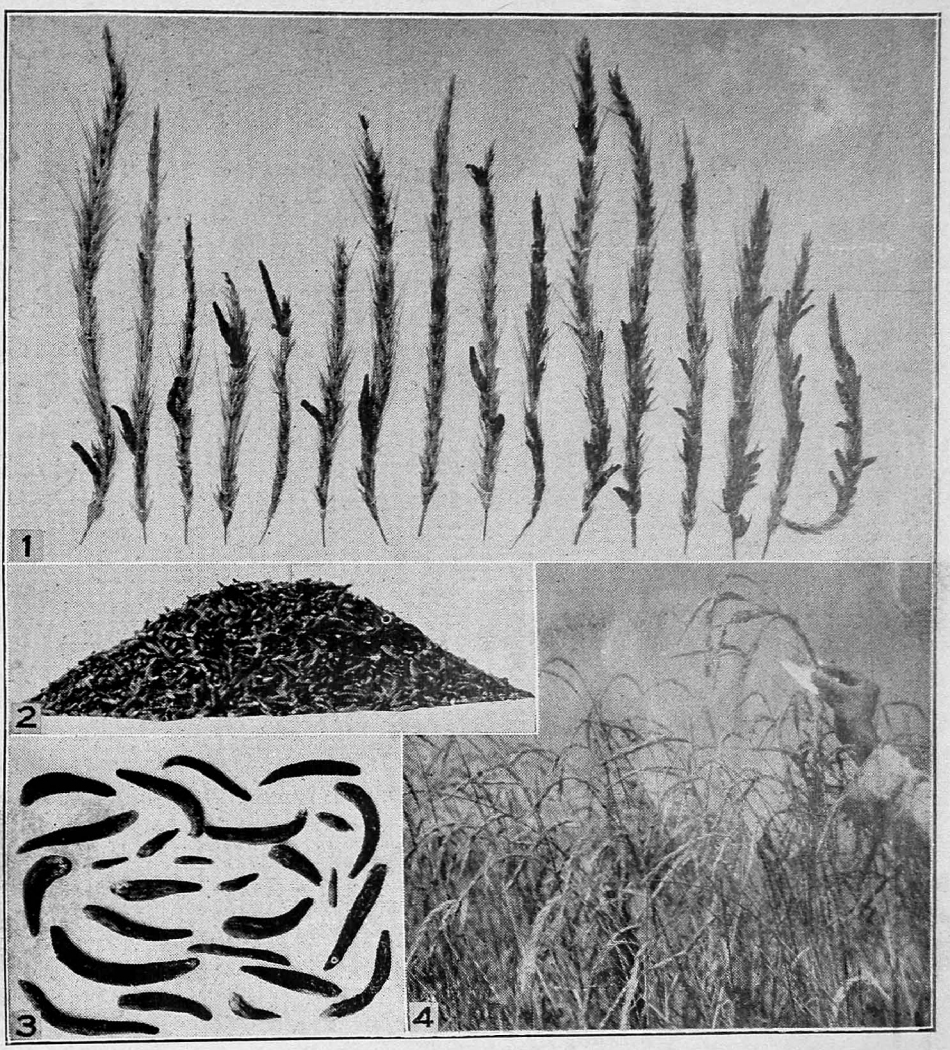
An interesting phenomenon of proliferation of a sorghum earhead was observed in the summer season of 1940 in a seed multiplication plot of an yellow grain sorghum strain (A. S. 809). While removing rogues at the flowering time, one earhead was observed to have rather longer spikelets, though in other respects, the plant was normal. The plant was as well developed and as tall as its neighbours, and the size and shape of the earhead also appeared normal. A closer examination of the earhead re vealed that the fertile spikelets had not opened. While the spikelets of the normal plants were awned, the awns being about one centimetre in length, there was a complete suppression of the awn in the proliferated earhead. It was also observed that the spikelets in the basal regions of the earhead were reduced to scale-like structures.

A few days later two more earheads with proliferated spikelets were obtained from a neighbouring field sown with the seed of the same stock. This field was also sown about the same time as the previous one and the plants in this also flowered about the same time. In these earheads it was observed that some of the spikelets had developed into seedlings, which appeared like normal sorghum seedlings about a fortnight old.

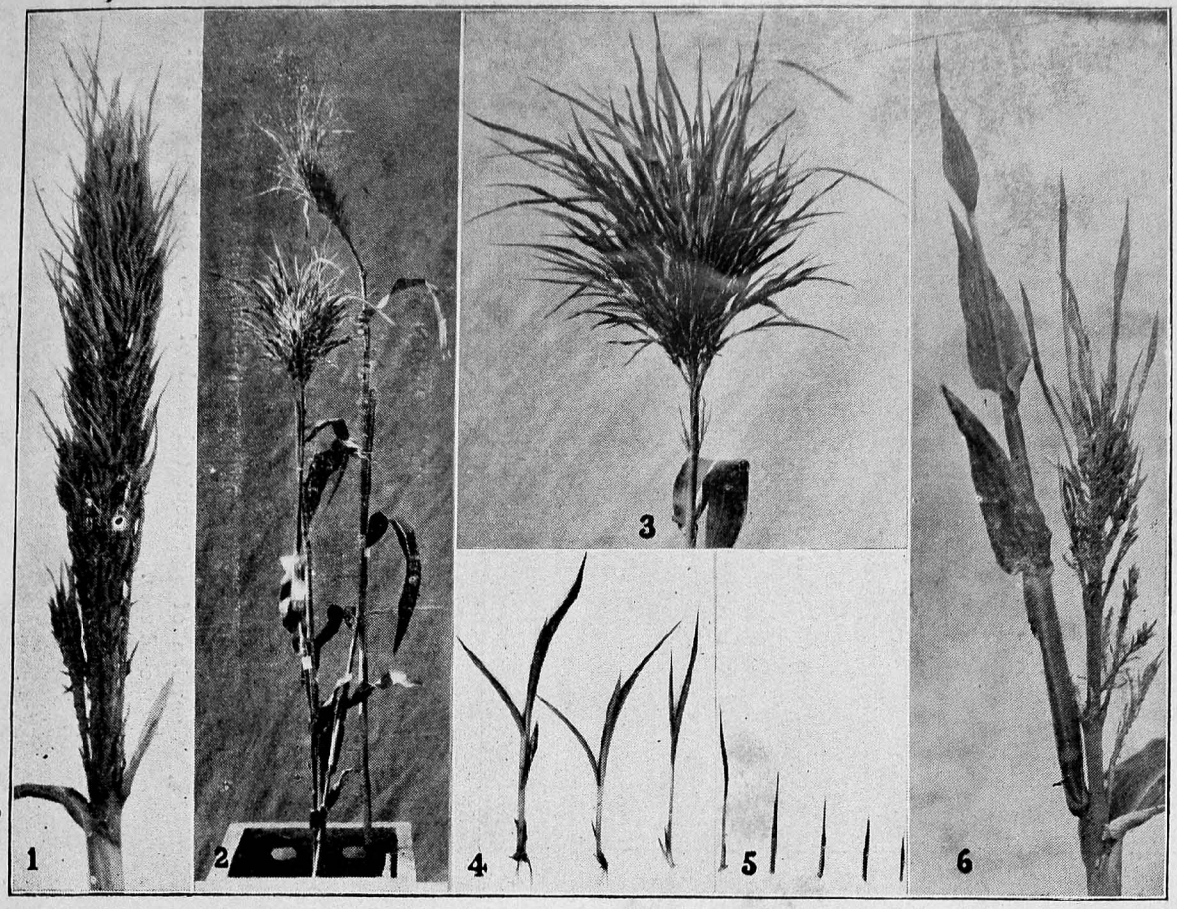
A few seedlings were detached from the earhead and kept in water for examination. They developed roots. These and a few more seedlings from one of the earheads were planted in pots filled with soil. All of them survived, grew up and in about 50 days developed earheads. These ear-heads also were abnormal. The spikelets were longer and developed into 'seedlings'. Seedlings from this when about three weeks old were again planted. The abnormality was thus perpetuated.

In the second generation raised in pots it was observed that the seed-lings developed roots while still attached to the earhead, as they were



ERGOT PRODUCTION IN MADRAS

1. Ear-heads of rye showing ergot sclerotia.
2. A heap of ergots collected from an experimental field on the Nilgiri hills.
3. Individual sclerotia showing variations in size and shape.
4. A portion of an inoculated field of rye. Note the bunch of infected ears.



EXPLANATION OF PLATE

Fig. 1. A proliferated earhead, about one week after emergence.

Fig. 2. Two plants with proliferated earheads, grown in a pot, about three weeks after emergence of the earheads.

Fig. 3. A closer view of one of the earheads in Fig. 2.

Fig. 4. Seedlings with roots, separated from a proliferated earhead.

Fig. 5. Early stages in the proliferation of the spikelets.

Fig 6. A branch of the earhead modified into a shoot.

exposed to rainy weather. And in a few cases in which the earheads were retained on the plants for a longer period, stray seedlings completed their life-cyle on the earnead, without dropping off, and in their turn produced proliferated earheads These had 12 to 13 leaves, including the spikelet parts, which is the same as for normal plants of the variety; only the plants were much reduced in size.

