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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXIV. 1 DECEMBER, 1930. PART 6.

Event and Comment.

The Current Issue.

ANOTHER instalment of his interesting review of the development of sugar-growing in Queensland is supplied by Mr. Easterby. Brown Spot of the passion fruit vine is the subject of a very useful and well illustrated paper by Mr. Simmonds. Field trials of citrus fruits in Southern and Central Queensland are described by Mr. Prest. Mr. Roberts has a brief note on the poultry mite infesting dwellings. Milk and cream testing are discussed by officers of the Dairy Branch for the benefit of the young farmer. Mr. Carew continues his notes on farmers' sheep and wool. Renewed interest in the possibilities of increasing Australian trade with Eastern Asia is stimulated by Colonel Evans's observations in the course of a recent visit to Manchuria, which are continued in the current number. Other features, including general working notes, make up a good December Journal.

Diseases in Stock.

OPPORTUNITY was taken in the measure now before the State House to include many amendments to the Diseases in Stock Act, which were not considered necessary previously. Power will now be given to restrict the movements of suspected stock, to prescribe the routes by which they may travel, to prohibit clean stock from travelling over a suspected route, to declare roads to be stock routes, and to declare any part of the State an infected area. Quarantine areas may also be declared, and provision is made for the destruction of infected stock, with due arrangements for compensation, under prescribed conditions. The Minister for Agriculture and Stock (Mr. Harry F. Walker), who introduced the measure, said, in moving its second reading, that the Government is negotiating with the Commonwealth Council for Scientific and Industrial Research with a view to treating many diseases in stock from an Australian point of view—that is, to eliminate overlapping in many experiments that are being carried out to-day. Queensland is singularly free from most

of the major stock diseases, and is one of the healthiest stock countries in the world. The Government realises the great importance of keeping it so, and every precaution is taken against the introduction of pests and diseases. In keeping our stock free from disease, it is generally admitted that we have done remarkably well, and the progress made in these matters over the last thirty years has been very sound. There is, of course, always room for improvement, and the present measure is in keeping with our general advance in veterinary science.

Yeerongpilly Stock Experiment Station.

DESCRIBING the work of the Yeerongpilly Stock Experiment Station, Mr. Walker, in the course of his speech in Parliament, gave the following summary of its operations for the twelve months ended 30th October last:—

The work included the immunisation of 221 stud animals against tick fever, with only two mortalities.

Twenty-four specially prepared "bleeders" were sold to stockowners, each of which, before sale, was subjected to the tuberculin test and immunised against blackleg.

Three thousand eight hundred and ninety-three doses of recovered tick fever blood were supplied for the inoculation of station and other cattle.

Approximately 1,000 specimens were submitted for bacteriological examination. These included milk, pathological blood, water, cream, pleuro virus, cheese, and butter.

One hundred and ninety-two pleuro cultures of lactic acid bacteria were supplied to cheese factories.

Contagious mammitis vaccine was prepared and distributed sufficiently for the treatment of 9,489 cows.

Three thousand and eighty-five doses of blackleg vaccine were sold and 418 tubes of glucose agar.

Eighty-seven thousand six hundred and sixty-eight doses of natural pleuro virus and 31,275 sterilised setons were supplied to stockowners.

In addition, many bacteriological examinations were made in connection with poultry diseases.

Investigational work included:—

Testing the effects of feeding healthy pigs with milk from a cow known to be affected with tubercular mammitis.

Testing the resistance of tubercle bacilli during the curing process (salting and smoking) of bacon.

Testing the practicability of vaccine treatments for affections of the udder caused by staphylococci and gas-producing bacteria.

Investigations as to the nature and cause of what is popularly spoken of as soft bacon.

Special attention was directed to the preparation of a standardised blackleg vaccine put up in pill form.

The bacteriological examination of samples of water to determine their suitability or otherwise for butter-washing and general factory purposes.

Banana Marketing.

THE Minister for Agriculture and Stock (Mr. H. F. Walker) informed the Press recently that in passing through Sydney to the Wheat Conference at Canberra he had taken the opportunity to make some inquiry as to the condition in which bananas from Queensland were arriving on the Southern market, particularly in respect of the quality of the fruit and the manner in which it was being packed and graded and grade-marked by the growers. The design of the rooms for maturing bananas and the facilities provided and methods adopted for the controlling of the temperatures in these rooms were also made a subject of inquiry by the Minister.

In respect of the quality of the fruit supplied to the market by Queensland, it was found that a large proportion of the fruit was well up to standard, and that some growers were consigning fruit of especially high merit. On the other hand, there was a percentage of growers marketing fruit below standard, which was reacting to the detriment of the industry. Far too many growers were grade-marking their fruit from one to two grade classifications higher than was warranted. This practice had recently been officially brought under his notice, and he intended to take suitable action in the matter, but before doing so he had decided to make inspection and inquiry personally. This he had now done, and had found that there is justification for the complaint. In the interests of the industry, it is essential that the grade mark applied to the package containing bananas shall indicate accurately the grade of fruit packed in each case. Growers defaulting in this direction will be called upon to amend their methods.

The confidence of buyers must be retained if it is desired to hold the Southern market. Queensland growers must more fully recognise this fact, and, in addition, appreciate that New South Wales is at present growing bananas on a scale equal to that of the period precedent to Bunchy Top infestation, and the estimate is that there will be a further 2,000 acres planted under bananas in New South Wales within the next twelve months. That State has banana grade regulations in operation, and Queensland growers should remember this and recognise that the same degree of leniency that has existed in the past will not be continued now that the local production has been increased. The authorities are exhibiting restiveness in the matter of incorrect grade-marking of the fruit grown locally, and it is anticipated that certain definite action will be taken in the matter in the near future, and it would be somewhat remarkable if the defaulting growers in Queensland should escape attention at their hands. He appealed to the growers here to put their house in order without delay.

It was pleasing to note the material improvement that had been effected in the ripening chambers utilised by the more progressive merchants. The improved facilities provided for the maturing bananas will be of great benefit to the industry. He felt confident that there will be an extension in the installation of modern machinery and equipment in the maturing chambers.

Queensland Flora.

THE Bill for the preservation of native flora, introduced by the Minister for Agriculture and Stock (Mr. Harry F. Walker) and which is now before Parliament, has been received with general acclaim. Every thoughtful citizen is heart and soul with the Minister in his determination to provide every possible safeguard for what was described by Professor Goddard of the Queensland University, in a recent public address, as our natural monuments. The flora of Australia, and especially that of Queensland, is unique and of great scientific value, and also, in some instances, of high commercial value. Assisted by her isolation from other land system of the globe, Australia has developed a distinct flora of her own, and through wholesale spoliation many of our valuable plant specimens are in danger of extinction. The flora of this continent concerns the world in general, and we may be regarded only as trustees of the floral wealth with which it abounds. Unfortunately, much of our natural beauty has already been destroyed, and this measure is designed to check a thoughtless or selfish tendency towards wanton spoliation and a spirit of wastefulness and destruction. Our native flora has a really national significance, and in our exploitation or wilful destruction of indigenous plants, æsthetically or commercially valuable, we have allowed our national pride and thoughts for the needs and pleasures of future generations to be overcome. There is always a danger in interfering unwisely with natural features, the value of which is too seldom realised or even thought of. We all know of numerous instances of individual vandalism—and even organised vandalism—through which posterity has been robbed of its undoubted right to enjoy the beautiful things of nature in a country which, from a scientific point of view, is unique in its vegetation and bird and animal life. In all these things we hold a trust, not only for our people, but for the world at large.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director of the Bureau of Sugar Experiment Stations.

PART XII.

(*c*) Mills and Milling Work—*continued.*

IN the last instalment of this series it was stated that there were fifteen vacuum pans in Queensland. An engraving of one of these early pans has been kindly supplied by Mr. W. G. Gibson, of Bingera Plantation, and is shown below:—

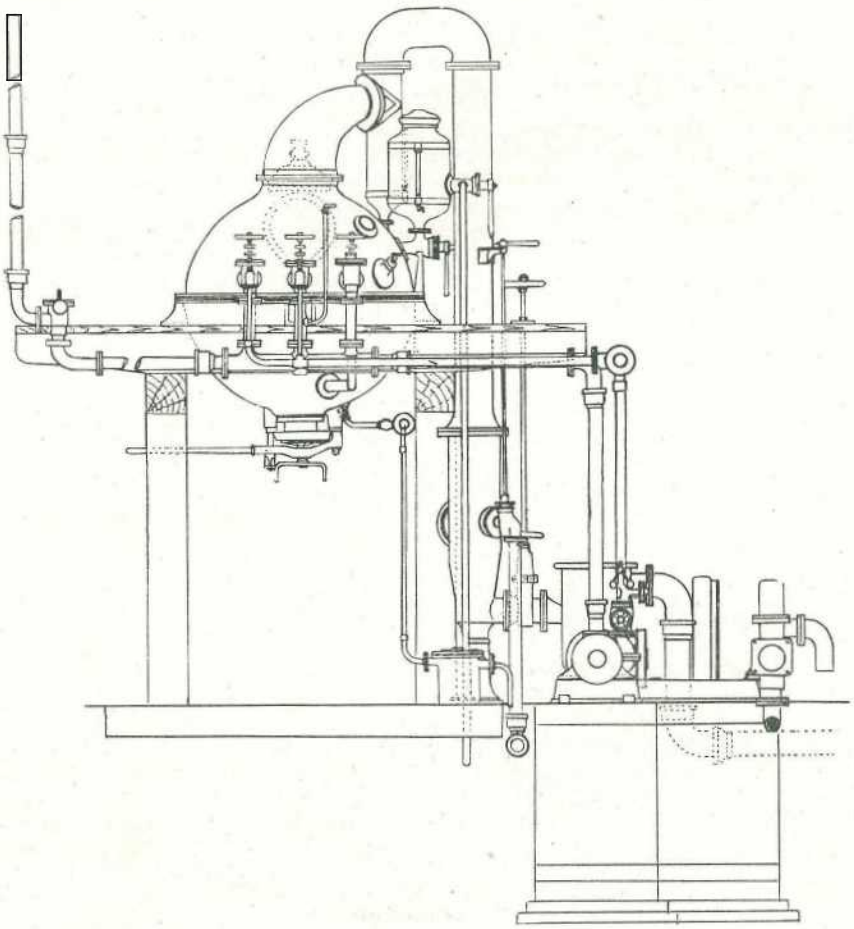

PLATE 173.—EARLY TYPE OF VACUUM PAN USED IN QUEENSLAND SUGAR MILLS.

This pan was made by Mirlees Tate and Watson, of Glasgow, for Messrs. W. Gibson and Sons' Clydesdale Mill, Hemmant, in 1878. It was entirely of copper except that the outside jacket was cast iron. The pan was 5 feet 6 inches in diameter by 5 feet deep, and had a capacity of 1½ ton of sugar. It was used till about 1886 and then transferred to the Rocky Point Mill. I understand it was scrapped about 1921.

In 1880 there were stated to be eighty-three sugar-mills in Queensland as under:—

Cardwell District	2
Mackay District	16
Maryborough and Bundaberg	23
Brisbane District	19
Logan District	23
	83

The production in Queensland that year was reported to be some 15,000 tons of sugar.

Historical facts in relation to the industry between 1880 and 1900 are difficult to secure. During the first decade there was no paper published entirely in the interests of sugar-growing. However, this period of twenty years was one of great development, and a large number of sugar-mills were established, principally in the Bundaberg and Mackay districts.

It was during the eighties that the first two Central Mills—i.e., Racecourse and North Eton—were erected, and it was, unfortunately, during this period that the bottom fell out of the sugar market, due to the rapid development of the European beet industry, and this rival to cane kept the price of sugar low for many years. The introduction of Central or farmers' mills into Queensland, however, was a big step forward and laid the foundation of the subsequent "White Australia" policy. The following extract taken from a booklet published in 1925 on the History of the Racecourse Mill at Mackay is of much interest:—

> "To the Racecourse Central Sugar Company Limited stands the undoubted distinction of having erected the first Central Mill to crush cane in Australia, and thus laying the foundation of the movement that finally wrested the industry from the hands of the black man. . . . prior to the formation of the company the industry was entirely in the hands of private enterprise, the capital being mainly supplied from England. Black labour in the form of Kanakas secured from the South Sea Islands was used in the fields, and (with the exception of a few technical occupations) in the mills."

When the question of farmers' mills was first mooted, there were thirty-one private mills in operation, sixteen on the north side and fifteen on the south side of the river, in the Mackay district.

The initiation of sugar-growing in the Lower Burdekin or Ayr district was said to be in 1879, though a mill was not erected till 1884 on Airdmillan Estate. Seaforth Estate and mill commenced operations in 1884; Kalamia, Drynie, and Pioneer also started crushing about this time.

The late John Drysdale, popularly known as the "Grand Old Man" of the Lower Burdekin district, arrived in Ayr in 1887, and he took a leading part in the development of sugar-milling and field work. He was a member of the firm of Drysdale Brothers. The mill they were so long associated with was the Pioneer, which was built by Spiller and Brandon, of Mackay, but before the mill commenced operations they sold out to Drysdale Brothers, and this mill also commenced crushing

in 1884. Before the arrival of Mr. John Drysdale the operations were carried out by Mr. George Drysdale. The irrigation system laid down by the latter was greatly improved on and extended by John Drysdale, who had been trained as an engineer. He was responsible for many of the improvements carried out in the Ayr district, which owes a heavy debt of gratitude to him. Later, he was responsible for the erection of the fine, up-to-date plant at Inkerman, on the south side of the Lower Burdekin River, and which has done so much to create a large settlement of contented sugar-farmers. His memory is perpetuated by a fine clock-tower in the main street of Ayr.

Owing to pressure of work this part is a very short one. In my next article I hope to be able to supply some further information of the earlier mills.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

CANE PESTS AND DISEASES.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following notes for publication from the Assistant Entomologist at Bundaberg, Mr. R. W. Mungomery:—

FUMIGATION FOR CANE GRUBS.

At the present time and for the next few months cane grubs will be actively engaged eating the roots of the cane stools, and when sufficient numbers are present, their attack usually results in the total failure of the cane in the areas they infest. Several species of root grubs are involved in this destruction, but they are all alike in their ultimate effects on the plant, and, indeed, their habits are very similar. "Frenchi" grubs, however, have a more definite period of inactivity during the winter than some of the other common grubs, and when they resume feeding after this dormant period, they feed very ravenously, causing great damage to the cane, which, by its wilting and yellowing, soon shows unmistakable signs of their presence.

All of these cane grubs can be destroyed by soil fumigation, and this practice offers one of the best ways of dealing effectively with comparatively small outbreaks. By cleaning up small patches in otherwise even blocks of cane, not only may the cane be saved, but a check is placed on the increase of the pest. Young plant cane, by reason of the fact that these fumigants produce a severe wilting effect on cane at such an early stage of its growth, cannot be so treated, and it is essential that the land should, first of all, be thoroughly freed from grubs prior to being planted with cane. Grubs in old ratoons are best dealt with by ploughing out and hand-picking, and as a further aid in this connection, the rotary cultivator will be found very serviceable. This implement, with its revolving knives, cuts up the stools into small pieces, so that many grubs are either killed by it or they are more easily exposed by the ploughs, which later follow on this system of cultivation.

For grub attack in older plant cane or first ratoon cane, soil fumigation offers a remedy, and in order that supplies of fumigants may be on hand the moment grub damage first becomes apparent, the Bundaberg District Canegrowers' Executive has purchased a supply of fumigants, which are to be made available to growers at cost price. By careful experimenting we have found that a mixture of carbon bisulphide and liquid dichlorbenzene in the proportion of two of the former to one of the latter, has given a high percentage of deaths when injected into the soil to kill cane grubs, and this mixture is being made available to growers at £2 per 5-gallon drum. Injectors will also be loaned out at a nominal charge. These injectors deliver measured doses of fumigant into the ground, the usual practice being to inject the dose at a depth of 4 inches. The resulting fumes, which quickly penetrate the soil, soon over-power all insect life that comes within its effective radius. Two injections —one on each side of the stool, are generally given to normal-sized stools, but for

large spreading stools three or four injections may be necessary. For further particulars, growers are requested to call at, or 'phone, the Sugar Experiment Station, Bundaberg, where full particulars of these fumigants and the method of applying them will be given.

SUGAR YIELD.

The Director of Sugar Experiment Stations states that the yield of sugar in Queensland from the present crop is anticipated to be about 508,000 tons of raw sugar of 94 net titre. This will, if realised, be about 10,000 tons below last season. The export of sugar, it is anticipated, will be higher this year owing to decreased consumption in Australia. The cane crop is also lower than last year, and this is due to the dry period late last year and early in the present year.

CANE CROP PROSPECTS.

The Director of Sugar Experiment Stations, Mr. H. T. Easterby, has returned to Brisbane after visiting the sugar districts between Mackay and Cairns. The present crushing is proceeding satisfactorily without any labour or shipping difficulties, and at many of the mills the sugar is being cleared as quickly as it is manufactured. The prospects for the coming season are exceptionally bright, due to the recent splendid rainfalls in the Northern canegrowing areas.

The young cane was looking vigorous and healthy in all the sugar districts from Mackay northwards, and splendid crops are in sight for next season. The rainfall at Innisfail up to the end of October reached 150 inches, while at Babinda the amount registered was 186 inches. Most of this, however, has fallen since the beginning of April. Due to the earlier dry weather in February and March the crops from Ingham to Cairns are not quite so good as was originally expected. On the other hand, the sugar yield at Mackay this year will be better than was anticipated in June, as the commercial cane sugar in the cane is remarkably high in this district, and also at Proserpine.

It is anticipated that, due to the amount of rain that has fallen in the more Northern cane areas, an earlier emergence of the grub pest will be in evidence.

The Bureau hope to furnish an estimate of the present sugar crop within the next few days.

Plate 174.—Surprise Creek, Winton. A Favourite Picnic Spot.

BROWN SPOT OF THE PASSION VINE.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

Introduction.

THE value of the passion fruit crop to Queensland is relatively small as compared with other classes of fruit. The crop nevertheless forms a very important adjunct to the establishment of young citrus orchards in some districts, and is commonly grown in connection with certain types of mixed farming. Although possibly justified from the commercial aspect, there are few instances where passion fruit are planted as a main crop. Moreover, an examination of the figures for the acreage under passion vines for the past few years discloses little increase in the area devoted to this fruit. This situation is to a large extent due to the reputation for uncertainty held by this crop, this uncertainty being due to the serious and sudden outbreaks of disease to which the passion fruit is liable.

As little definite knowledge was available concerning these epidemics, and still less concerning their satisfactory control, investigations were commenced in 1926 and have been continued at somewhat disjointed intervals since then.

It has been found that most of the loss may be attributed to one or more of four distinct diseases. These are: (1) Brown spot, a fungus disease caused by a species of *Macrosporium;* (2) powdery spot and fruit scab, with which is associated a *Cladosporium sp.;* (3) a crown rot, the definite cause of which is at present in doubt so far as Queensland is concerned, but which closely resembles a disease occurring in New South Wales, where it is attributed to the action of *Fusarium sp.;* (4) woodiness, a disease of the virus type. Of these diseases, by far the most serious in Queensland is brown spot. The disease, powdery leaf spot and scab, is mainly restricted in its occurrence to the cooler months, and attacks only the young growth and fruit. Crown rot may at times be responsible for considerable loss, but as this disease appears to be to a certain extent dependent on other contributory conditions, such as poor cultivation, the presence of brown spot, &c., for its serious development, it is not held to be of great primary importance. Woodiness, which is of major importance in New South Wales, is fortunately not to the same extent prevalent in Queensland. Possibly the temperature factor stressed by Noble[7] in a recent paper dealing with the disease is to some extent responsible for this freedom. Several other leaf and fruit troubles may at times appear, but in comparison with those previously mentioned they are of a minor nature and rarely cause loss of any economic significance. The disease, brown spot, will now be considered in more detail.

Symptoms.

Brown spot may attack all aerial portions of the vine, and the symptoms displayed are usually quite characteristic of the disease. On the leaves the first symptoms consist of a minute brown dot which enlarges to a more or less circular spot 2 to 3 mm. in diameter and often possessing in the early stages a suggestion of translucency. The spots may shortly show a differentiation into a lighter central area or may retain a uniform shade of dark chocolate brown (Plate 175). When suitable moisture conditions obtain, such as during periods of wet weather, a spot may further enlarge, and there appears a definite water-soaked margin to the old spot limits. The different stages of growth

Plate 175.
Brown spot on leaves of the passion vine (*P. edulis*).

later become evident in a faint concentric ridging, and in a variegation of the shades of brown—the darkest being towards the margin, while the central region is often not more than a light grey. Older spots may attain a diameter of 1 to 2 cm., and may be rounded or angular in shape.

The spores of the fungus causing the disease may often be seen forming a fine, dusky coating over older spots usually more abundant on the lower surface.

Fruit appear to be most commonly attacked from the time they are about half-grown until almost ready to colour. The lesion appears first as a minute dark-green water-soaked spot with an almost indistinguishable light-brown speck in the centre. The light-brown centre gradually enlarges to form a more or less circular area of uniform brown, sometimes retaining the water-soaked region as a narrow dark-green border. When over 2 mm. in diameter the spot usually becomes somewhat sunken, and after reaching about 2 cm. the marginal tissue becomes wrinkled and contracted (Plates 176, 178). Unless invaded by secondary organisms the spot remains firm and the fruit shrivel up without presenting a wet rot.

On the branches the lesion commonly takes the form of a dark-brown area extending 2 to 4 cm. or more up and down the runner. This affected area is, in the majority of cases, associated with the leaf axils and is usually at first confined to that side of the runner from which the tendril and leaf is given off (Plate 177). Eventually complete circling and consequent cincturing may take place. As the lesion ages it becomes greyish brown in colour and often bears a sooty mass of Macrosporium spores as well as pustules of various saprophytic fungi.

Effect of the Disease on the Vine.

The effect of brown spot on passion fruit culture is twofold. There is the indirect loss occasioned by the reduction of foliage and runner, and the direct loss, when the fruit are attacked.

A characteristic feature of the disease is the rapidity with which abscission of the leaves takes place when these are affected. The presence of the fungus in even a single lesion is sufficient to cause a leaf to fall shortly after the appearance of the spot—in many, if not the majority of cases before spore formation has commenced. The result of a severe outbreak is to leave the vines practically devoid of foliage and consisting merely of an interlaced network of bare runners (Plates 182, 183). Although the runners, unless themselves attacked, will often come away again, this defoliation will cause a set-back of several months duration. Young buds also fall readily if they become spotted, and much loss may be occasioned should the disease be prevalent during the flowering stage.

Probably the greatest damage is done when the runners themselves are attacked. The leaves and fruit on several feet of runner may suddenly wilt and wither. On tracing back the affected branch there will usually be found a brown spot lesion which has worked round and through the runner until the distal portion is completely cut off from the main vine. It is doubtful whether the older runners are ever infected directly, but there is evidence to suggest that the disease may work in from an infected young lateral and eventually cincture the larger branch. This cincturing is not necessarily a quick process, and its effect may show up in the spasmodic wilting of individual runners long after the actual infection took place. For this reason the origin of the wilting is often puzzling to some growers.

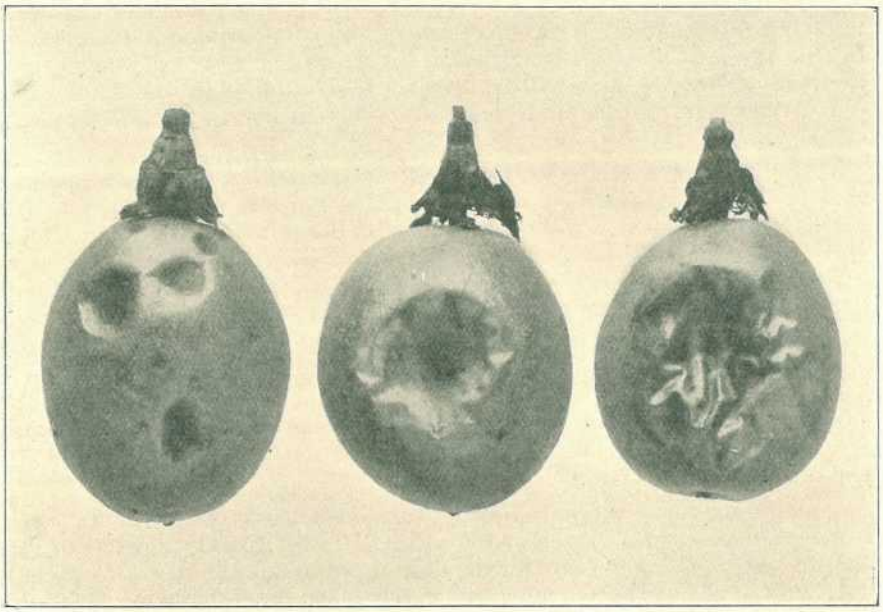

PLATE 176.
Brown spot on passion fruit.