A critical examination of the earheads revealed that both the sessile (grain bearing) and pedicelled spikelets proliferated. When the spikelets were examined at the early stages, soon after emergence of the earhead, some were observed to contain both ovary, with style and stigma, and anthers, but reduced in size compared to those in normal spikelets. But in most of them no sexual organs were noticed. In these both the glumes and lemmas and paleae were herbaceous. In some cases it was also noted that the branches in the lower whorls of the earheads were suppressed, and in rare cases 'shoots' were produced in place of branches.

Proliferated spikelets when examined about a fortnight after the emergence of the earhead were observed to have five glume-like, but much elongated basal leaves, and two to three well developed normal leaves with sheath, junction, and blade, well differentiated. These when planted continued to grow, producing more leaves from the apex, while in a few cases, terminal growth was arrested and sideshoots developed from the axillary nodes and grew up. In all these the adult plants appeared healthy and bore only proliferated earheads.

As stated above, this phenomenon was first observed in a summer season crop. This crop is sown in the month of March, and the flowering period of the plants is in May. To see whether this phenomenon is affected by weather conditions, 200 seedlings were planted in a field in September 1940. All of them repeated the same phenomenon. In no case was there any seed production. Another 100 seedlings were planted in April, along with the 1941 summer season crop. In this trial also none produced any seed. All bore only earheads with proliferated spikelets.

Sap extracted from seedlings borne on a proliferated earhead was injected, with a hypodermic syringe, into young seedlings raised from normal seeds. These produced only normal earheads with seed. Selfed seed from these, when sown, produced only normal earheads with good seed. Cytological examination of the root tips of the proliferated spikelets revealed no chromosomal peculiarities or aberrations.

Proliferations of the sorghum earhead have been previously reported from America. Laude and Gates (1929) reported a 'proliferated' earhead of sorghum, in which a series of glume-like structures replaced the floral parts in the spikelets. The spikelets were about normal in size. Karper (1936) also has recorded an instance of similar proliferation. A similar earhead was obtained at the Millet Breeding Station, Coimbatore, but not reported hitherto.

Karper (1936) has recorded an instance of proliferation almost similar to the one described in this paper. He observed this in a large number of

plants which were localised in one half of a field of Kafir. None was observed in the other half, which was sown on a different date, nor in other fields sown with seed from same stock. The number of vegetative shoots varied widely in different heads, ranging from only a few to practically 100 per cent, and normal seed bearing spikelets were found interspersed with the 'shoots' throughout the inflorescence. The plants bearing these heads were abnormal, profusely tillering and producing a bunchy growth. But no roots or root-like structures were observed in the 'shoots'. He did not test the ability of these 'shoots' to survive independently of the mother plant. The progeny raised from seed of these abnormal plants did not repeat this phenomenon. So he concluded that "the most likely cause of the phenomenon appears to be an unusual combination of environmental factors encountered by those particular plants at a critical stage in the early development of the reproductive organs".

Rangaswami Ayyangar and Panduranga Rao (1935) have recorded the development of bulbils in place of grains in the sorghum panicle. These were noted in double or multiple-seeded spikelets in which one of the seeds, in stray cases, was transformed into a bulbil. In these the two outer glumes of the spikelets were normal. Ranaswami Ayyangar and Ponnaiya (1939) later observed that these bulbils when planted in soil could survive, and one such plant obtained from a bulbil, though weak in development, produced a small earhead with a few spikelets, which were normal in appearance but devoid of normal sexual organs.

There are a few instances of similar abnormality in other plants also. Ganguly (1936) has recorded a complete proliferation of the reproductive spikelets into potential vegetative shoots in maize. Reeves and Stansel (1940) have described anamalous vegetative prloiferation of the spikelets and the plants in general, in maize and teosinte. They ascribed this phenomenon to environmental conditions. Collins and Kempton (1916) observed 'little plants' in place of spikelets in the terminal inflorescence in the F_2 generation of a cross between *Tripoxcum* and *Euchlaena*, and several of these little plants developed roots while still attached to the parent plant, and when separated and planted in pots grew up and matured seeds. Plants from seed thus produced behaved like those from self-pollinated seed of second generation plants. They observed 'apogamous' plants in place of spikelets in *Euchlaena* also, in one season. Kostoff (1940) observed similar abnormality in the perennial plants among the progeny of the backcross *(Secale cereale* × *S. montanam)* × *S. cereale* in the eighth generation, when they were grown at a low temperature. The shoots had rootlets and when planted survived. When they were grown in a temperature of above 15°C they developed into normal plants. All the plants produced by 'viviparous propagation' set quite normal seeds during summer. So, he also concluded that the proliferation is the result of environmental (temperature) conditions. Krishnaswami and Rangaswami Ayyangar (1942) observed 'leafy bunches' in place of panicles in the second generation progeny

of X-rayed seed of *ragi* (*Eleusine coracana* Gaertn.), and also as stray plants in natural populations from bulk seed. These 'leafy bunches' developed roots and when planted survived and repeated the same behaviour. In the third generation of the X-rayed seed partial foliation was also observed. Subsequently Krishnaswami (unpublished) has observed the repetition of the phenomenon in the fourth generation in the progenies of apparently normal plants. This indicates its heritability and the possibility of its perpetuation through seed. Arber (1934) has recorded instances of proliferations of the spikelets in a few grasses—*Poa alpina* L. f. *vivipara* L., *Phleum pratens* L., *Festuca ovina* L. and *Arrhenatherum avenaceum* Beauv., and in the bamboos. In a submerged plant of *Deschampsia caespitosa* Beauv var. *rhereana* Grem., she observed flower production was entirely inhibited in favour of proliferation, while in other plants of the same species which were not swamped bore flowers and fruit. She has further stated that in the same variety a race is known in which this peculiarity is heritable and not controlled by environment. So, she concluded that there are two classes of proliferation, that controlled by environment and that which is innate and hereditary. She has added that "cytolcgical examinations have shown a chromosomal basis for some instances of proliferation, e. g., in *Festuca ovina* L. and in some wheat crosses. Nielsen (1941) observed proliferations of the spikelets in *Festuca obtusa* Spreng., *Bromus inermis* Leyss., *B. purgans* L., *Phleum pratens* L., *Avena sativa* L. and *Panicum virgatum* L., and attributed these to adverse environmental factors or abrupt changes of environmental factors particularly moisture, light and perhaps temperature.

The proliferation described in this paper differs from 'bulbils', as in the latter the two outer glumes of the spikelets in which the seeds are transformed into bulbils are normal and similar to the glumes in seed-bearing spikelets. In the instance recorded by Karper, he observed both seed-bearing spikelets and 'shoots' on the same earhead, whereas no such instance was met with here. Moreover he observed no roots or root-like structures in the 'shoots'. Further, the phenomenon which is described here is not season bound or affected by environmental or weather conditions. This is a new experience in sorghum not previously recorded.

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SELECTED ARTICLE

The Dehydration Industry in War-Time.

Scientists have often been accused of a desire to reduce the human diet to a pill or powder form "to be taken daily with water at meal times". Whatever truth there might be in the allegation, it is an actual fact that more and more foods are being proved suitable for preservation in dried form. This is partially a logical development of the processes of food preservation, which are largely the concentration of food products for convenience in transport and storage, and partially the results of special war-time demands. The need for concentrated nourishment is never greater than under conditions of war stress and the present serious pressure upon Allied shipping facilities has further tended to increase the need for foods that occupy the least possible space. On the average, one pound of fully dehydrated food is the equivalent of fifteen pounds of the same product in its original form. Thirty dozen eggs in the shell, packed and crated for shipment occupy $2\frac{1}{4}$ cubic feet; dried, the same number take slightly more than one-half cubic foot. The saving in ships and cargo space is obvious.

While the problem of shipping space has been a major factor in the stimulated interest in dehydration, other elements in the existing situation have also had their influence. In Great Britain, under constant threat of invasion, it has been essential to build up reserve stocks of food throughout the country, often under storage conditions that are far from ideal. The serious shortage of tin has restricted the use of ordinary canning methods to food which cannot, at the present stage of research, be preserved in any other form. A further stimulus has been given by the necessity of providing concentrated food for paratroops and commando units, which must be entirely self-sufficient when in action. Special rations are prepared which provide meals for two or three days, yet weigh only a few pounds.

Drying is the oldest known form of food preservation, in fact, it may be termed the natural method of preservation. Nature herself uses it. On the average, seeds, grains and nuts contain less than 10 per cent of moisture, regardless of the amount which may be present at earlier stages of growth. The very existence of vegetable life from year to year is in the final analysis dependent upon this lack of moisture, which inhibits the growth of bacteria and moulds. Perhaps by some accident, perhaps by imitation of the natural process man early began to preserve food by drying, either in the sun or by artificial heat. Robinson Crusoe's raisins and the dried apples of our pioneer ancestors leap at once to the mind. Dried fruits and fish, jerked and smoked meats are all preserved by the removal of some part of their original water content. Sometimes this is the sole process, sometimes it is combined with other methods, as salting or pickling. In recent years, however, the preservation of foods by canning, refrigeration and latterly by quick freezing has largely replaced the earlier method.