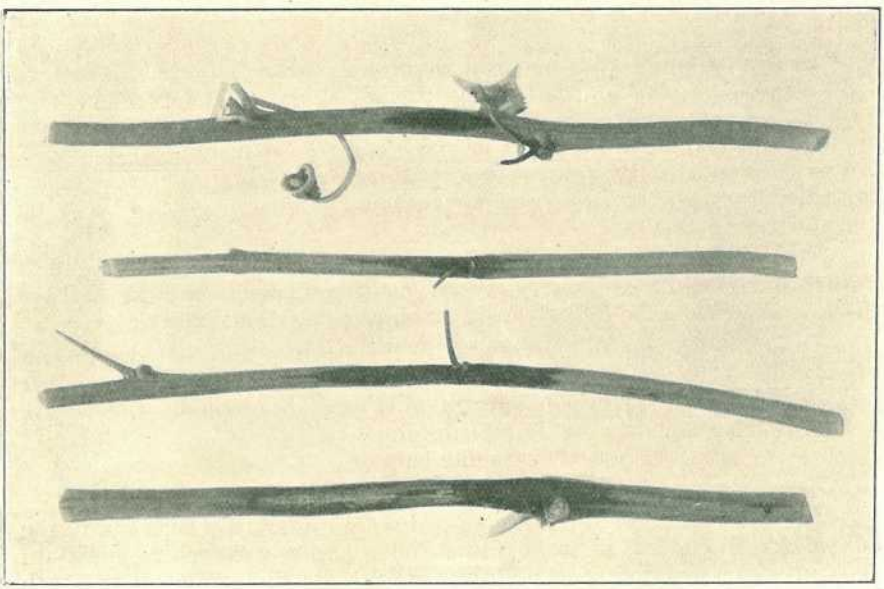

PLATE 177.

Brown spot lesions on the stem of the passion vine. The upper specimen shows infection commencing both at the leaf axil and apart. The lower illustrates complete cincturing.

The combined result of a severe attack of brown spot is to cut back the vine to the main stems. New shoots may be produced from these during the next season, but in the meantime valuable intermediate crops are lost. Often the vine will not recover and whole plantings have been destroyed by this means under conditions favourable to the development of the fungus.

An important factor augmenting the seriousness of brown spot is that the set-back given by a bad attack often appears to be able to upset the balance sufficiently to enable collar rot to gain the ascendancy and completely kill a vine. A healthy and vigorous vine is usually able to form new tissue in pace with the invasion of the rot so that little actual damage results.

Fruit bearing small spots may be marketable for pulping purposes as the pulp is usually unaffected in these cases. Fruit bearing larger lesions are of course valueless. The loss occasioned in this way may be considerable as may be judged by a count made on coloured and colouring fruit from two short rows. This showed that out of 317 fruit 228 or 72 per cent. were affected with brown spot.

Under ordinary plantation conditions the severity with which a vine is attacked by brown spot is usually found to be directly related to its age. Vines up to two years old usually do not suffer to a great extent, but from then on the older the vine the more severely is it attacked. After an epidemic it is often a simple matter to pick out the relative age of the rows from the state of the vines. This is not considered to be due to a loss of resistance but to the great increase in the mass of foliage and vine in the older plants. Pruned vines exhibit no increase in susceptibility with age.

Distribution.

Brown spot appears to be distributed throughout South-eastern Queensland, and as a consequence the more important passion fruit producing centres have the disease well in evidence. The most northern limit from which brown spot has been recorded is the district of Waterloo, 230 miles North of Brisbane. As will be seen later there is evidence that an allied form of the disease exists further north, the granadilla being the sufferer in this case.

The origin of brown spot in Queensland is obscure. The first authentic record of its occurrence was made by Tryon[2] in 1912, and the disease was evidently already well established at that time.

It is interesting to point out in this connection that while this disease has been found affecting under natural conditions three other introduced South American species of *Passiflora* none of the native species is attacked.

History of the Disease.

The first available reference to a disease apparently resembling the one under discussion is to be found in a paper written by Cobb[1] in 1903 in which are discussed certain passion vine diseases of New South Wales. Reference is here made to a fruit spot with which is associated a species of *Macrosporium*. As neither the descriptions of the disease nor the associated organism agree satisfactorily with the facts as they obtain in Queensland, it is not possible to decide definitely on any relationship between the two diseases.

Tryon[2] (1912) in a preliminary report on a disease of the passion vine in the Cleveland district, Queensland, describes symptoms identical with those of brown spot. He attributes the cause of the disease to the presence of a species of *Helminthosporium*. It is, however, probable that in his first naming of the casual organism Tryon was misled by the fact that it is characteristic of the *Macrosporium* found fruiting on brown spot lesions to produce spores with few or no longitudinal septa, as in the Annual Reports for 1917[3] and 1918[4] he refers to a leaf spot caused by a *Macrosporium sp.* allied to *M. cucumerinum*.

In Victoria, Farrol[5] (1923) refers to a disease which from the description and illustrations given closely resembles in its symptoms the brown spot of Queensland. He, however, gives as the casual agent *Glœosporium sp.*

In the leaflets of the Department of Agriculture, New South Wales[6] (1923, 1926), a similar disease is described and attributed to *Glœosporium fructigenum*. Noble[7] (1928) also mention brown spot, caused by the fungus *Glœosporium fructigenum* Berk as being responsible for serious loss in New South Wales.

Cause of Brown Spot in Queensland.

In Queensland all evidence obtained points to the fact that the disease so far as this State is concerned is due, as was first indicated by Tryon, to a species of *Macrosporium*.

Extensive isolations made by single spore and tissue plantings from typical lesions on leaves, fruit and stems, consistently yielded this organism. Typical lesions can readily be obtained on all the above-mentioned parts by inoculation of mycelium taken from pure cultures of the fungus. Ten different strains have yielded positive results in this way. From these lesions the *Macrosporium sp.* can be re-isolated.

Glœosporium pustules are not uncommonly found associated with brown spot lesions, though usually in a position suggesting their presence in a secondary capacity. Inoculations with strains of *Glœosporium* isolated from such associations have in no instance produced typical lesions—the usual result in these cases being little or no development differing from those of the controls.

A species of *Glœosporium* is, however, apparently responsible for a distinct disease. This consists of a leaf spot and a small white stem canker. The former takes the form of an opaque, whitish lesion of from ½ to 2 cm. diameter sharply delimited by the veins of the leaf to a definitely angular shape. A few black Glœosporium pustules may be present on the otherwise uniformly light surface.

Morphological and Cultural Characters of the Causal Organism.

Under suitable natural conditions spores of the *Macrosporium sp.* associated with brown spot are formed on the older leaf, fruit and stem lesions in abundance. In culture spore formation has only been obtained by the special method described by Rands[8] and then only in the case of certain strains. Some considerable difference in spore dimensions appears in measurements made from field material obtained in southern districts and in those obtained from a more northern situation near Bundaberg. Spores obtained in cultures from both places are, however, in close agreement although differing again from those naturally produced. The difference is mainly due to the size of the beak which is greatly reduced in the northern form as compared with the southern and is specially well developed in culture. The dimensions will be found in Table 1.

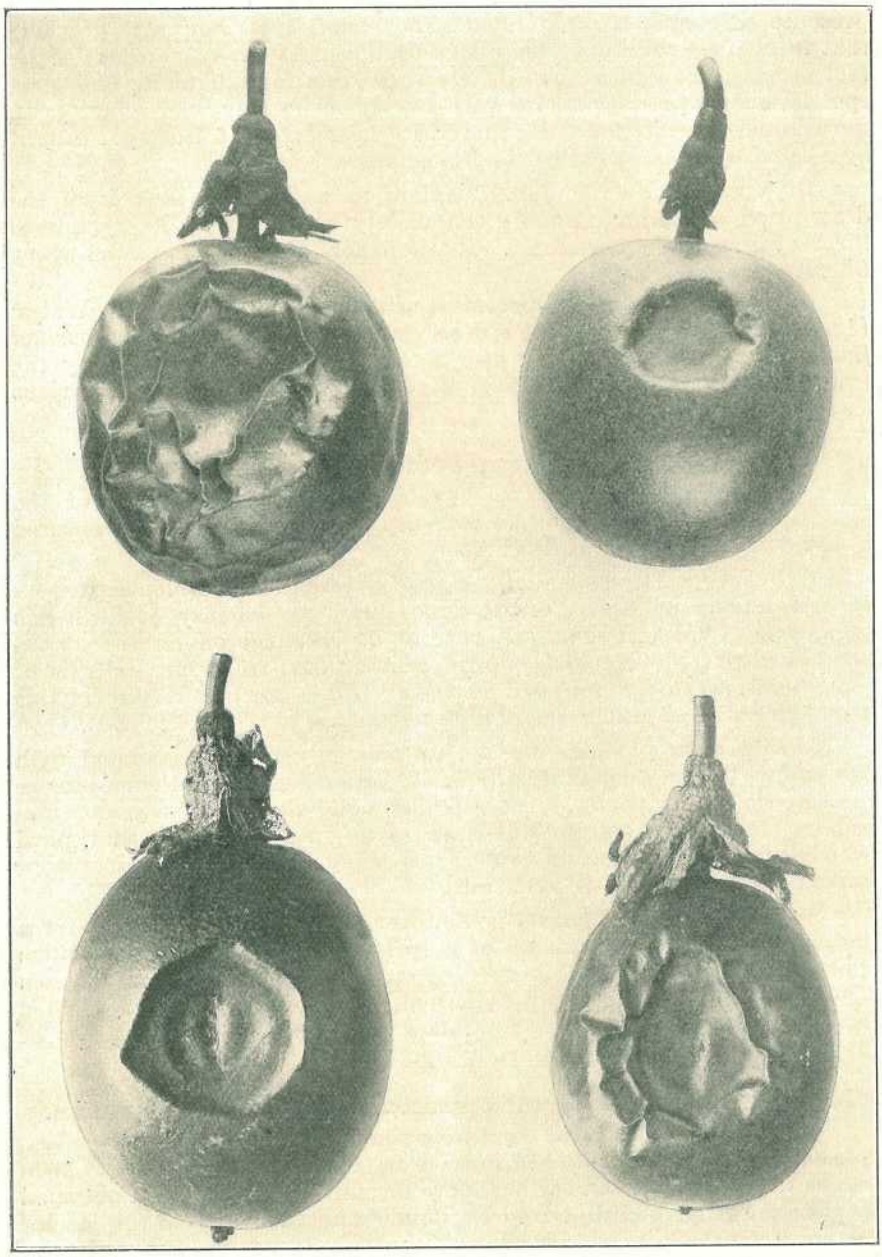

PLATE 178.

Upper: Passion fruit naturally infected with brown spot. Lower: Fruit artificially inoculated with a culture of the *Macrosporium sp.*, from *P. edulis*.

The spores of the passion *Macrosporium sp.* resemble in general appearance those of *M. solani* E. and M. as described by Rosenbaum[9] and as a characteristic have their septation largely restricted to transverse divisions of which there may be 5 to 13 with an average of 8·7. Longitudinal and oblique septa are in many entirely absent, the average being 2·5. Definite muriform septation is rare. The beak is rarely forked in the naturally formed spore, but in culture as many as five branches may be formed with two and three appearing most commonly. The length of the beak is also increased on culture material.

TABLE I.

SPORE MEASUREMENTS OF THE *Macrosporium* CAUSING BROWN SPOT OF *Passiflora spp.*

ORIGIN.	Number Measured.	LENGTH OF BODY.		LENGTH OF BODY PLUS BEAK.		WIDTH.		NUMBER OF TRANSVERSE SEPTA.		NUMBER OF LONGITUDINAL SEPTA.	
		Extremes.	Means.	Extremes.	Means.	Extremes.	Means.	Extremes.	Means.	Extremes.	Means.
P. edulis (natural)	80	64–116	87	108–240	168	15–26	20	5–13	8·4	*	2·5
P. edulis (culture)	40	66–108	85	186–305	253	18–24	20	6–12	9·1	0–8	2·6
P. edulis (northern form, natural)	20	54–102	70	87–150	106	16–27	21	5–10	7·6	0–4	2·6
P. edulis (northern form, culture)	20	69–105	86	191–305	249	18–23	21	8–12	9·6	0–7	2·7
P. alba (natural)	50	60–114	80	96–212	151	14–26	18	5–12	8·3	0–10	1·8
P. quadrangularis (natural) ..	60	44–135	88	92–232	179	14–24	19	6–12	8·7	0–7	1·8
P. foetida (northern form, natural)	35	30–75	46	54–117	71	12–21	16	3–11	6·8	*	3·4

* 0–muriform.

A typical fourteen-day-old culture on potato dextrose agar slope takes the form of a fairly close-growing, light-grey, cottony growth with not usually more than 5 to 6 mm. marginal extension round the glass. Later the surface becomes compacted and smooth. Substratal growth is black. The colour of the media may remain unaltered, or it may change to various shades of brown or occasionally to a deep reddish brown, depending on the strain under observation. Accompanying the darker discolouration of the media there is often an orange or reddish-brown zonation of the mycelium, especially in old cultures.

No perfect stage has been found associated with the *Macrosporium sp.* of brown spot. Such a stage is not deemed necessary for the life history of the organism, as sufficient lesions are present throughout the year to ensure a continuity of spore material. The spores themselves may remain visible for considerable periods, as may be judged from the following figures for longevity taken from material kept in the laboratory:—

TABLE II.—LONGEVITY OF SPORES.

Age of Spores.	Per Cent. Germination.
19 months	13
16 „	30
2 „	72
A few days	100

Temperature Relationships.

On potato dextrose agar the *Macrosporium sp.* has been found to grow readily at temperatures between 20 deg. and 29 deg. Cent. On the lower side growth falls away gradually until it becomes very scanty at temperatures approaching freezing point. Above 30 deg. Cent. growth diminishes rapidly and ceases entirely round 35 deg. Cent. The optimum temperature ranges from 23·5 deg. Cent. to 28·0 deg. Cent. according to the particular strain under observation. So far as can be judged from the limited number of series available, there is no appreciable difference between strains derived from either *P. edulis, P. alba,* or *P. quadrangularis,* three known hosts of the species of *Macrosporium* in question. These relationshipships are illustrated graphically in fig. 1.

Spore germination follows the same general scheme of temperature reaction as does mycelium development.

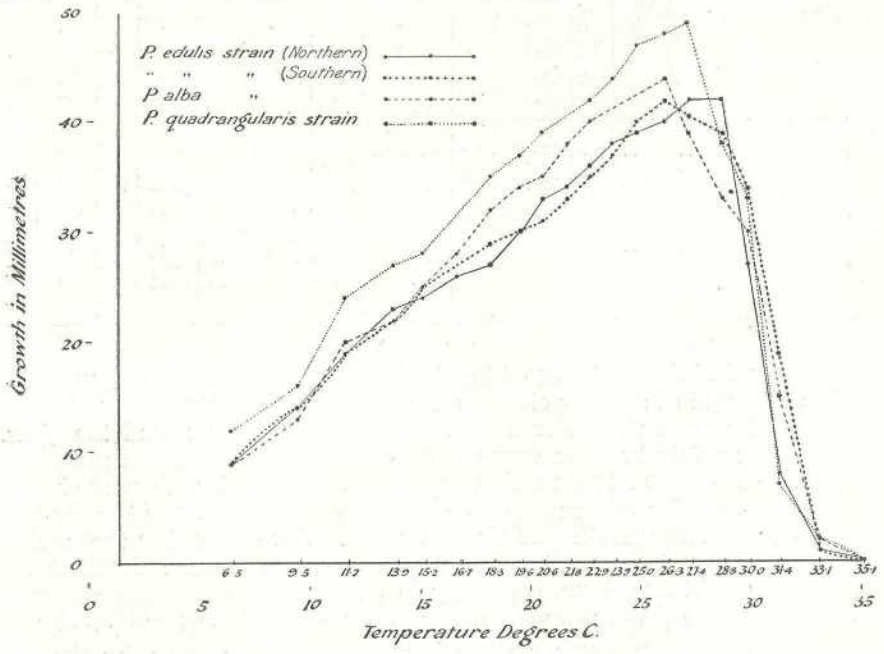

PLATE 179.

Fig. 1.—GROWTH-TEMPERATURE CURVES FOR FOUR STRAINS OF THE *Macrosporium sp.* ASSOCIATED WITH BROWN SPOT. Six days growth on potato dextrose agar at twenty temperatures ranging from 6.5 deg. Cent. to 35.1 deg. Cent.

Seasonal Conditions contributing to Brown Spot Development.

Owing to the fact that seasonal observations of this passion vine disease were necessarily of a somewhat disjointed nature, it is not possible to indicate relationships between weather conditions and brown spot other than in a general manner.

It is possible to find odd leaves affected with brown spot at all times throughout the year. However, the disease is not usually present to any marked extent, except during the period from August to March inclusive.

Plate 180.
Brown spot on the leaf, stem, and fruit of the white passion flower (*P. alba*).

During the other four months rainfall is normally low and the temperature as a rule averages less than 15 deg. Cent., with the result that brown spot is usually of secondary importance to powdery leaf spot and scab. Serious epidemics usually follow a period of several days wet and muggy weather. These conditions are apparently also necessary for abundant spore formation.

The usual course of events is for the disease to gradually increase in prevalence during the spring and early summer months to culminate in a more or less serious defoliation about December and January, the seriousness of the attack being largely determined by the extent and nature of the rainfall during the latter months of the year. Thus, for example, brown spot was not nearly so serious following light spring rains in 1926 and 1928 as in the 1927-1928 summer, when rain towards the latter end of 1927 was abundant. Smaller outbreaks may occur during later summer months but these are not as a rule of such serious consequence.

Varietal Susceptibility.

The common purple passion fruit is highly susceptible to brown spot as may be judged from the remarks already made in this article. The only other variety which is grown to any extent on a commercial scale is the "mammoth" characterised by somewhat larger leaves and fruit. When judged against the plantings of the common vine growing in the same locality this variety appears to be equally susceptible to the disease. Other varieties such as the "yellow" passion fruit and species of *Taxonia* are not grown in sufficient quantities for their relative resistance to be ascertained. The fact that the fungus readily attacks three other species of *Passiflora* would suggest that the chance of obtaining a resistant variety of *P. edulis* is not favourable.

Other Hosts.

(1) The White Passion Flower.

There are to be found in Queensland several species of the genus *Passiflora*. Of these the commonest and closest ally of the common edible passion fruit (*P. edulis* Sims.) is the white passion flower (*P. alba* Link and Otto), a Brazilian plant which is commonly to be found in the naturalised state throughout coastal Queensland. This plant is usually to be found on the edges of scrub clearings and is particularly abundant at Tamborine Mountain.

The white passion flower is commonly found affected with a fungus disease whose general appearance suggests a similarity to the brown spot under discussion. Lesions are produced on leaf, stem, and fruit, identical with those found on the edible passion, with the exception that on *P. alba*, owing no doubt to some difference in chemical composition, the spots are of a deep purple rather than brown colour. The natural effects, such as leaf fall and stem cincturing, are found as in the case of the cultivated species. Isolations from leaves, fruit, and stem lesions by tissue planting and single spore methods yielded a fungus culturally identical with that obtained from the cultivated vine. Inoculation of six of the *P. alba* strains of *Macrosporium* into *P. edulis* fruit and stem gave positive results in each case. Equally as good development was obtained as when *P. edulis* itself was the origin of the inoculum. The reciprocal inoculation has not been attempted.

The spore characteristics and measurements of the *Macrosporium* obtained from lesions on both species of *Passiflora* are in close agreement (Table 1). The temperature reactions of the two strains are also similar (Fig. 1).

It would therefore appear that the disease on the two hosts is identical. Little difference can be noted in the extent of infection in the two plants. It has not been found possible to theorise as to which *Passiflora* species was the original host for the fungus.

Theoretically passion fruit growers should be advised to destroy all plants of the white passion flower growing in the vicinity of their plantations. The condition of the cultivated passion vines themselves on most farms would suggest that such a high percentage of infection must arise from these alone, that the part played by the wild vines is insignificant. Any grower, however, who intends to systematically treat his vines for brown spot should also keep the white passion flower in check as far as possible.

(2) The Granadilla.

The granadilla (*P. quadrangularis* Linn.) is also affected with a fungus disease producing a brown leaf spot and a spot on the fruit. The lesion on the leaf closely resembles the brown spot of the passion vine. On the fruit, which possesses a thick soft rind, there may be produced eventually large pyramidal excavations 2 to 3 cm. in diameter and somewhat less in depth. (Plate 181.)

By using tissue planting and single spore methods there has been obtained from lesions on leaves and fruit of Brisbane-grown granadillas a *Macrosporium* which differed very little, if at all essentially, as regards cultural characters from those strains of *Macrosporium sp.* isolated from *P. edulis* and *P. alba*. The spore characteristics and measurements agree fairly well with those from the latter hosts. (Table 1.) Typical lesions were produced by inoculation of this granadilla strain into passion fruit. Inoculations of the *P. edulis* and *P. quadrangularis* organisms into granadilla fruit were also successful. (Plate 181.)

The granadilla being a more tropical plant than the passion vine, is found more extensively grown in the Northern districts of Queensland. It is there subject to a brown leaf and fruit spot closely resembling in general characters the disease just described from the Brisbane district. However, although a *Macrosporium* was associated with the Northern form of the disease, this organism showed considerable difference culturally and as regards spore measurements from the *Macrosporium* strains described above. Nevertheless, when inoculated into passion fruit, cultures of one of these Northern species produced definite and fairly typical brown spot lesions. Further work is necessary in connection with brown spot as it occurs on the granadilla, but it is considered likely that while the organism obtained from *P. edulis, P. alba,* and the Brisbane grown *P. quadrangularis* evidently represent closely allied strains of the one species, the Northern form is possibly distinct.

(3) Passiflora foetida.

More recently there has been noted at Waterloo, a district some 250 miles north of Brisbane, a leaf spot and stem cincturing of the more tropic-loving Passiflora, *P. foetida* Linn. The lesions on this plant were practically identical with those occurring on *P. edulis* and *P. alba,* plants of both of these latter species in the same locality being heavily infested with brown spot.

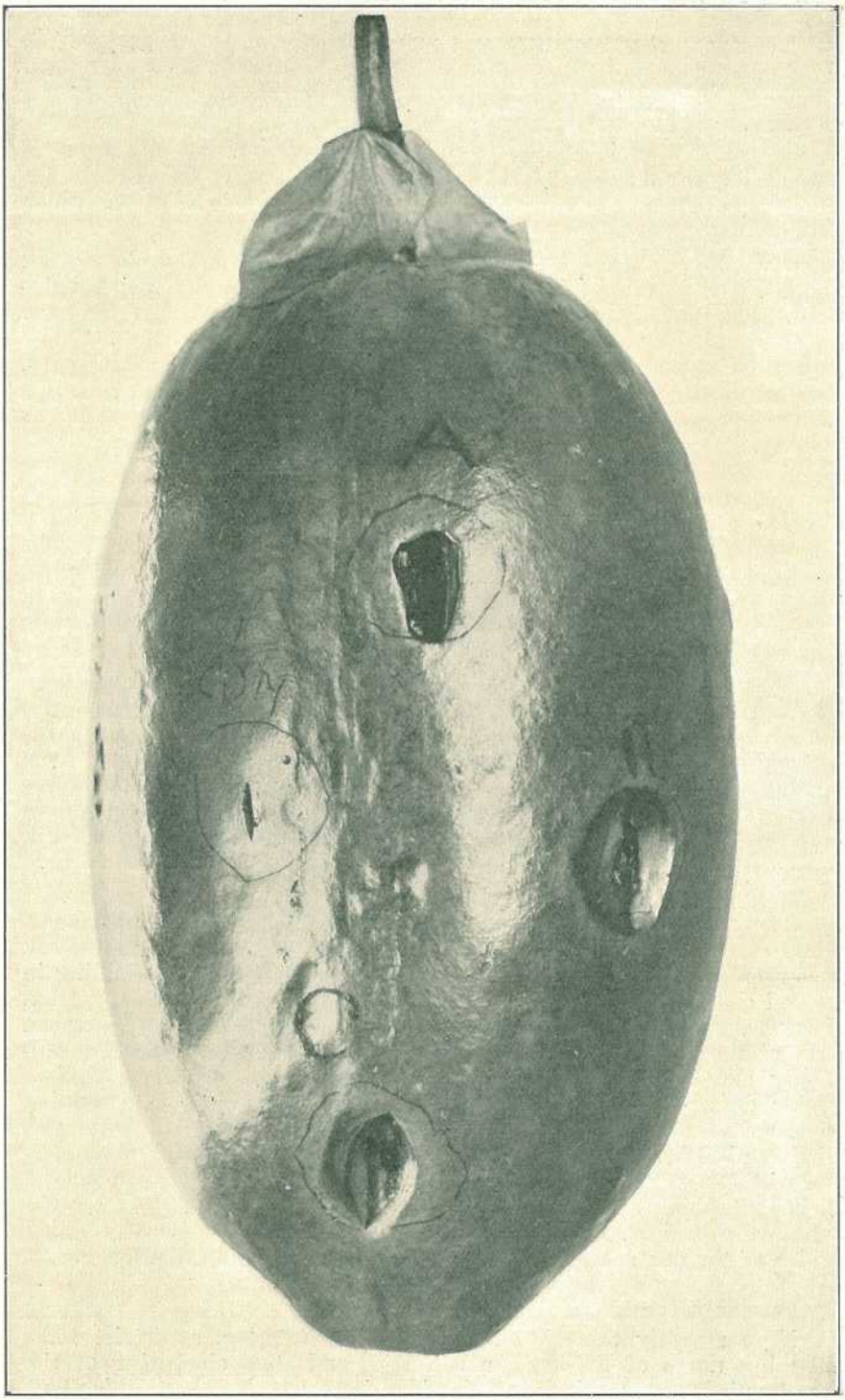

PLATE 181.