Natural or artifical drying methods have in the past, permitted the storage of food and the retention of a part of its nutritive value at the expense of flavour and colour. Every one knows the difference between the flavour and texture of sweet corn in the milky stage and that which has ripened further, *i. e.*, begun to dry out. In the case of such products, we have largely come to prefer the dried flavour, even where we can know the so-called fresh flavour. Some artificially dried or semi-dried foods have, in fact, retained their place in the modern diet in direct competition with the fresh form, not as substitutes, but as independent food

products in their own right. Such fruits as dates, figs, prunes and raisins are perhaps the best examples. No one expects raisins to take the place of grapes or prunes to have the same flavour as plums. These so-called dried fruits are, however, really only semi-hydrated. They retain from 20 to 25 per cent of their moisture; only enough has been removed to ensure their keeping qualities. While they are a concentrated product, the process has not been carried to the point of complete transformation into the solid form.

Meats. Jerked or dried meat and such products as pemmican are also among the oldest forms of preserved food and jerked beef is still extensively produced in many countries. A more generally known form of meat product is meat extract. There are a number of famous brands available either as a thick syrupy liquid or in a solid cube. The keeping property is implicit in its low water content usually about 15 per cent. These extracts are prepared by removal of the fat and albumen, the addition of salt and evaporation in vaccum. One pound is ordinarily obtained from twenty-five pounds of lean meat. Packing companies in the United States report that experimental methods of producing a true dehydrated meat, one which can be restored to its normal character, have been successful, at least in regard to beef. Pork is apparently too fat for such treatment. If this process works on a commercial scale as successfully as in the experiments, additional savings in shipping space will be realized. It is estimated that one ship could carry as much meat as ten cargo vessels were able to transport during the last war.

Dairy products. Among other concentrated foods that go back to antiquity are the milk products, butter and cheese. These belong in the class which has little relation in either flavour or texture to the original from which they are made. Cheese is a product of fermentation as well as drying, while butter is additionally protected by salt and by refrigeration in storage and transport. Thus, while the romoval of water is an important step in their manufacture, they cannot be considered dried foods. Recent reports from New Zealand indicate that butter is now entering the category. As a result of research which antedates the war, the New Zealand Dairy Research Institute has perfected a method of dehydrating butter. The British Government has contracted to purchase 20,000 tons during 1942 and 1943. A trial shipment of 400 tons was made last year and was well received According to a report from the Canadian Trade Commissioner in New Zealand the process was developed originally in order to reach markets not served by refrigerator ships. The dislocation of the shipping facilities between New Zealand and Great Britain has eliminated the usual means of sending butter. The new product however, can be shipped as general cargo on any ship that may be available. The dried butterfat can be used directly by industrial food manufacturers and its conversion into table butter is simply a matter of adding water and salt. Not only will it serve a valuable war-time purpose of providing Great Britain with needed fats, but it will also relieve the position of dairy farmers in New Zealand. After the war it is considered possible that the original purpose of marketing, in countries without refrigerator service may continue to absorb available supplies.

Other concentrated milk products are evaporated or condenced milks. These do serve as direct substitute for the original supply by the restoration of the original amount of water content. Large shipments of these products are going forward regularly from Canada and the United States to Great Britain. The next logical step in the process is the complete dehydration into powdered form. This has been an expanding industry in recent years. Milk in powdered form occupies only about one quarter of the space taken by evaporated milk and approximately one-eleventh of the volume of the original fluid milk. Experiments are now under way in Canada to make further economics. Dired milk is

usually packed in tins or small containers, in loose powder form. Half a ton of milk was recently sent from Ontario to Great Britain in the form of solid blocks, packed in large cartons. If these experiments are successful further important economics in shipping space will result.

Eggs. The drying of eggs has until last year only been incidentally carried on in this continent, and industries using dried eggs have depended upon China for their supply. The cutting off of this source and spectacular demand for military use and overseas shipment have resulted in a tremendous increase in output. In 1939 the United States egg-drying industry prepared only 10 million pounds of dried egg products By 1941 this had been increased to 45 million pounds and it has been estimated that output in 1942 will reach 150 million pounds. Some fear has been expressed that the present expansion in the industry will have severe repercussions when conditions of normal supply and demand are restored after the war. It should be noted however that the production of this year's quota will involve operation of the plants twenty-four hours a day throughout the year and that the industry could go back to a peace-time operation with an eight hour day and four-month season. On this basis output would be only 17 million pounds per annum or slightly larger than pre-war consumption in the United States.

Egg drying in Canada has also begun to expand. During 1941 we delivered 15 million dozen eggs to Great Britain These eggs were shipped in the shell and owing to shipping delays their condition upon arrival was not always satisfactory. Egg deliveries to Great Britain in 1942 expected to reach 45 million dozen eggs, and since February 7th all of these have been shipped in the dried form. Although the drying capacity in Canada has been sharply increased it is not yet capable of handling all the eggs available at the period of peak production and the surplus eggs are being packed for future processing.

Vegetables. While there has been a substantial growth in the processing of milk and eggs by dehydration, the industry which has received the greatest publicity and aroused most public interest is the dehydration of vegetables. During the World War of 1914—18 a substantial quantity of dehydrated vegetable was prepared and shipped to Europe, primarily for the use of United States armed forces. These were not popular; in general they tasted like anything but vegetables and the kindest description of their flavour was that it resembled hay. The industry died away at the end of the war almost as rapidly as it had risen. The last few years however, have seen a revival of interest and of operation in the dehydrated vegetable industry. This revival has, curiously enough, been based upon discoveries made in research for a rival, the quick-frozen food industry. In the earlier days of the latter industry the same problem of hay-like flavour arose. Research indicated that this was due to activity of enzymes, those curious biological catalysts present in all living matter without which the chemical changes necessary for its existence could not take place. It was discovered by pioneers in the frozen food industry that a pre-heating or "blanching" process immediately prior to freezing prevented activity of the enzymes during the period when the food remained frozen. As a result of the lack of chemical change the flavour remained unaffected.

It is thus against the background of this research rather than as a result of immediate war demands that the dehydrated vegetable industry has so far had its development. For a number of years the industry in the United States has been slowly growing and a survey conducted last year by the United States Department of Commerce indicated that 15 commercial plants produced slightly less than five million pounds of dehydrated vegetables in 1940. Nearly two-thirds of the output was in the form of powders to be used for seasoning, including such highly flavoured vegetables as onions, celery and red peppers The

remainder of the output was either in the form of mixed vegetables which, combined with animal protein and flavourings, make up the now familiar packaged soups. There has also been however, a relatively substantial volume of production for rehydration and use in the form of the original vegetable. One company in fact has specialized in the production of potato shreds which permit the preparation of mashed potatoes in five minutes. The greater part of the output was purchased by hotels, restaurants and other large organizations where convenience in use was a major factor. The direct sale to individual consumers was only in the preliminary stages.

The increased demand for food products in the United States both for the armed forces and for shipment abroad under "lease lend" has aroused an intense interest in the industry. The United States Department of Agriculture announced at the beginning of June, a programme of technical assistance and priorities on materials for food processors desirous of converting their plants. Compared to the 15 plants producing 5,000,000 pounds in 1940 there are now reported to be 113 companies operating dehydration plants with an aggregate annual production of 125,000,000 pounds Potential demand may be measured by the fact that if dehydrated potatoes were served to the men in the United States army only once a week it would require one million pounds of finished product per annum of this vegetable alone.

The type of dehydrated vegetables most in demand are potatoes, onions, cabbages, carrots, beets and tomatoes. The important factor in all these products is quality. Dehydration is not a process for getting rid of second grade products One successful operator has found that green peas for dehydration should be of approximately the same quality as those used for quick-freezing and must be better than the average quality of peas canned. If the product is to be restored to anything like palatable flavour and texture, the flavour must be there to begin with.

Dehydration in Canada. During the last few months the Canadian Government has been actively encouraging experimental work in the dehydration of vegetables. It is only fair to say that this work is backed by a larger basis of research than exists in most countries For nearly twenty years, that is, since the formation of the "Dehydration Committee" by the Department of Agriculture in 1923, experiments have been carried on to determine the best methods of dehydrating Canadian apples and the experience gained is now being applied to the dehydration of vegetables. One point which has been emphasized consistently throughout the work of the Committee is that high quality and fine flavour are essential for fruit or vegetables to be processed.

During the past winter the Canadian Government was informed that the British Government was interested in dehydrated vegetables to an amount of approximately 1,000 tons. While the Canadian industry was not equipped to handle on short notice such a large order, immediate steps were taken in the establishment of test plants and the speeding up of experimentation. At that time representatives from the United Kingdom pointed out that no commercial samples of dehydrated vegetables from any country had been considered entirely satisfactory from the point of view of nutrition. The Canadian tests indicate that dehydrated vegetables can be of fine flavour and retain from 50 to 75 per cent of the original vitamin content. Five experimental dehydration plants have been operating for some months, processing potatoes, carrots, turnips and cabbages from the 1941 crop. These are being held as a reserve supply for the Canadian Army. On the basis of these results Canada should be able to supply large quantities of high-quality dehydrated vegetables.

Dehydrating processes. The actual methods of dehydration employed vary according to the product The simplest is that applied to the drying of fruits,

Many of these such as dates, figs, raisins are dried in the whole state; others, apricots for example, are halved and pitted, while apples should be peeled, cored and sliced. Cut fruits such as apricots and apples, are treated with sulphur dioxide, which acts as a sterilizer and prevents discolorization. Such fruits must be cooked before using in order to drive off the sulphur, but other dried fruits can be used without soaking or cooking. The moisture is removed by natural drying in the sun or by artificial evaporation.