Granadilla inoculated with single spore cultures of the *Macrosporium sp.* from brown spot. Upper: *P. quadrangularis* strain. Right mid and lower: *P. edulis* strain. Left mid: Uninoculated control.

Cultural characters and spore measurements of the *Macrosporium* associated with *P. foetida* lesions present certain differences from those of the organism from the cultivated vine although inoculations proved the *P. foetida* organism capable of producing typical lesions on *P. edulis*. However, it may be pointed out that the spore measurements of the Northern form of the *P. edulis Macrosporium* also present considerable differences from the Southern.

Other species of *Passiflora* growing in Queensland—*P. suberosa* Linn., *P. Herbertiana* Lindl., and *P. aurantia* Forst., the two latter being native species—have not so far been found affected with a disease akin to brown spot. It is interesting to note that *P. Herbertiana* is a probable host for the species of *Cladosporium* associated with the powdery spot and fruit scab of the passion vine, while *P. alba* at times harbours a closely allied strain of this fungus.

Control Experiments.

Experiments designed to effect a control of brown spot and other foliage diseases of the passion vine were commenced towards the latter end of 1926. Suitable vines and facilities for preparing the sprays were kindly placed at the disposal of the Department by Messrs. H. Bishopp and J. Dunlop, of North Tamborine, to whose generous help we are greatly indebted.

PLOT A.—Early in October, 1926, applications of Bordeaux (6:4:40), lime sulphur (1 in 30), Burgundy mixture (6:8:40), and culcal (a copper sulphate-lime dust) were made each to one of four pruned rows of vines.

PLOT B.—The same treatment was applied to each of four unpruned rows.

These eight rows were at the time two and a-half years' old, were 1¼ chains long, and contained six vines. These applications were repeated in November and again in December. Suitable adjacent rows were left as controls.

Little disease developed during the season, and the effectiveness or otherwise of the applications could not be determined. It was subsequently found that the majority of the vines pruned and sprayed with Bordeaux and Burgundy and a few of those treated with lime sulphur were sufficiently improved to enable them to live, whereas the dusted and control rows died out completely twelve months later.

It was shown that no practical result can be expected from spraying an old unpruned vine, as the mass of foliage accumulated effectively prevents efficient covering by the spray. It was also found that the ideal conditions necessary for obtaining satisfactory covering and adherence of a dust on a leaf as shiny as that of the passion vine practically precludes any but the wet method of treatment. Dusting was therefore not attempted in subsequent trials.

1927-28 Season:

The experiments were taken up again towards the end of October, 1927.

PLOT A.—The four rows pruned and treated in 1926 were again pruned, and alternate rows sprayed with Bordeaux 6:4:40 and lime sulphur 1 in 30. That row receiving Burgundy the previous year received Bordeaux on this occasion, and the dusted row received lime sulphur.

PLOT B.—The four rows treated but not pruned in 1926 were cut well back, heavily fertilised, and sprayed as for the first four rows. This treatment proved too severe owing to the poor condition the vines were in at the time, and they subsequently died back to the crown.

PLOT C.—In addition to the above, five rows of younger vines twelve months planted out and each containing eight vines were treated as follows:—

No. 1.—Pruned; fertilised 3 lb. per vine of a mixture containing 4·5 per cent. ammonia, 8·9 per cent. phosphoric acid, and 15·8 per cent. potash; sprayed Bordeaux (6:4:40).

No. 2.—Received the same treatment as row 1 except that lime sulhpur (1 in 30) was substituted for Bordeaux.

No. 3.—Pruned and fertilised only.

No. 4.—Control—untreated.

No. 5.—Pruned only.

No difference was noted with respect to either yield or disease occurrence between the manured and the unmanured vines which were growing in a red basaltic loam, and the manuring was not therefore repeated.

The pruning and first spray application were made on the 26th October, 1927. Six further applications of spray were made during the 1927-1928 season.

Results: PLOT A.—A few months after the time of the first spray application the controls for this plot had died out completely as a result of brown spot and crown rot.

Of the treated rows (pruned and sprayed, and pruned also in 1926) those receiving Bordeaux made good growth which was maintained by similar treatment in subsequent years, until other operations necessitated their removal at the end of 1929. At this time when nearly six years old, these two rows were considered among the most productive on the plantation.

PLOT B.—The treated rows (heavily pruned and sprayed but not pruned the previous year) did not recover from the severe treatment they had received from the disease and the pruning and were of no further use in the experiment.

PLOT C.—Of the five rows of younger vines it was noticed throughout the year that the Bordeaux treated row, and, to a slightly less extent, the one receiving lime sulphur, were comparatively free from brown spot and grey powdery spot. The disease was slightly less effectively controlled on the rows pruned only. The controls at certain periods exhibited considerable brown spot with consequent leaf fall. Serious epidemics were, however, absent during this year of the experiment.

1928-29 Season.

PLOTS A AND C.—Towards the end of September, 1928, the annual pruning took place, followed by the usual spray applications. The various rows received the same treatment as in the previous year. The spraying was repeated six times during the ensuing twelve months at from one to two months intervals. Taken over the whole of this time the results indicated that Bordeaux spray on pruned vines will effectively

PLATE 182.

Three-year old untreated vine from control row of Plot C. Photographed, 12th December, 1929. A mass of defoliated and dead runners, and very few fruit present. *Cf.* Plate 184.

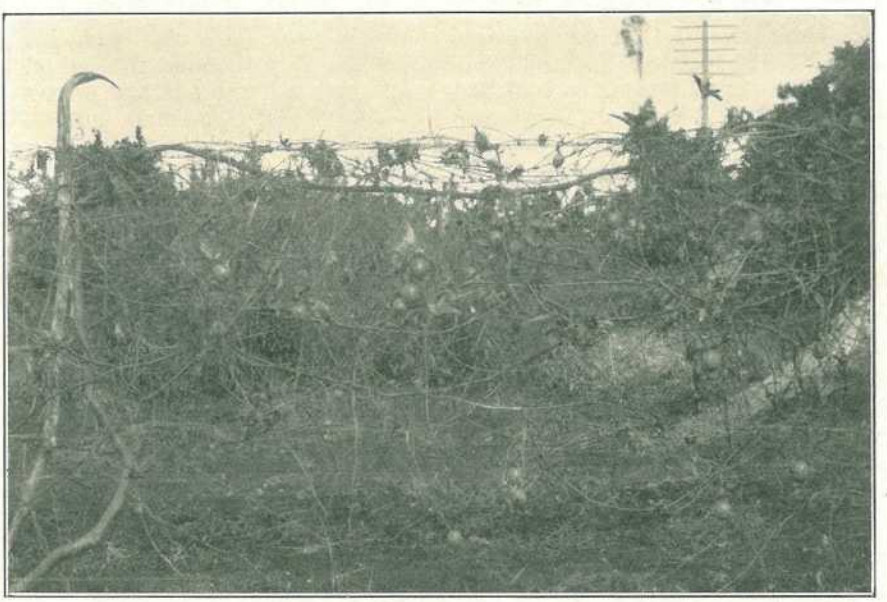

PLATE 183.

Four-year old untreated passion vine. Photographed, 12th December, 1929. Almost complete defoliation and die-back, resulting from brown spot.

control brown spot in all its various manifestations. Lime sulphur is slightly less effective. Pruning alone, while somewhat less successful again, yet gives very fair control and does not allow of the extreme defoliation and runner cincturing met with in the check rows. A count made on one occasion of ripe or colouring summer crop fruit from treated and control rows will illustrate this.

	Sound.	Affected brown spot.
Pruned and sprayed witn Bordeaux	44	2
Pruned and sprayed with lime sulphur ..	29	5
Pruned only (average two rows)	40	21
Control (average two rows)	44	114

It will be noted that the wastage due to pruning was in this instance almost made up by the increased proportion of healthy fruit borne by the pruned vines. It might appear from these figures that in spite of the disease the untreated control row would be the most commercially successful. However, reference to the yield from subsequent crops usually shows otherwise. Moreover, in a year of severe brown spot incidence, the chance of obtaining any intermediate or even winter crop off any but young vines when untreated is very small.

1929-30 Season.

PLOT A.—The four rows of old vines in this plot representing the original vines experimented with were left unpruned, as it was intended to remove them after the summer crop as the land was needed for other purposes. Spray applications were made in October and December. Ammoniacal copper carbonate replaced Bordeaux in the spraying schedule, as it was desirable to find an effective spray that would not stain the fruit.

Results:—In October the vines, now six years old, were carrying a very heavy summer crop and represented probably the most productive vines in the plantation. It will be remembered that the controls of this series died out two years previously and checks had to be made against other younger, untreated vines in the plantation. However, although sprayed they soon began to show the effects of not having had the usual pruning, and by the end of January were fairly heavily affected with brown spot.

PLOT C.—On 10th October, 1929, the vines of this plot received their annual pruning and spraying as in previous years with the exception that ammoniacal copper carbonate replaced the Bordeaux in row 1. A second spray was given in December, but opportunities were available for making only two further applications during the next six months.

Results:—The pruned and sprayed and the pruned only rows made the usual rapid growth and presented a marked contrast to the check rows throughout the ensuing twelve months, although towards the end of winter the absence of the usual number of spray applications made itself felt to a certain extent.

Plates 185 and 182 give some indication of the condition of the treated and untreated vines of this plot. Plate 184, representative of similar vines treated by Mr. Bishopp, is also interesting in this connection.

A careful record kept by Mr. Bishopp of the marketable fruit obtained from the experimental rows of Plot C for the winter crop

during July and August, 1930, is definitely in favour of the treatment. The counts were made from eight vines in each case.

(1) Pruned plus ammoniacal copper carbonate (Bordeaux previous years)	1,682
(2) Pruned plus lime sulphur	1,409
(4) Check untreated	112
(5) Pruned no spray	655

Conclusions from Field Experiments.

(1) Brown spot can be effectively controlled by systematic pruning and spraying.

(2) Spraying unpruned vines is ineffective.

(3) Dusting is likely to be of little use in connection with a plant such as the passion vine and under the conditions obtaining where this crop is grown.

(4) Bordeaux mixture was the most efficient of the fungicides used. This spray also appears to have somewhat of a stimulating effect on foliage and fruit production. Care must be taken not to apply Bordeaux during showery weather or severe burning of exposed runners is likely to occur.

(5) Burgundy and ammoniacal copper carbonate are also effective, but have not had a very extensive trial. The latter is probably about on a par with lime sulphur. A spreader can be used with advantage in the copper sprays.

(6) Lime sulphur when used with a casein spreader exhibits a better covering capacity than Bordeaux, but is somewhat less effective in its control of the disease.

(7) Pruning alone has been shown to give very fair control of all ordinary outbreaks of brown spot; in fact, pruning is considered to be the major factor in the control of this disease. So necessary is it considered to be that a special discussion of the merits and demerits of the procedure are given below. Fruit production from vines which have been pruned only does not appear to equal that from vines which have received spray as well.

Pruning.

The effect which pruning has on the control of brown spot can be explained as follows:

(1) Pruning stimulates the vine to healthy, vigorous growth.

(2) The thinning-out process allows a free access of light and air to all parts and prevents the formation of a moisture-holding mass of accumulated runner and foliage. It also enables a spray if such is being applied to reach all parts of the vine.

(3) Old stem cinctures can be removed, and as these are a prolific source of spores the spread of the disease is checked thereby.

(4) Probably the most important influence is due to the fact that infection of a leaf with brown spot usually leads to early abscission.

In the unpruned vines these leaves tend to be caught in the tangled mass of foliage and runner, and it is an easy matter for spores associated with the spots to be washed on to further healthy portions. In a pruned vine, however, it is usual for infected leaves to fall to the ground carrying any spores which may be present to a certain extent out of harms way. In many cases spore formation has not taken place before the leaf falls.

PLATE 184.

Three-year old vine similar to those of Plot C, pruned third week in August, 1930. Sprayed three times (Bordeaux). Photographed, 12th December, 1929. Good summer crop hanging. *Cf.* Plate 182.

PLATE 185.

Three-year old passion vine, from Plot C, pruned and sprayed with ammoniacal copper carbonate on 10th October, 1929. Photographed, 12th December, 1929 Healthy runners in preparation for intermediate crops. Summer crop light on account of late pruning.

It has further been shown that spore formation may take place on brown spot lesions after the leaf has become detached from the stem and even after the leaf has commenced to dry up, thus disclosing an additional source of danger in leaves held in the vine. It is common to find more or less concentrated patches of dead and dying leaves suggesting an origin from a single source such as a spore-bearing leaf remaining in the vine.

It is often observed by growers that passion vines growing wild on the borders of the scrub are affected little by the disease. This can be explained partly by the isolation from sources of infection and also by the fact that a vine growing under these conditions rarely makes a dense growth.

A further advantage to be derived from pruning is found in the stimulus given to fruit production and in the better quality of fruit obtained. It is possible to very considerably increase the quantity obtained from intermediate and winter crops when prices are at their best. Mr. Bishopp estimated that for the intermediate crop harvested in April and May, 1929, the Bordeaux sprayed and pruned rows yielded double the average of his untreated vines. Moreover, the fruit graded out at three firsts to one second, a considerable improvement on the quality of the rest of the plantation. The effect of pruning on the winter crop is shown in the figures given on page 581.

The main arguments against pruning are the time and labour involved, and the fact that it is usually necessary to sacrifice a portion of at least one crop during the pruning process. As regards the sacrificing of a portion of the summer crop, it is usually found that the added return from the off season fruit more than compensates for the previous loss.

It is interesting to note that, according to the records of the Government Statistician, the average annual return per acre over the last ten years for passion fruit was £93, while that per acre of grape vines was £58. Even allowing for some discrepancies in these figures, it still appears possible for the passion grower to devote with advantage more time to pruning and spraying, such time being spent as a matter of course in grape cultivation. In fact it is doubtful whether passion fruit growing will ever be placed on a satisfactory basis until the present haphazard methods give place to ones more comparable to those devoted to the culture of other fruits.

Time of Pruning.

As is pointed out in another section, brown spot usually reaches serious proportions only during the months from September to February, inclusive. Hence to be effective, pruning should take place early in this period. It has been found that by pruning when the summer crop has just commenced to set (usually some time in August in early localties or in September or October in cooler areas) a proportion of the summer crop is sacrificed, but a considerably better yield of intermediate and winter fruits is obtained. By pruning in August before the summer crop has commenced to form, a full summer crop is obtained, but it may be necessary in some districts to lose the latter end of the previous winter crop. When the latter method is adopted, the intermediate and winter crop cannot be expected to be as good as when the pruning is left until later.

By the time winter comes round the vines will be found to have formed a thick growth of leaves and runners, leaving no sign of having previously been heavily cut back. From the disease point of view this growth is not of such serious consequence at this time of the year, as powdery leaf spot is usually the only disease of consequence during the cold months, and to check this a spray needs to be applied principally to the young shoots and fruit on the outside of the vine.

A Warning.

A word of warning is necessary to those growers who have the disease known as woodiness in their plantation. This disease, characterised by the production of small, hard, and usually deformed fruit and a mottled and crinkled condition of the foliage, has recently been shown by Noble[7] to be a disease of the virus type which may be transmitted from a healthy to a diseased vine by mechanical means, such as possibly the pruning knife or even the hand.

Careful examinations of the plantation should therefore be made towards the end of the winter, when woodiness will be showing up, and any plants exhibiting symptoms of this disease should be cut off at the base so that the vine will have died and dried out before pruning time. Should a plant that has been missed be met with when pruning, the knife and hands if used on a diseased vine should be washed well in methylated spirits or soapy water before passing on to a healthy plant.

Recommendations.

Based on the results of the experimental work the following recommendations are now made for the control of brown spot of the passion vine:—

(1) Train the passion vines in a systematic manner right from the start, making sure that the main runners are kept well tied to their respective wires, as this facilitates subsequent pruning.

(2) Prune back laterals at least once a year either before the flowers for the summer crop have formed if a summer crop is desired, or later if the intermediate and winter crop is most favoured. A further trimming may be necessary after the vines have begun to shoot.

(3) Follow the pruning with a Bordeaux spray of 6:4:40 or 4:4:40 strength. This spraying should be repeated once a month until the end of January, and then once every six weeks or two months until next pruning time. When mature fruit are on the vine ammoniacal copper carbonate may be substituted for the Bordeaux. During the cool months special attention needs to be given to young shoots and fruit for the control of powdery spot and scab which is prevalent at that time.

For the first eighteen months most attention should be paid to training the young vine, spraying, except during the winter for powdery leaf spot, being not always necessary.

Summary.

The most serious disease of the passion vine in Queensland and a limiting factor in its cultivation is brown spot. This disease is responsible for a leaf spot, stem cincturing, and fruit spot, and its presence may ultimately result in the complete dying back of the vine.

Brown spot is shown to be caused by a species of *Macrosporium*, spore measurements and cultural characters of which are given.

The temperature reactions of the organism and the seasonal development of the disease are discussed.

Other species of *Passiflora*, including *P. quadrangularis* and *P. alba*, are shown to be subject to attack by the same disease.

Field experiments are briefly described whereby it has been shown that brown spot may be effectively controlled by systematic pruning and spraying. The value of pruning is discussed in some detail.

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CAMP FOR MEMBERS OF HOME PROJECT CLUBS.

IPSWICH SHOW, MAY, 1931.

The Ipswich Pastoral and Agricultural Society has requested the Department of Public Instruction to select fifteen boys from among the members of Home Project Clubs to attend a camp at the Ipswich Show in May next, as guests of the Show Society.

Nominations will be considered from schools on or near the following railway lines:—

Ipswich to Yarraman;

Ipswich to Murphy's Creek;

Ipswich to Dugandan and Mount Edwards; and

Ipswich to Marburg.

Schools which have completed their organisation of clubs on or after 1st September, 1930, may nominate members desirous of attending the camp. Other schools which desire to be represented should commence their club work not later than 7th February, 1931, and should furnish to the Department of Public Instruction by that date particulars of the membership of the clubs operating.

The Departmental Organiser will visit the various centres for the purpose of valuing the work of the club members, and the selection will be made on the comparative merit of the work done by the members.

These agricultural project clubs have a definite educational, as well as an economic value, and parents are urged to co-operate with the head teachers of the various schools in establishing club work in their districts.

CATERPILLAR CONTROL.

Some few weeks ago an armyworm outbreak was reported from the Darling Downs. Although the reports indicated damage of a serious nature to wheat and other crops, an investigation showed that the outbreak was localised and that the total damage was of a minor nature. However, in view of the possibility of future outbreaks the following standard control measures, drawn up by Mr. J. A. Weddell, Assistant Entomologist, should be of interest.

The standard control measures recommended to cope with an armyworm outbreak—measures that should be applicable in this instance, consist of the following:—

Where the extent of a local infestation is fairly clearly defined and there is danger of further spread of the caterpillars into neighbouring and relatively clean areas, the spread may be prevented by means of furrows dug either around the infested area or, if the caterpillars are on the move, at right angles to the main direction of the advance. The furrows should be dug, having the side next to the area to be protected as steep as possible. At intervals along the bottom of the furrow, holes should be sunk. As an extra precaution, a bait consisting of poisoned bran should be sprinkled along the furrow. The poisoned bran may be made up as follows:—

Bran	25 lb.
Paris green	1 lb.
Molasses	1 quart
Oranges	2 fruits
Water	2 gallons (about)

The Paris green and bran should, first of all, be mixed together in a thorough manner and while still dry. The molasses and the finely chopped fruit and its juice should then be added to some of the water. The water containing the molasses should next be mixed with the bran and Paris green and the whole should then be well stirred up, enough water being added to produce the right consistency.

It is highly desirable that the poison bait should be of the right consistency, and only sufficient water should be added to permit of its being in a crumbly state and thus capable of being easily scattered broadcast on the ground. It should, at the same time, be sufficiently moist to permit of each flake of bran taking up its quota of Paris green and molasses.

Neither the fruit juice nor the molasses is essential in this bait, although they are usually considered desirable.

Poultry and other domestic animals should not have access to areas that have been treated with poison bran baits.

The value of the furrow lies in the fact that the crawling caterpillars will usually follow the line of least resistance, and that once they fall in to the furrow they will move along its length rather than climb the steep side. They thus find and feed on the poisoned bran, and ultimately gather in the prepared holes where they die or may be conveniently killed and buried.

The sprinkling of the poisoned baits is of value within the area actually infested. The material mixed as described should be broadcast loosely into the foliage; some of it then remains in the foliage and the rest trickles to the ground, but in either situation it is readily accessible and acceptable to the caterpillars. The quantity mentioned above is usually considered sufficient for about half an acre when scattered broadcast.

Where a portion of the crop is already a total ruin and it is desired to kill the caterpillars, more especially to prevent further spread, the foliage may be sprayed with arsenate of lead, made up at the rate of 1½ lb. lead arsenate powder to 50 gallons of water. In this case, however, the grain crop will be dangerous as food for both man and beast, and this method must not be applied unless the owner is prepared later to destroy by burning the area so treated.

FARMERS' SHEEP AND WOOL.

By J. CAREW, Senior Instructor in Sheep and Wool.

PART III.

This is the third article of a series planned for the purpose of supplying information sought from time to time by readers interested in sheep and wool; and also with the hope of stimulating interest in sheep-raising on comparatively small holdings.

SELECTION OF BREEDS.

THE breed type most suitable to local conditions should be selected, for types as we know them have been evolved under special and selected conditions. The greater area of our merino country is suitable to the medium to strong types of that breed.

Very few flocks of the fine-woolled types are now bred, the medium and strong types being more generally raised. As they advance in age their wool "fines down" and most of our fine fleeces are produced by these older sheep. Usually the sheep are bred on the holding, therefore the most suitable breed and type is of first

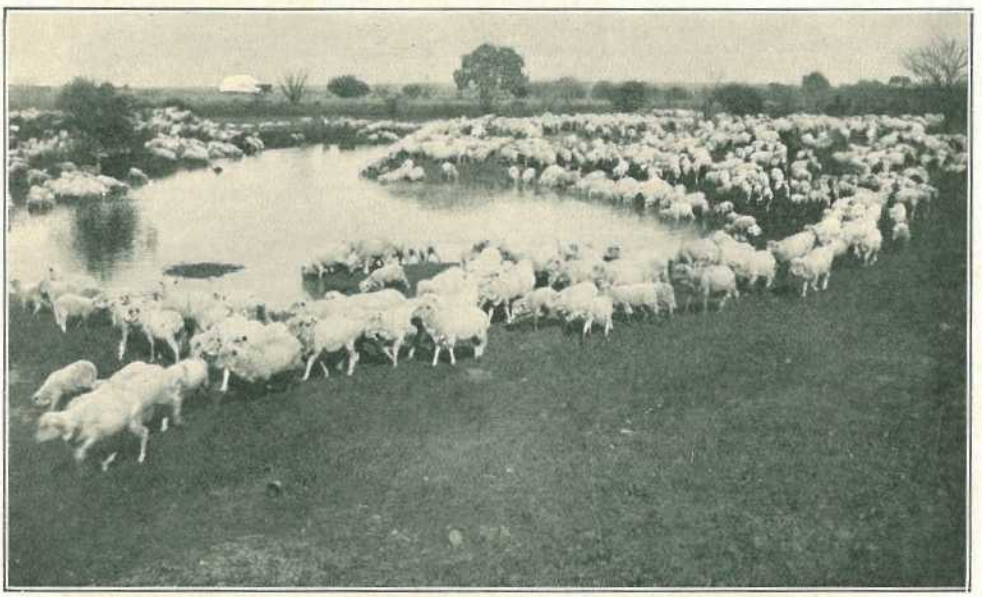

Plate 186.—Sheep Watering at a Dam, Stamford, Hughenden District.

consideration. Many owners are satisfied to go on without culling, but as an inferior sheep eats as much as a good one it is sound policy to class the flock carefully, and endeavour to raise the standard to as high a level as possible under existing conditions.

Culling.

The proper time to cull is just before or during shearing, whichever is found more convenient. The average sheep farmer, who has ewes of a fair standard and of the type suitable to his conditions, can, with careful judgment, class his own flock. By introducing a suitable ram to mate with the best of the ewes, a start may be made to improve the flock.