Many of the dehydration processes lie in the realm of chemical technology, but a short sketch of the principles involved may be of interest. The dehydration process used in the case of vegetables involves careful cleaning and cutting into small pieces, shreds or flakes. These are then "blanched" in steam or boiling water and placed in the drier. While the amount of moisture which should be left varies with the particular vegetable, it should never exceed 7 per cent, and best results indicate a moisture content of 3 to 5 per cent. Substantial progress has already been made in research into the pre-treatment of the vegetables. Cabbages, for example, should be "blanched" in steam, potatoes in plain water and carrots in salt water. Investigation is continuing, however, into the actual drying of the vegetables and particularly as to the proper stage of maturity at which dehydration should take place. So far, it appears that no vegetables which are woody or fibrous, have produced satisfactory results. Soft fruits such as raspberries or straw-berries, are reduced to a pulp after the preliminary cleaning and "blanching". This pulp is forced out over a heated drum and when drying is completed looks something like "coloured crepe paper". This filmy layer is broken into small fragments for packing and storage. It is reported that the original flavour and colour of the fruit is well maintained.

The handling of milk and eggs which are very liquid in their original form requires a different process. After testing and preliminary sterilization, the liquid is sprayed into a drying chamber where hot air in constant motion reduces it to a powder which falls to the floor.

Although dehydrated foods can be kept under conditions of ordinary storage, they do require special care in packing. Metal containers are unnecessary, but the cartons must be impervious to moisture, to changes in temperature and to the attacks of insects and rodents. Canadian experience also indicates that removal of the oxygen in the container and its replacement by an inert gas, such as hydrogen, prevents any recurrence of chemical change and retains flavour for a considerably longer period.

Post-war prospects. The acceptance of any product in war-time even for civilian consumption is, of course, no proof of its continued acceptance under normal conditions. Shortages of supply and the exigencies of the situation necessitate strange substitutions. Sometimes these are found better than the original product, and in the post-war period tend to replace it. But this only occurs when the new substance or material has intrinsic advantages and can compete on a basis of quality.

Many of us can remember the reaction in Great Britain against Canadian bacon after the last war resulting from war-time shipments of a type and quality to which the British were not accustomed. Long years of effort were necessary to break down the prejudice against Canadian bacon which was built up at that time. In the present war Canadian bacon is being prepared to suit the British palate.

Since dehydrated foods have not yet come into general war-time use it is impossible to prophesy regarding post-war markets, but there are a number of interesting sidelights on the situation. One of the industries hardest hit by the tin shortage has been the manufacture of dog food which has been growing

rapidly in the pre-war years. These manufactures have been the first to produce dehydrated products to be sold to the general public, truly a case of "trying it out on the dog". While we do not attempt to draw any analogy between dog biscuits and food for human consumption, it will be interesting to watch the results of this experiment. Dogs are certainly not interested in eating things that are good for them regardless of flavour and if our canine friends accept the new preparation it will at least indicate that a palatable product has been obtained.

The palatability of food can only be determined in use. It is feared, for example, that dehydrated vegetables would tend to become monotonous in constant use. General consumer interest has, however, been aroused by the wide publicity which has been given the industry and already commercial dehydrators in the United States are studying the possibilities of civilian markets. The future of this development would appear to depend upon the assurance of quality as the convenience of such products is undeniable. (*Mysore Economic Journal*, Vol. 28, Nov. 42.)

ABSTRACTS

Greenhouse tests of the availability of phosphorus in certain phosphate fertilizers. P. E. Karraker, H. F. Miller, C. E. Bortner, and J. R. Todd (*Kentucky Sta. Bul. 413, 1941*). Greenhouse tests with 9 sources of phosphorus from 1934 to 1939 are reported. Various crop plants were grown in jars of soil to which the several fertilizers were added, and then the plants were analyzed to determine how much of the phosphorus was taken up. The fertilizers were applied so as to supply an equivalent amount of phosphorus and with this system the less readily available rock and colloidal phosphates were handicaped. As determined with 9 kinds of crops and 10 different lots of soil, ordinary superphosphate, triple superphosphate, dicalcium phosphate, calcium metaphosphate, and fused rock phosphate were practically equally available in the greenhouse tests. Tricalcium phosphate was appreciably less available than the others, with rock and colloidal phosphates very much less available. Field tests were found to agree fairly well with the greenhouse tests, except that the relative availability of the tricalcium phosphate and rock phosphate was greater in the field. Liming decreased materially the availability of rock phosphate and colloidal phosphate and decreased somewhat the availability of tricalcium phosphate in the greenhouse tests. (*Exp. Sta. Rec. 86, Jan. 1942*).

Processing and chemical investigations of taro*, J. H. Payne, G. J. Ley, and G. Akau (*Hawaii Sta. Bul. 86, 1941*). The authors find that taro can be converted into flour by cooking, peeling, grinding, refrigeration, drying, and milling. This flour can be substituted for from 15 to 20 per cent of wheat flour in a wide variety of baked goods, with an increase in yield due to high absorption and improved keeping qualities of the baked product resulting from the higher moisture content. A beverage powder, which mixes readily with milk and water and is considered highly palatable, can be prepared from cooked taro by adding flavouring and sweetening agents, and drum drying. Taro can be used in the preparation of such breakfast foods as grits, shreds and flakes by cooking, flavoring, drying and toasting. Taro products have been shown to be of value in diets for wheat-allergy cases. Taro can be canned as a substitute for potatoes or other starch crops. Complete analyses of two wet-land and upland varieties of taro are recorded. (*Exp. Sta. Rec.* 86, Jan 1942)

* *Colocasia antiquorum* (Tam.—*Cheppankizhanku*).

The nutritive value of some Tanganyika foods—II. Cassava, W. D. Raymond, W. Jojo and Z. Nicodemus (*East African Agr. Jour. 6 (1941), No. 3, pp. 154—159*). Based upon analyses presented, the following figures for the composition of fresh peeled cassava root are suggested for use in dietary calculations: Moisture 62 per cent, protein 0 7, fat nil, and carbohydrate 30 per cent. Analyses showed the calcium content to vary from 31·26 to 51·35 mg. per 100 gm. of fresh peeled root, phosphorus from 104·6 to 199·5, and iron from 0·18 to 0·37 mg. Determinations of ascorbic acid gave values from 30·9 to 54·6 mg. per 100 gm for four samples of raw peeled root and from 12·3 to 52·4 (average 29 3) mg. for 91 varieties of raw whole roots. The skin was less rich in ascorbic acid than the edible peeled roots; these latter when boiled lost about half of their ascorbic acid, but roasting caused only slight loss. Cyanogenetic glucosides present in appreciable quantities in the raw roots were destroyed upon cooking. The leaves, analyzed without leaf stalk, were very rich in ascorbic acid containing from 325·6 to 381·4 (average 353·2) mg. per 100 gm. when freshly picked. Storage at tropical room temperatures caused rapid and pronounced losses of ascorbic acid, the leaves containing but 75·1 mg. of ascorbic acid per 100 gm. after one day and only 37·5 mg. after three days of storage. The carotene content of the leaves varied from 9,746 to 11,136 mg, per 100 gm. in the fresh state. Losses of vitamin C and carotene upon cooking (boiling until tender in a small amount of water) were slight, but the cyanogenetic glucoside present in the raw leaves was destroyed upon cooking. Determination of phosphorus, calcium and iron in the leaf blade gave values of 0·098, 0·187 and 0 003 per cent, respectively. Oxalic acid in the leaves was high, averaging 108·9 mg. per 100 gm. Juice extracted from the fresh leaves and concentrated in vacuum gave a preparation that kept well and that contained upwards of 2,000 mg. of ascorbic acid per 100 gm. (*Exp. Sta. Rec.* 86, *June 1942.*)

Comparison of nutritive value of refined coconut oil and butterfat, R. S. Harris and L. M. Mosher (*Food Res., 5 (1940) No.* 2). Young healthy adulterates were fed diets in which refined coconut oil or butterfat in two series of experiments, furnished fat at an abnormally high level (25 per cent) the rest of the diet being made up of extracted skim milk powder (72 per cent) and extracted brewers' yeast (3 per cent) supplemented with iron and vitamins A and D. Animals on the experimental diets were guillotined at intervals of 15, 30, 60 and 90 days for histological examination and analysis of the body tissues. The results were compared with those for a control group on a standard stock ration.

Rats on the butterfat and coconut oil diets made comparable weight gains during the first 30 days but by the end of 90 days the respective average total gains were 32 and 50 gm. The greater gain on the coconut oil diet was not due to greater food consumption, since the group receiving butter fat had consumed slightly larger amounts of the diet; nor did the greater weight gain represent increased accumulation of adipose tissue, since body and liver tissues of the two groups contained essentially the same amount of fat (alcohol—ether extract) and true lipide (petroleum ether extract of the alcohol—ether extract). The animals on both diets developed a slight equally intense fatty infiltration of the body and liver tissue, as evidenced by histological examination and confirmed by chemical analyses. At the end of 90 days, for example, the tissues of these two groups and control group averaged respectively. 39 3, 38·8, and 29·6 percent of fat (dry basis) and 28 2, 27·4, and 23·2 percent of the lipides, while the liver tissues averaged, 24·6, 26·4, and 23·0 percent of fat and 19·3, 20·4, and 17 0 percent of true lipides. Histological examination of various body tissues gave no evidence of pathological tissue changes in any animal in any group. "These results indicate that butterfat and coconut oil even when fed at rather high levels in a complete diet, are equally harmless to rats and presumably to man". (*Exp. Sta. Rec. 86, Feb. 1942*).