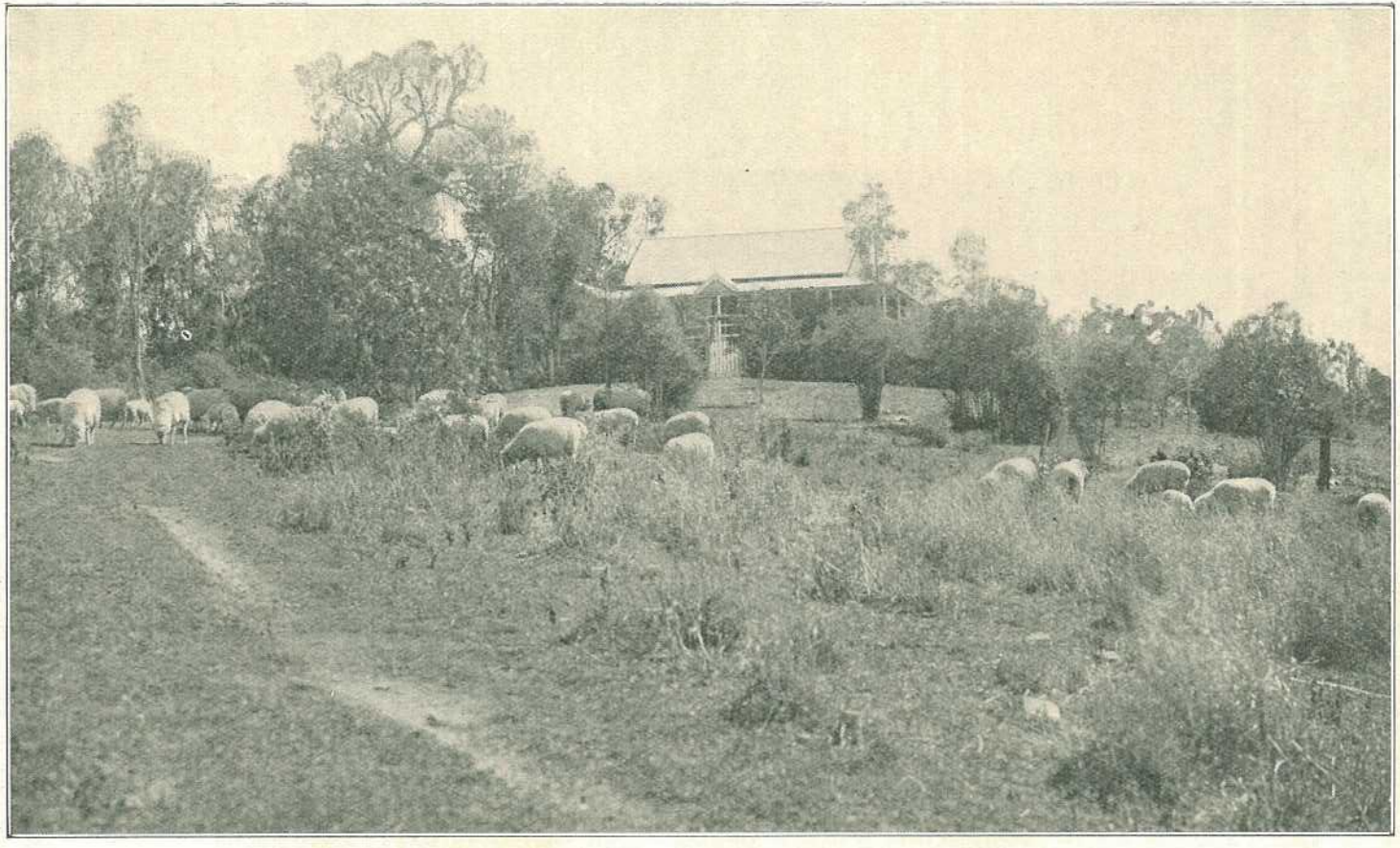

PLATE 187.—A FARMER'S FLOCK AT COALSTOUN LAKES, NEAR BIGGENDEN, BURNETT DISTRICT.

By a sound system of culling, when a holding is fairly well stocked up, big losses may be averted. Firstly, all nondescript ewes should be fattened and sold.

The old breeding ewes, if culled for teeth defects, may be fattened before they become broken-mouthed, otherwise it is impossible to improve their condition. On large holdings sheep classing forms part of the yearly operations, and what is profitable to the large flock-owner may also apply to the small one.

Not only is it more profitable, but it gives a greater amount of satisfaction to possess a good flock, which should be the owner's pride. At the first the standard may not be high, but any sheep farmer who takes a proper pride in his flock will soon form his own standard of excellence. To achieve this, the first culling will be the number that can be spared economically.

A thorough inspection of each sheep as it is shorn, when all defects in the fleece are revealed, will soon convince the owner that the matter of culling is simple but very important. As the flock increases in numbers the percentage of culls may be greater until the standard aimed at is reached.

The chief aim should be to retain all full-sized, vigorous sheep according to type, possessing a well-proportioned body and showing a robust constitution, carrying a full, even fleece of good colour, and true to type.

Merino Types.

A fine merino should have a covering of fine dense wool, with spinning counts of 70s to 70s supers as a 4-tooth. They are more suitable to the cooler parts of the State, but if exposed to hard, dry conditions their wool is more subject to deterioration than the stronger types.

The medium type of sheep should be bigger bodied and more robust than the fine. They will be found suitable to the greater extent of our sheep country, and should produce a wool varying in spinning counts from 64s to 70s. They are a very desirable type and retain their chief characteristics to a great degree. As they grow older their wool is less robust; it "fines down," and if well grown, as in normal seasons, will be found to possess a good length of staple of a desirable character.

The strong-woolled type of sheep are large, plain-bodied animals, more robust in every respect, with a deep-grown covering that resists dust to a greater extent, and will not deteriorate to the same degree under the trying conditions met with on the exposed western plains. To be a true, strong wool type they should produce a characteristic merino wool of 60s to 64s spinning counts in ewes and 60s to 58s in rams, but in each case they should possess a liberal length of staple.

To be a thoroughly efficient sheep classer it is necessary to be able to recognise the different types and qualities of merino wools as well as to discriminate between the types of sheep, when all circumstances likely to affect both sheep and wool must be taken into consideration.

[TO BE CONTINUED.]

QUEENSLAND SHOW DATES, 1931.

Stanthorpe: 4th to 6th February.
Allora: 18th and 19th February.
Killarney: 27th and 28th February.
Milmerran: 3rd March.
Pittsworth: 5th March.
Warwick: 10th to 13th March.
Toowoomba: 23rd to 26th March.
Oakey: 11th April.
Dalby: 15th and 16th April.
Chinchilla: 21st and 22nd April.
Taroom: 4th to 6th May.
Boonah: 6th and 7th May.
Murgon: 8th and 9th May.
Ipswich: 12th to 15th May.
Mitchell: 13th and 14th May.
Kilkivan: 20th and 21st May.
Biggenden: 21st and 22nd May.
Wowan: 4th and 5th June.
Lowood: 19th and 20th June.
Mount Larcom: 19th and 20th June.
Rockhampton: 23rd to 27th June.
Kilcoy: 2nd and 3rd July.
Cleveland: 10th and 11th July.
Rosewood: 17th and 18th July.
Ithaca: 18th July.
Royal National: 10th to 15th August.
Wynnum: 28th and 29th August.
Imbil: 2nd and 3rd September.
Beenleigh: 18th and 19th September.
Rocklea: 26th September.

AUSTRALIAN TRADE WITH THE EAST—II.

By COLONEL D. E. EVANS, D.S.O., M.I.E.S., M.I.M.E.

The following notes by Colonel Evans, who is well known in professional and commercial circles in Brisbane, were made in the course of a recent visit to Japan, Korea, Manchuria, and China, and will be read with much interest by all concerned with the expansion of Australian trade in the countries of Eastern Asia, especially in relation to our primary products. The first instalment of this series was published in the November Journal.—Ed.

MANCHURIA is situated in the north-eastern extremity of China. Parts of Russian Siberia and Japanese Korea form its own north-eastern boundary. Its area, covering about 382,000 square miles, is almost the same as that of Egypt, or the aggregate area of Texas and New Mexico in the United States; it is almost half the size of Mexico, or more than three times the size of Japan proper; it is larger than New South Wales, about four times the size of Victoria, and rather more than half the area of Queensland. Its population is estimated variously at from 23,000,000 to 27,500,000, and it is now increasing rapidly through constant migration from China proper.

PLATE 188.—PLOUGHING A SOYA BEAN FIELD.

Contrasted with other parts of China, its natural resources are rich, especially in agricultural, mineral, and forestry products. Its economic possibilities attracted the attention of neighbouring nations, but it was not until after the Russo-Japanese war in 1904-5 that it became more or less a land of opportunity for the world generally. The waters of the Yellow Sea and Gulf of Pechihli wash its southern shores.

Two large mountain ranges—the Khingans, Great and Little, and the Changpai —traverse its territory from north to south.

The valleys are extensive and generally fertile, while the mountainous regions are rich in timber and minerals. The country also possesses the advantage of large navigable rivers, among the chief of which are the Amur, Sungari, Yalu, and Liao. Though frozen in winter, each of these waterways during other seasons carries a large commercial traffic.

Although the indigenous native is the Manchu, 90 per cent. of the present population are Chinese.

The country has a most interesting historical background which, to those so inclined, would repay earnest study.

There are about 3,400 miles of railway in operation, mainly financed by foreign (principally Japanese) capital.

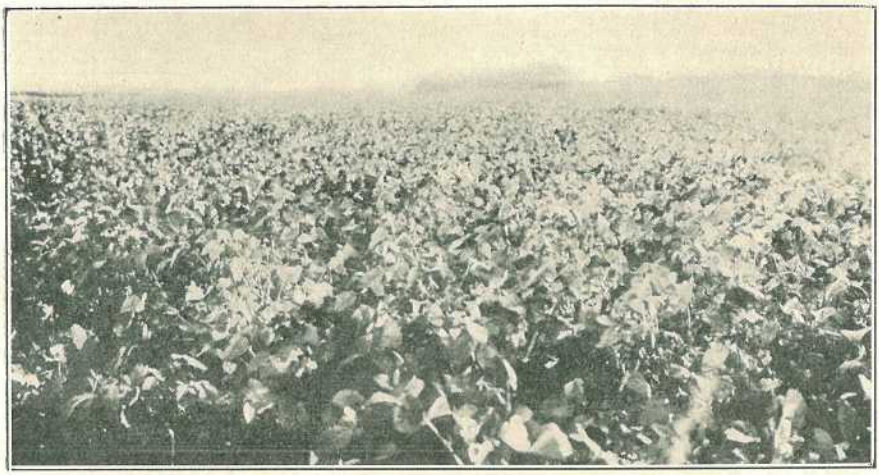

PLATE 189.—A SOYA BEAN FIELD IN MANCHURIA.

PLATE 190.—TRAIN LOAD OF SOYA BEAN CAKES BROUGHT TO MIXED STORAGE AT DAIREN.

Trade.

In the commercial history of Manchuria, the growth of Dairen as a world port, and the creation of a great export trade in beans, are the most significant features. Agricultural produce remains the principal item in outward manifests. Soya beans and their products (bean cake and bean oil) to-day command the world's markets. For many years these products constituted more than half the total exports of Manchuria. Millet, wheat, maize, and barley are also important exports. Imports are made up mainly of steel, machinery, cotton yarns and fabrics, mineral oils, and woollen goods.

Agriculture in Manchuria.

Manchuria has been described as the "granary of Asia," as possessing "one of the richest soils in the world," or as "the land of opportunity." Its agricultural possibilities were not realised generally until railway development was extended along the Liao Valley after the Russo-Japanese war. To-day the country is supplying a large proportion of the requirements of Japan in foodstuffs and raw materials for industrial purposes.

The principal cultivated crops are the world-known and valued soya bean and kaoliang, the staple food of the native.

PLATE 191.—PLANTING THE SOYA BEANS.

Besides those already mentioned, other products include hemp, flax, ramie, tobacco, rice, cotton, and silk. Of live stock, cattle, horses, donkeys, mules, sheep, and pigs are important. Lack of reliable statistics makes it difficult to state quantities of production.

Kaoliang or sorghum, being not only the staple food of the native population, but the principal grain food of numerous animals engaged in farm work, the major portion of the cultivated land of Manchuria has for centuries been cropped with this grain, and its production surpassed even the bean. Bean cultivation has gradually extended, however, as the world's markets strengthened their insistent demand.

Soya Beans.