Mineral losses in washing fresh vegetables preparatory to cooking. (Trans. title) C. Dienst (*Munchen. Med. Wchnschr. 87 (1940). No. 43*). A number of vegetables, including lettuce, rutabagas, carrots, kohlrabi, potatoes, several kinds of cabbage, and brussels sprouts, were soaked in water for periods of 1 and 6 hr.; the root vegetables were peeled and soaked whole or after being cut and the cabbage either as whole or cut leaves. The wash water was analysed in each case for the amount of the various minerals lost from the vegetables during soaking. The values obtained were then calculated as percentages of the minerals present in the raw vegetables. Figures for the latter were obtained in part from original analyses of the raw samples before soaking, but were taken for the most part from tabulated averages of R. Berg. Calculated on this basis, losses from 1·44 to 32·2 percent are reported for potassium from 0 to 15·1 for sodium, from 0 to 98·2 for calcium, from 0 to 95·5 for chlorine, 0 (or undetermined) for phosphorus and sulphur, and from 0 to 6·29 percent for nitrogen. Losses were slight in the case of the uncut vegetables, (*Exp. Sta. Rec, 86, Feb. 1942*).

Preservation of fruits and vegetables by commercial dehydration, E. M. Chace, W. A. Noel and V. A. Pease (*U. S. Dept. Agr. Cir. 619; 1941*). Sufficient concentration of the soluble solids of fruits and vegetables inhibits the growth of molds and bacteria, but enzymes capable of changing the composition, flavor and appearance are not always inactivated by such dehydration, and fruits and vegetables to be dehydrated must first be blanched or otherwise processed to inactivate such enzymes. Dehydration has the advantages of reducing bulk and weight, with resultant lowering of storage and carriage costs; a processing cost lower than that of canning or freezing; and products more convenient for use than are the fresh products. The comparative advantages of various types of drying equipment are briefly discussed, and the engineering calculations for dehydrator design are given. Details of preparation, pretreatment, and drying of numerous fruits and vegetables are tabulated. A patent list, list of publications cited, and a supplementary bibliography are added. (*Exp. Sta. Rec.* 86, *Feb. 1942.*)

How fine should grain be ground for milk cows? G. C. Wallis and T. M. Olson (*South Dakota Sta. Cir.* 54; 1941). This popular publication briefly summarizes the results of a series of digestion trials with cows comparing the utilisation of whole, medium ground, and fine ground corn and oats. Medium grinding and fine grinding were accomplished by using a $\frac{7}{16}$ in. and $\frac{1}{16}$ in. screen respectively, in a hammer mill. In each case the grain was fed in combination with alfalfa hay, in equal parts by weight. Assuming a constant value for alfalfa in all cases, an equivalent amount of nutrients was provided in 119·3, 100 and 96·2 lb of whole, medium ground and fine ground corn, respectively, and in 105·1, 100, and 103·3 lb. of whole, medium ground, and fine ground oats. It is concluded that from the standpoint of food value obtained, palatability, cost, and ease of mixing and handling the medium grinding of grain, which is just sufficient to break up the kernels into several portions, is the best practice in preparing grain for dairy cows. (*Exp. Sta. Rec. 86, Feb. 1942*).

Menstruation frequency and its relation to conception in dairy cattle, G. W. Trimberger. (*Jour. Dairy Sci. 24 (1941) No. 9.*) Four groups of dairy animals, including 100 heifers and 100 cows not bred and comparable groups which were bred, were observed at frequent intervals after oestrus for external evidence of menstruation. Of the animals not bred 100 per cent of the heifers and 61 per cent of the cows showed evidence of menstruation. Among the bred heifers 81 per cent menstruated, while of the 61 per cent which conceived 85·25 per cent showed evidence of menstruation as compared with 74·36 among those not conceiving. Among the bred cows 72 per cent conceived of which 69·44 per cent also menstruated as compared with 39·29 per cent among those not conceiving.

No definite relationship between breeding and conception as affecting menstruation could be established on the basis of these data. Among all animals with external evidence of menstruation 74·26 per cent showed this discharge on the second day following oestrus. (*Exp. Sta. Rec. 86, Feb. 1942.*)

Are soaps germicidal ? K. G. Klarmann and V. A. Shternow (*Soap and Sanit. Chem. 17 (1941), No. 1)* Tables are given for potassium soaps of saturated aliphatic acids with the minimum germicidal concentration (1) of original solutions of potassium salts for forms representing five genera of micro-organisms and (2) of seven brands of toilet soaps for two genera of micro-organisms in 5, 10, and 15 min. It was found that the anti-bacterial properties displayed by the commercial soap products tested were not such as to entitle this kind of soap to any one of the designations " disinfectant " " antiseptic " or " germicidal ". (*Exp. Sta. Rec. 86, Feb. 1942*).

Pyrethrum in medicine, W. K. Angevine (*Soap and Sanit. Chem. 17 (1941), No. 3.*) The value of pyrethurm compounds in the treatment of scabies, as shown by 1,213 cases treated. is emphasized in this contribution. It is pointed out that pyrethurm is a central nervous toxin to cold-blooded animals, and that its active principles are harmless to warm-blooded animals, including man. (*Exp. Sta. Rec. 86, Feb. 1942*).

Mango budding in situ—a new technique likely to revolutionise mango industry; by Lal Singh and Abdul Aziz Khan. (*Punjab Fruit J. 6 (1942) 1195—1206.*) The article describes mango budding trials conducted in the Punjab by the authors. Their investigations reveal that (1) Budding was not successful with seedlings in pots, (2) three years old seedlings gave as high as 70 per cent bud take, (3) best time for budding is early spring, (4) bud wood of the corresponding age and thickness to that of the root-stock gave the best results, (5) 'shield budding' was better than 'patch budding', (6) cotton tape dipped in paraffin wax was the most efficacious bandage material. and (7) ringing of the shoots a fortnight after budding, 4 inches above the bud point, gave the maximum 'take'. Since three year old seedlings successfully budded in the nursery would not stand transplantation in the field, the authors tried budding seedlings in situ, *i. e.*, stones were planted at suitable distances in the main field and after three years' growth, budding operations were done successfully. Top working by budding is also described. All limbs except one (sap drawer) of old mango seedling trees are beaded back to within a foot of the main trunk in February—March. The trunk is protected from sunburn by wrapping with old gunnies. The strongest shoots that grow out are budded in September—October with immature budwood as is done with three year old seedlings already described. The successful budded shoots are retained while others including the one limb left as sap drawer, are removed.

T. N.

Gleanings.

Seed treatment for increased yields—Bigger yields of a number of field crops were obtained by treating their seed before sowing, and in some instances by spraying the plants in the field, with plant hormones or growth-promoting substances. in large scale tests reported by Professor J. C. Ireland, of Oklahoma Agricultural and Mechanical College. Of special potential practical interest is the fact that the stimulant he found most valuable, levulinic acid, can be made cheaply from waste materials. Its most important present use is in the making of plastics. " The most outstanding results with levulinic acid were obtained in the treat· ment of cotton seed and cowpeas. The results show that there is not only more than a 50 per cent increase in the yields over the untreated but that dusting with soyflour and 1 per cent levulinic acid during the flowering period

aids in the setting of bolls". An acre of cotton thus treated would yield 838 pounds, worth about $ 134, as compared with a yield from an acre of untreated crop of only 581 pounds, worth $ 93. Cost of materials for treating one acre with levulinic acid is about $ 3, so that the method appears to be commercially profitable. (*Science, Vol 95, No. 2459, Feb. 1942, Supplement P. 10*).

Coconut milk encourages embryo growth. A coconut served as foster mother to embryo plants much as a cow or goat serves as foster mother to infants of our own species, in experiments reported to the American Society of Plant Physiologists by Dr. J. van Overbeek, of the Californic Institute of Technology. Inducing very small plant embryos to grow outside their seeds is a feat comparable in difficulty with growing chick embryos outside their eggs. Working in cooperation with Dr. Marie E Conklin, of the Brooklyn Botanic Garden, and Dr. A. F. Blakeslee, of the Carnegie Institution of Washington, Dr. van Overbeek succeeded in getting them to grow in glass laboratory dishes, feeding them on a solution of nutrient chemicals. At first the embryos would not grow. Recalling the physiological function of the milk in the coconut, in feeding the embryo of the coconut palm, he decided to add some coconut milk to his nutrient medium. It worked. The embryos he reared were those of jimsonweed. He succeeded in carrying them through from specks about the size of a pinpoint to a diameter of nearly a quarter of an inch, in six days' time. After a week in the coconut milk enriched fluid medium they were "weaned" by transfer to a milkless solution, and later planted in ordinary garden soil. Dr. van Overbeek has detected evidence of the presence of at least three distinct enzymes, hormones or similar substances in coconut milk, that influence the growth of embryos. He is now investigating the chemistry of the one that seems to be most important. (*Science Vol. 95, No. 2459, February, 1942, Supplement P. 10*).

A Syrup to enable man to eat grass. A chocolate flavored syrup of germs that according to preliminary tests, enables human beings to eat grass leaves and wood if other food supplies fail was announced by Dr. Gustav J. Martin, of the Warner Institute for Therapeutic Research, New York City (before a meeting of the American Chemical Society). The germ syrup, which would accomplish the desired result for a lifetime at a cost of $ 2 per person, is considered particularly suitable for paratroops and other army units. It seems to be the American research scientist's answer to reports that the Germans have developed a similar procedure for enabling their soldiers to live on wood, leaves or grass. For civilians as well as soldiers, a germ syrup to supply vitamins for a lifetime is also on its way if Dr. Martin's experiments prove successful. Certain bacteria or germs, of a type that do not cause disease, are known to manufacture various of the B. Vitamins. The cow does not have to eat B. Vitamins in food because her rumen contains the bacteria that manufacture them. Dr. Martin's experiments are designed to develop similar germ vitamin factories in man's intestines. Dr. Martin's work on developing germ vitamin factories and the chocolate flavored germ syrup for digesting grass, leaves and wood has been done on laboratory animals Preliminary tests on humans have been started in New York hospitals, but have not gone long enough for conclusive results to be reported. (*Science Vol. 95, No. 2469, April 24, 1942, Supplement p. 8.*)

Nicotine accumulation in reciprocal grafts of tomato and tobacco. The distribution of nicotine between stock and scion in reciprocal grafts of tomato and tobacco was described by R. F. Dawson at the Autumn Meeting of the U. S. National Academy of Sciences held during October 13—15. When tobacco scions were grown upon tomato stocks no appreciable amounts of nicotine accumulated in the tobacco leaves and stems. In fact, the nicotine which was originally present in the scions remained in the lower leaves or stems, and the leaf and stem tissues which afterwards developed were nicotine free. When tomato scions

were grown upon tobacco stocks nicotine was found in appreciable quantities in the tomato stems and fruits, and large quantities of the alkaloid accumulated in the leaves. Nicotine accumulation in the leaves of the tomato scions was sectoral when tobacco stems were decapitated and inserted into the tomato stems unilaterally. Nicotine was isolated from the xylem and the xylem exudate of the stems of intact tobacco plants. The evidence indicates that the presence of nicotine in tobacco leaves is due to (a) the synthesis of the alkaloid in the tobacco roots, (b) the translocation of the fully formed base (and not its precursor) to the leaves by way of the xylem, and (c) the continued accumulation of this nicotine in the leaves. (*Nature, Vol. 148, No. 3762, Dec. 6, 1941*)

Correspondence.

Wet land Bunds—Utilisation.

To the Editor, The Madras Agricultural Journal.

Sir,

The area under rice in Madras is roughly 11·4 million acres which form about 29% of the total area under cultivation. Rice is the staple food of the people in this Province and of late much attention and effort is made to increase its output to meet the shortage of imports arisen out of the present war. Merely following the grand old customs of cultivation will not materially increase the production to meet the growing demand. The Agricultural Department has suggested a scheme of utilising the wet land bunds which are being neglected by almost all and propaganda is done in this direction on a mass scale. A *ryot* who does really follow the advice of the Department of Agriculture in properly utilising the bunds will not only get himself economically bettered but does a good deal in furthering the war effort. Agriculture and industry are the fundamental factors which can defend a country from hostile invasion. I am sorry the readers may think I am going out of the subject and shall come down to the point. There might be some practical difficulties in bringing every wet land bund into use in some of the tracts but if there is a will, those can be easily overcome. The suggestions of the Department can be applied even on small bunds. This practice has already been in operation in Melur taluk, Madura district and best seen in Gudivada taluk, Kistna district and in some parts of Northern Circars. What are the crops that could be sown on bunds and how best they could be utilised, I shall deal in detail below.

Soon after transplanting is over the grass on the bunds is scraped if it was not already done while repairing bunds and a mixture of seeds (*cholam*, sunhemp, cowpea, *pillipesara* or green gram) may be sown for fodder which may be fed green till paddy is removed and if any thing is left over, it is cut and made into hay.

However small the bund may be it can be utilised wholly or at least in parts *i. e*, the sides. Plants could be put one to three feet apart—the choice of crop depending on the nature of soil, duration of water supply, etc. This procedure will make every village, why every taluk, self-sufficient for green manure seeds. Soya beans can also be tried in different months on the sides of bunds for grain purpose.

Pillipesara and sunhemp if sown on bunds after transplanting of *Kuruvai* is over, give you a good growth of green manure after harvest of *Kuruvai* for incorporation before planting *samba* These two green manure crops are of short duration and can be done without extra labour and water. Special protection I think, will not be necessary, when there is standing crop in the fields. Green

manure crops of daincha, *kolingi* and indigo being longer in duration may be sown on the bunds two months after transplanting of *samba* is over and they give good green manure crop for incorporation before planting *kuruvai*.

If a *ryot* takes up this work in right earnest in a village for the first time and gets a bumper green manure crop, others will certainly follow his example after seeing for themselves the income without extra labour and cost. Thus in a short period all the bunds in a village will be utilised. By properly utilising the bunds, you are building the national strength by stimulating the fertility of your lands to give more food to your fighting bretheren. This will also go a great deal in improving the economic condition of the crippled agriculturist.

I give below my own practical experience in cultivating the bunds on a small scale for the first time. I casually went to the Agricultural Demonstrator of my place to consult about some paddy pests In the course of our conversation, the Demonstrator told me about the ways and means of utilising the wet land bunds. In the beginning I had no confidence but on the persuation of the officer, I purchased one Madras Measure of sunhemp seed and had it sown on the sides of bunds running round an area of one acre according to the instructions given by him. The crop came up promisingly and exhibited a picturesque scene which has not failed to attract the neighbouring cultivators. The growth was good and I was pleased to look at it every day and regretted much my folly in having had an argument with the officer, who gave the best guidance. I immediately rushed to him and took him round the field. He then asked me to continue this next year on a mass scale. Before the harvest of my *kuruvai* crop the sunhemp crop on the bunds began to flower. Then I cut the entire crop and placed it on the field for incorporation as green manure. The sunhemp thus spread on the field gave me best relief to stack the harvested earheads of *kuruvai* crop over it without being carried to the bund or outskirts every now and then. This maiden attempt induced me to continue the practice on a mass scale in the coming year.

"Cast off your primitive methods and follow scientific agriculture".

Trichinopoly,
29—10—1942.

A. K. Lakshmanan,
Sivagnanam Co-operative Agricultural Society, Lalgudi.

Crop and Trade Reports.

Statistics—Paddy— 1942-43— Intermediate Report. The harvest of first crop of paddy has concluded in parts of East Godavari, South Arcot, Coimbatore, Trichinopoly, the South and the West Coast. The yield per acre is expected to be generally normal in South Arcot, Coimbatore, the South and the West Coast and slightly below normal in East Godavari and Trichinopoly for want of rains in the growing period. The condition of the main crop of paddy is generally satisfactory except in Kistna (uplands). Guntur, the Deccan, Chingleput, Chittoor, North Arcot and Ramnad where dry paddy is reported to have been adversely affected by drought.

The wholesale price of paddy, second sort, per imperial maund of 82⅔ lb. (equivalent to 3200 tolas) as reported from important markets on 9th November 1942 was Rs. 5—5—0 in Madura, Rs. 5—15—0 in Chittoor, Rs. 5—13—0 in Vellore and Virudhunagar, Rs. 5—11—0 in Tinnevelly, Rs. 5—4—0 in Trichinopoly and Kumbakonam, Rs. 6—3—0 in Conjeevaram, Rs. 4—12—0 in Vizianagaram and Hindupur, Rs. 4—11—0 in Cuddalore, Rs. 4—9—0 in Cocanada, Rajahmundry and Negapatam, Rs. 4—8—0 in Ellore, Masulipatam, and Guntur and Rs. 4—7—0 in

Bezwada and Anantapur. When compared with the prices published in the last report, i. e. those which prevailed on 5th October 1942, the prices reveal a rise of about 14 per cent in Chittoor and Kumbakonam, 13 per cent in Anantapur, 11 per cent in Madura, 9 per cent in Cuddalore, 7 per cent in Negapatam, 6 per cent in Vizianagaram, 4 per cent in Hindupur, and Vellore, 2 per cent in Tinnevelly and one per cent in Bezwada and a fall of about 8 per cent in Trichinopoly, 3 per cent in Rajahmundry and one per cent in Ellore, the prices remaining stationary in Cocanada.

Statistics—Crop—Gingelly—1941-1942. Intermediate condition report. The gingelly crop has been affected to some extent by drought in Bellary, Anantapur, the Carnatic, Chittoor, North Arcot and Tinnevelly. The yield per acre is expected to be normal except in these districts.

The wholesale price of gingelly per imperial maund of 82⅔ lb. as reported from important markets on 9th November 1942 was Rs. 13—3—0 in Trichinopoly, Rs. 12-3-0 in Salem, Rs. 12-0-0 in Tinnevelly, Rs. 11-8-0 in Tuticorin, Rs. 11-5-0 in Cuddalore, Rs. 11—0—0 in Cocanada, Rs. 10—15—0 in Ellore, Rs. 9—15—0 in Rajahmundry and Rs. 9—12—0 in Vizianagaram. When compared with the prices published in the last report, i. e., those which prevailed on 5th October 1942, these prices reveal a rise of approximately 26 per cent in Tinnevelly, 9 per cent in Salem, 8 per cent in Trichinopoly, 5 per cent in Vizianagaram, and 4 per cent in Cocanada; the prices remaining stationary in Ellore, Cuddalore and Tuticorin.

Statistics—Crop—Groundnut—Condition report. The winter crop of groundnut has been affected to some extent by drought in the districts of Guntur, Bellary, Anantapur, Cuddapah, and North Arcot and by insect pests in parts of the districts of Chinglepet, South Arcot, Coimbatore, Tanjore, Madura and Ramnad. The condition of the crop is generally satisfactory in the rest of the Province.

The wholesale price of groundnut (machine shelled) per imperial maund of 82⅔ lb. as reported from important markets on 9th November 1942 was Rs 8-5-0 in Coimbatore, Rs. 7—14—0 in Hindupur, Rs 7—12—0 in Adoni and Tadpatri, Rs. 7—5—0 in Nandyal, Salem and Guntakal, Rs 7—3—0 in Guntur, Rs. 7—2—0 in Vizagapatam, Rs. 7—0—0 in Vizianagaram and Cuddalore, Rs. 6—12—0 in Cuddapah and Rs. 6—8—0 in Vellore. When compared with the prices published in the last report i. e., those which prevailed on 5th October 1942 these prices reveal a rise of approximately 11 per cent in Adoni, 9 per cent in Hindupur, 4 per cent in Tadpatri and a fall of approximately 18 per cent in Vizianagaram and Vellore, 6 per cent in Cuddalore and Coimbatore, 4 per cent in Cuddapah, 3 per cent in Guntur, 2 per cent in Vizagapatam and 1 per cent in Nandyal, the price remaining stationary in Salem.

Statistics—Crop—Sugarcane—Intermediate condition report. The condition of the sugarcane crop is generally satisfactory and the yield per acre is expected to be generally normal in all districts except East Godavari, Bellary, South Arcot, Chittoor and Salem where the crop suffered from drought to some extent.

The wholesale price of jaggery per imperial maund of 82⅔ lb. as reported from important markets on 9th November 1942 was Rs. 15—6—0 in Adoni, Rs. 15—4—0 in Cuddalore, Rs. 13—11—0 in Chittoor, Rs. 13—9—0 in Vellore, Rs 12—12—0 in Coimbatore, Rs. 12—8—0 in Salem, Rs. 12—5—0 in Trichinopoly, Rs. 11—8—0 in Cocanada, Rs. 10-11-0 in Rajahmundry, Rs. 10-10-0 in Mangalore Rs. 8—14—0 in Bellary and Rs. 8—4—0 in Vizianagaram. When compared with the prices published in the last report, i. e., those which prevailed on 5th October 1942, these prices reveal a rise of approximately 23 per cent in Coimbatore, 16 per cent in Adoni, 14 per cent in Bellary and 7 per cent in Cuddalore and a fall of approximately 15 per cent in Mangalore, 15 per cent in Rajahmundry, 10

per cent in Vizianagaram, 6 per cent in Cocanada and Vellore and 5 per cent in Chittoor, the prices remaining stationary in Salem and Trichinopoly.

Statistics—Cotton—1942-43—Intermediate Report. In the Central districts and the South, the sowings of cotton are still in progress. The area under the crop is expected to be normal in the Central districts and slightly below normal in the South.

In the Deccan, the sowings of *hingari* or late cotton have been delayed for want of rains and the area sown is expected to be below normal due partly to the food production drive and partly to the unfavourable season. The yield of the mungari or early sown crop is expected to be below normal on account of drought.

The local cotton trade is not generally active at this time of the year. The average wholesale price of cotton lint per imperial maund of 82⅔ lb. as reported from important markets on 9th November 1942 was Rs. 23—1—0 for Cocanadas, Rs. 26—2—0 for white northerns, Rs 18—15—0 for red northerns, Rs. 16—12—0 for Westerns (*mungari*) Rs. 21—4—0 for Westerns (*jowari*), Rs 55—15—0 for Coimbatore Cambodia, Rs. 47—2—0 for Coimbatore *karunganni*, Rs 38—2—0 for Tinnevelly *Karunganni*, Rs. 32—2—0 for Tinnevellies and Rs. 37—4—0 for *Nadam* cotton. When compared with the prices published in the last report, i. e., those which prevailed on 5th October 1942, these prices reveal a rise of approximately 19 per cent in the case of Tinnevelly *Karunganni*, 18 per cent in the case of white northerns, 16 per cent in the case of Tinnevellies, 15 per cent in the case of red northerns, 7 per cent in the case of Coimbatore Cambodia, 6 per cent in the case of *Nadam* and 5 per cent in the case of Coimbatore *Karunganni*, the prices remaining stationary in the case of Westerns (*mungari* and *jowari*).

(Additional Joint Secretary, Board of Revenue, Madras.)

Cotton Raw, in the Madras Presidency. The receipt of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 11th December 1942 amounted to 692,518 bales of 400 lb. lint as against an estimate of 559,700 bales of the total crop of 1941—42. The receipts in the corresponding period of the previous year were 617,070 bales, 658,618 bales mainly of pressed cotton were received at spinning mills and 2,592 bales were exported by sea while 83,342 bales were imported by sea mainly from Karachi and Bombay.

(Director of Agriculture, Madras).

Moffussil News and Notes.

Nidamangalam. An agricultural exhibition was held at Nidamangalam on 21st November in connection with the Silver Jubilee celebrations of Nidamangalam Co-operative Manure Society, the pioneer non-credit society of the Madras presidency. It was opened by the District Agricultural Officer, Sri R. Chockalingam Pillai, L. Ag., in the presence of the District Collector, Sri M. S. Sivaraman, I. C. S., the District Health Officer, the Deputy Registrar of Co-operative Societies and the prominent *mirasdars* and co-operators of the district. Various useful implements like the buckscraper, Burmese settun, Bullock drawn levelling board, iron ploughs etc., improved strains of paddy, millets, oil seeds, cotton, sugarcane and new varieties of tapioca, pulses, fruits and vegetables like Sathgudi orange, mangostein, sapota, potato, tomato and plantains from the farms and from mirasdars, and insecticides, fungicides, sprayers, fly trap rice huller for hand shelling, manure samples and pictorial posters were prominently displayed and they aroused the interest of the visitors. Malt making was demonstrated. *Daincha*, *pillipesara*, *sesbania speciosa*, indigo, *kolinji*, sunnhemp, *pungam*, glyricidia, *prosopis*, *juliflora*, strains of millets, groundnut, castor

Napier and Guinea grasses had been raised in small plots a month in advance and were of high educative and practical value to the *mirasdars*. R. C.

Ramnad. In connection with the 34th birthday celebration of the Raja of Ramnad an Agricultural Exhibition was held from 5th to 10th November 1942 in the Palayampatti Zamindar Bangalow in Ramnad. Improved seeds of paddy, millets, and cotton, groundnut and gingelly were exhibited, besides green manure and fodder *cholam* seeds. Live specimens of green manure and fodder crops were also exhibited along with a live bee colony. A number of pictorial and word posters were exhibited and explained besides the lantern lectures at night. Different types of iron ploughs and labour saving implements were also exhibited. During the Exhibition large number of *ryots* from different villages in the Zamindary visited the exhibition and they were advised to adopt extensive and intensive methods of cultivation of food crops and vegetables. N. S.

Tiruvannamalai. An exhibition was conducted from 13th to 22nd November 1942 in the premises of the Municipal High School during the *Krithigai Deepam* festival at Tiruvannamalai. Exhibits from the paddy stations—Maruteru, Pattambi and Aduthurai were arranged. Fruit specimens and others received from the several specialists were most attractive and the public purchased outright large number of seedlings that were available for sale. These were grape vine cuttings, pine-apple suckers, packets of bean and tomato seeds, and drumstick cuttings, coconuts, coconut seedlings and grafted and budded seedlings of oranges, lime, lemon and mango varieties. In all 43 fruit plants and 102 packets of tomato and bean seeds were sold. Tomato plants grown in the locality were also exhibited. Methods of control of soil erosion were exhibited and crops were sown to show how to control erosion. Lime squash and lime juice cordial sent from Kodur were much appreciated by the public. M. A. B.

Palghat. An Agricultural Exhibition on a small scale was conducted at the time of the Kalpathi Car Festival at Kalpathi from the 13th to 15th November. Labour-saving implements, posters on agricultural improvements samples of seeds and manure which can be profitably used in the taluk, "grow more food" posters and several leaflets were exhibited. There were numerous visitors during all these three days especially in the evenings. On the whole the exhibition was a success. A. G. N.

Estate News and Notes.

The College. The College was closed for the Christmas vacation from the 18th December 1942 to 3rd January 1943.

Students' tour. The final year students went on a week-end trip to Pollachi in the last week of November and studied the weekly shandy and cultivation in the neighbouring villages. At Angalakurichi the party were entertained at Tea by Sri Kuttimuthu Gownder, a leading *ryot* of the village.

King's commission. Edward Balraj, a student of class II was granted an emergency commission in the Indian Army and was entertained at a farewell tea by his college-mates on the 6th December '42. We wish him good luck and safe return after the termination of the hostilities.

Students' Club. On the 2nd of the month Dr. T. S. Tirumurthy, Retired Principal, Stanley Medical College, delivered an interesting lecture on 'Nutrition and Victory' under the presidentship of Sri S. N. Chandrasekhara Ayyar, Lecturer in Botany. At a general body meeting of the club held on the 5th, a resolution was passed congratulating Rao Bahadur Sri C. Tadulingam Mudaliar, Retired Principal of the College, on his election as the Mayor of Madras.

Cyclone relief fund. The students collected a sum of Rs. 206 from among themselves and officers on the Estate, and remitted the same to the Mayor's fund for relief of sufferers in the Midnapore and Orissa cyclones.

Games. In connection with the Stone's Trophy Foot-ball tournament our College met the Government College on 30th November and were defeated by one goal. The final match of the Rhondy Shield in Cricket was played on 29th November against the Coimbatore Cricket Club in which also our team sustained defeat.

Fieldmen's Association. A general body meeting of the association was held on the 8th December when the following office-bearers were elected for the year 1943. President—Janab T. N. Kadderbacha Sahib; Secretary—Sri C. R. Venkatraman; Treasurer—Sri S. D. Anantanarayanan; Committee members—Messers S. Kalyanasubramaniam, V. Mahadevan, A. Kanniah Naidu and B. Rangiah Pillai.

Association of Economic Biologists. A meeting of the association was held on 28th November, when Sri K. M. Thomas, Government Mycologist, presented a paper on "Ergot cultivation in the Nilgiris, some experiences", which is published elsewhere in this issue.

Our graduates. We are glad to record that Sri P. S. Srinivasan, B. Sc. (Ag.) (1939) has been awarded the M. Sc. degree of the Madras University for his thesis on a subject in Agricultural Meteorology, and that Sri C. Sankara Rao, B. Sc. (Ag.) (1942) has been appointed as an officer on probation in the Indian Leaf Tobacco Development Company, Guntur.

Visitors. Sri P. H. Rama Reddi, Director of Agriculture, Madras and Mr. R. W. Littlewood, Livestock Development Officer, camped on the Estate, in the month. The latter, we understand, is proceeding on leave shortly preparatory to retirement.

Entomological Society of India—South Indian Branch.

Proceedings of the meeting held on 14—12—42 at Lawley Road with Sri M. C. Cherian as President.

Minutes of the meetings held on 8—11—41 and 7—10—42 were read and recorded. Sri S. Ramachandran read a paper on Fluctuation in Bee population. The following interesting exhibits were presented at the meeting.

1. *Tetrastichws ovulorum* Ferr. (Eulophidae). This is an egg parasite of *Epilachna* sp. on brinjal from Coimbatore recorded for the first time in the Madras Presidency. This is recorded from Mysore in 1933 on *Epilachna 28—punctata*.
2. *Polyodaspis compressicaps* Duda. (Chloropidae). A parasite on *Earias fabia* catterpillars infesting *Hibiscus vitifolius* pods from Coimbatore. Three to four maggots are found in each caterpillar.
3. *Anatrichus crionaccus* Lw. (Chloropidae). Predaceous on *Ripersia oryxas* on paddy from Aduthurai.
4. *Syrphus confrator* May. (Syrphidae). Predaceous on woolly aphis on apples from Coonoor.
5. *Bassus* n. sp. (Braconidae). Parasite on *Earias fabia* caterpillars infesting cotton from Coimbatore. A single adult emerges after the caterpillar has cocooned.
6. *Aplasaphes psychidivcrus* (Braconidae). A parasite of the casuarina bagworm. *Cryptothelia crameri* from Tindivanam.
7. *Bembex borrai* Hudl. (Sphecidae). This nests in sand and stores *Lucilia* flies as food for its young. Collected at Coimbatore.

8. *Liriomyza strigata* Meig. (Agromyzidae). The maggots mine into the cabbage and other cruciferous plants. Collected at Coimbatore.
9. *Argyroploce aprobola* Meyr. (Gracillaridae). The caterpillars defoliate roses. Collected at Coimbatore.
10. *Erythroneura maculifras* Motach. (Jassidae). They feed on *ragi* seedlings and make them wither. Collected from Gobichettipalayam.

(By Sri M. C. Cherian.)

1. *Helopeltis antonii*. A bad pest on guava in the Central Farm, Coimbatore. Adults and nymphs suck the fruits and at the places where they are pierced the fruits develop warts and in bad cases the fruits become hard before ripening, and crack. The insects attack also the tender shoots and leaves and make them fade and get brittle and break. The bug is said to introduce into the fruit a kind of fungus which is responsible for the damage which is sometimes 80—100% The bug is recorded to attack besides guava, pomegranate, orange and mango fruits, producing similar results. They also attack tender shoots of neem and cashewnut. There are variations in color, some having the whole body black while others have the thorax reddish orange on the dorsal side.
2. The pentatomid bug—*Canthecona furcellata*—was seen to attack grubs, pupae and adults of Epilachna on brinjals in the orchard area. They are also said to be predatory on various kinds of caterpillars.

(By Sri T. V. Subramaniam.)

1. A Carabid predator on *Sylepta derogata* catterpillars on cotton.
2. Two species of parasites reared from bitter-gourd gall-fly—*Luciopetera falcata* F.
3. Two species of parasites on gingelly gall-fly—*Asphondylia sesami* in Coimbatore.
4. *Microbracon hebator*—parasitic on *Adisura atkinsoni* and *Maruca testulalis* boring into lab pods. (By Sri P. N. Krishna Ayyar.)

Departmental Notifications.

Gazetted Service.

Transfers.

Sri K. Raghavacharya, J. L. A and Asst. Supdt. C. F. Coimbatore, to be D. A. O. Cuddalore.

Sri T. G. Muthuswami Ayyar, D. A. O. Cuddalore to be D. A. O. Tinnevelly.

Sri K. K. Raghavan, D. A. O Tinnevelly to be D. A. O. Calicut.

Sri M. Anandan, Dy. D. A. Chittoor, to be D. A. O. Tanjore.

Sri R. Chokkalingam Pillai, D. A. O. Tanjore to be D. A. O. Madura.

Saadat-ul-lah Khan Sahib Bahadur, on return from leave to be Dy. D. A. Central Division, Chittoor.

Sri S. Sitarama Patrudu, on return from leave to be D. A. O. Cocanada.

Leave.

Sri A. Gopalan Nayar, D. A. O. Calicut, l. a. p. for 3 months from the date of relief.

Sri K. Avudainayakam Pillai, D. A. O. (on leave) extension of leave on m. c. for 2 months on half average pay from 3-10-42.

Sri K. Raghavacharya, J. L. A. & Asst. Supdtt. C. F. Coimbatore, extension of leave on half average pay for 2 months from 4-11-42.

Sri R. Swami Rao, D. A. O. Cocanada, l. a. p. for 1 month from the date of relief.

Subordinate Service.

Transfers.

Name of officer	From	To
Sri P. Govinda Rao,	Asst. in Mycology Masulipatam,	Asst. in Mycology Guntur.
„ M. Sobanadri,	A. D. Madanapalli,	F. M. Guntur.
„ D. Srinivasa Rao,	F. M. Guntur,	A. D. Bapatla.
„ M. K. Gopalan,	A. D. Trivellore,	A. D. Madanapalli.
„ K. M. Krishna Menon,	Asst. in Chemistry, Coimbatore,	Chemical Asst. Malt Factory, Coimbatore.
„ U. Achutharamayya,	A. D. Srungavarapukota,	F. M. A. R. S. Samalkota.
„ Edwin Amirtharaj,	F. M. A. R. S. Nanjanad,	A. D Kodaikanal.
„ S. Mahadeva Ayyar,	A. D. Kodaikanal,	A. D. Palni.
„ N. Ganesamurthi,	A. D. Palni,	F. M. A. R. S. Nanjanad.

Leave.

Name of officer.	Period of Leave.
Sri K. Balaji Rao, A. D. Adoni,	Extension of l. a. p. on m. c. for 2 months from 11-11-42.
„ V. M. Ramunni Kidavu, A. D. Perintalmanna,	L. a. p. on m. c. for 2 months from date of relief.
„ P. R. Subramania Ayyar, F. M. A. R. S. Koilpatti,	L. a. p. for 1 month from 21-11-42.
„ P. V. Samu Ayyar, A. D. Musiri,	Extension of l. a. p. on m. c. for 1 month from 1-12-42.
„ M. Satyanarayana, F. M. A. R. S. Samalkot,	L. a p. for 1 month from 27-11-42.
„ V. V. Rajagopalan, F. M. Cotton Breeding Station, Coimbatore,	L. a. p for 52 days from 21-12-42.
„ K. Ambikacharan, A. D. Kanigiri,	Extension of l. a. p. on m. c. for 1 month from 7-12-42.
„ C. S. Namasivayam Pillai, A. D. (on leave),	Extension of l. a. p. for 1 month from 3-12-42.
„ S. Suryanarayanamurthi, Millet Asst. A. R. S. Guntur,	Earned leave with full pay for 32 days from 23-12-42.