The story of the Manchurian bean is one of the most interesting romances in economic history. The Japanese found some compensations for their heavy expenditure in the Chino-Japanese war in the mid-nineties in the discovery of the Manchurian bean, which revolutionised the fertiliser industry and became a substitute in the Japanese rice field for the dry herring fertiliser then extensively used. Ever since Japan has been the heaviest purchaser of the soya bean.

The first foreign trial shipment was sent from Dairen to Liverpool in 1908, and this was the beginning of a new industry in England, Germany, Denmark, and Holland. Germany's consumption subsequently became greater than all. At the time of the universal shortage of food during the European war, the Manchurian bean was a very important factor in the world's food supply.

Plate 192.—Soya Bean Graded at Mixed Storage at Dairen awaiting Shipment.

Plate 193.—Soya Beans being unloaded at the Railway Yard of Changchun Station.

The demand for this bean is ever increasing. Beans and bean cake imported by Japan, as foodstuff or fertiliser, are to-day helping in the solution of the national food problem.

The influence of the Manchurian bean on national economy is remarkable. Denmark was self-supporting in the production of cereals, especially wheat, until about thirty years ago; but through American large-scale production, Danish products were unable to compete successfully, even in the home market. Aided by the Manchurian bean, the Danes turned to extensive and intensive stock breeding. The bean is imported, the oil extracted and used for making margarine, soap, &c., while the residue is used extensively as stock food. Holland, to some extent, follows the same practice.

To climate and soil are ascribed the high quality and quantity production of the soya bean in Manchuria. The average yield is 20 bushels an acre in Manchuria, while it is 18 bushels in Japan, 18 in the United States, 13 in Korea, and 14 in China. Manchurian production amounts to more than half of the world's output from this crop. While bean production is increasing every year in Manchuria, it is at a standstill, more or less, in other countries.

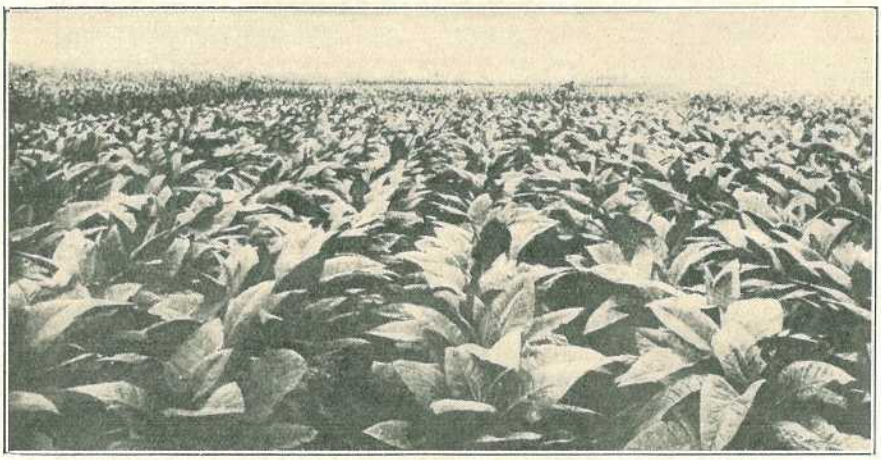

PLATE 194.—EXPERIMENTAL TOBACCO PLANTATION AT FENGHUAGCHENG MODEL FARM.

The reason why the Manchurian bean commands world-wide popularity is the actual value of this staple food for man and beast, fertiliser, and as raw material in various chemical industries. It is said to contain a higher protein content than the product of other countries. Whether that is so or not, it is hard to say, but there is certainly no reason why that claim should not be tested in Queensland. The constituents would vary, of course, more or less according to locality, variety, and season.

Manchurian beans are divided into four classes according to colour—yellow, white, green, and black. The chemical composition of these beans, according to analyses made in 1927 by the Central Laboratory at Dairen, is as follows:—

—	Moisture.	Crude Fat.	Crude Protein.	Crude Fibre.	Nitrogen Free Extract.	Crude Ash.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Yellow	11·06	18·19	39·94	5·20	21·41	4·30
Black	11·96	14·74	41·00	5·34	23·01	4·20
Green	8·13	18·96	40·12	5·45	22·54	4·80

[TO BE CONTINUED.]

A POULTRY MITE INFESTING DWELLINGS.

By F. H. S. ROBERTS, M.Sc., Veterinary Entomologist and Parasitologist.

Within the past two months instances of a poultry mite infesting houses and attacking man have been brought under the notice of this Department. Inquiries usually state that starling lice are the causal agents, but in the cases under consideration a species of poultry mite was found to be the cause of the discomfort to the inmates of the dwellings concerned.

The mite in question is known as the Tropical Poultry Mite, *Liponyssus bursa* Berlese, and, as the popular name implies, it is usually found on the domestic fowl, causing great discomfort at times to the nesting hen, and capable, if unchecked, of bringing about fatal results among the newly hatched chickens. This tiny parasite, like all mites, possesses four pairs of legs and is usually reddish in colour, the colour being caused by the ingested blood. In size it rarely reaches beyond .7 mm. or about 1/30 inch—i.e., not as big as a pin's head. The blood is sucked in through a tubular apparatus, part of which is the long chelate stylets which pierce the skin of the host.

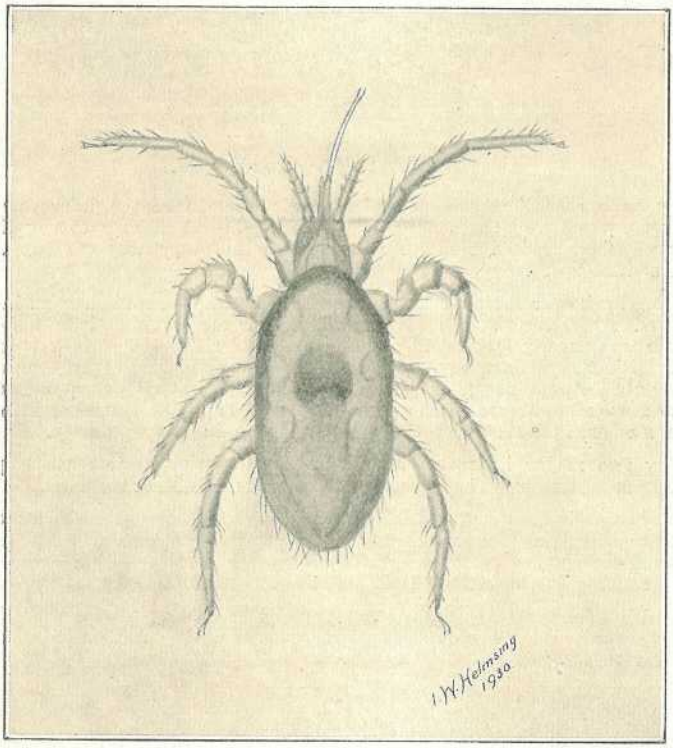

PLATE 195.

THE TROPICAL FOWL MITE, *Liponyssus bursa* Berlese.

These mites usually infest the nests and surroundings, attacking the birds only when food is required. The tiny egg is laid away from the host and in a short time hatches out into a larva which differs from the adult by possessing three pairs of legs instead of four. After the first moult or shedding of the skin four pairs of legs appear, and following one to three further moults the adult form is reached.

Besides the domestic fowl, *Liponyssus bursa* has been found on the domestic pigeon and common sparrow, and is probably conveyed from one locality to another mainly by these hosts. Both pigeons and sparrows nest in dwellings, and if these mites are present they will remain with the birds so long as the birds frequent the nest. Once nesting is finished and their hosts are fled, numbers of the parasites descend into the dwellings and attack any animal, including, of course, man, with

which they come into contact. In the cases cited, infestation of the dwellings was traced to pigeons which had vacated their nests, leaving the mites to starve. Fortunately, although their attack brings about acute discomfort to the inmates, they are able to live only about ten days away from their warmer-blooded hosts, and also appear incapable of breeding. As a rule, therefore, unless the building houses a large number of birds, the parasites do not last longer than about ten days.

Numerous other species of mites, other poultry mites, and rat mites have been recorded as attacking man, their infestations causing general, intense, and continuous pruritus or itching. The irritation may disappear within a few days, but if friction is resorted to as a relief an ulcerous condition may be set up.

As a first measure in the eradication of such parasites the nests of the birds—pigeon or sparrow—should be located and removed. The premises should then be thoroughly sprayed with a carbolic solution or some other efficient insecticide, such as a pyrethrum-containing solution, of which several proprietary mixtures are on the market.

For the treatment of the bites, the Health Department recommends the bathing of the affected areas with a weak carbolic acid solution—1 in 40 would do—and the application of the following ointment:—β/ Naphthol, 15; lard, 100; green soap, 50; lanoline, 10.

THE CARE OF THE CAR.

Every year sees the motor car improved; sometimes the improvement is an important step and sometimes only a refinement, but it is safe to say that in the motoring world at least the motto "Every day in every way we get better and better," is lived up to.

Looking back over the past decade, we see remarkably rapid changes in motor-car construction. After the war the heavy four-cylinder car dominated the motor market. The engine was usually lacking in acceleration, and riding comfort did not exist as compared with the modern car. About 1920 the more flexible six-cylinder engine began to gain in popularity, or rather car builders began to turn out six-cylinder cars at a reasonable figure. The year 1924 saw four-wheel brakes introduced on numerous models, and 1925 saw the balloon tyre gain its popularity.

To-day two major improvements in the transmission system are engaging the minds of keen motorists. They are the silent gears and the free wheel.

The transmission system of the average car has always been one of its weaknesses. The skill required in effecting gear changing has frightened many a would-be motorist, and is a worry to many experienced drivers, also the noise made by most cars when running in the intermediate gears has been unpleasant, to say the least.

Difficulties in gear-changing, together with noise in gears, have made the "go-anywhere-in-top" car popular, although such cars consume much more petrol than the car that requires gear-changing.

The Silent Gear.

When the usual type of gear is used its silence in operation depends chiefly upon two factors—its accuracy of machining and its size compared with the amount of work it does. High-grade cars fitted very large gears and had them ground so perfectly that the noise in gear was not very pronounced. However, in a light car the gear must necessarily be light, and because of the vibration set up as the strain is transferred suddenly from one tooth to the next the gears tended to whine. The obvious way out of the difficulty was to use gears so arranged that each tooth took up its load gradually. So-called helical gears do this because the teeth are cut on a bias across the face of the gear wheel. It is obvious, however, that helical gears are not suitable for sliding into mesh, as is done in the usual type of gear box. Therefore ingenious gear boxes were designed in which the next gear to top (third in a four-speed box, second in a three-speed box) was permanently in mesh and the drive was actually engaged by means of dogs on the main shaft. Another form of silent gear was obtained by using an internal gear—that is, a pinion meshing with gear teeth on the inside of a ring. When this method is used, instead of one tooth taking all the load at any instant, the load is shared among several teeth so that the operation is comparatively silent.

The introduction of silent gears changed the outlook of many manufacturers in the matter of top-gear performance, so that cars that until recently were fitted with three gears now have four forward speeds, the silent third gear being used for work in traffic or for hill climbing, whereas the top gear is used for high-speed driving on the other road.

The Free Wheel.

For many years motorists have discussed the possibilities of using a free-wheel attachment on the motor car, and for the last three years it has been possible to have a free wheel fitted to many European cars as an extra. However, this year the free wheel has been standardised on a very popular American car, so that it may be said that the free-wheel fashion is established.

The free wheel is essentially a device in the transmission which allows the car to over-run the engine without speeding the engine up. Motorists who have ridden an ordinary bicycle will appreciate how the free wheel acts.

The free-wheel device is usually placed just behind the gear box, so that immediately the throttle is released the engine and gear box will slow down to idling speed, but the car will coast along just as if it were in neutral. When the engine is again accelerated the drive will be taken up by the engine immediately the engine reaches the speed that corresponds to the speed of the car.

The free wheels used on motor cars are not fitted with ratchet devices, but are usually an arrangement not unlike a roller bearing, which runs freely when rotated one way but which jams when rotated the other way.

Gear Changing on a Free-wheel Car.

The addition of the free wheel to a car makes gear-changing simplicity itself, because it is no longer necessary to judge the speeds of the two gears to be meshed. Immediately the clutch is depressed the jack shaft to the gear box is released and comes to rest, whereas the free-wheel device frees the main shaft in the gear box and it also comes to rest, so that the changing of gears is actually effected in a gear box in which the pinions are not revolving. In fact, the gears are usually changed without touching the clutch, because immediately the accelerator is released the free-wheel device operates, and the engine and gear box slow down to idling speed; since the gears have no load upon them it is possible to change gear with the clutch still engaged without the slightest clashing of gears.

The free-wheel device results in a marked economy in the petrol consumption, because the engine merely idles when it is not required. With the ordinary fixed-drive car, the engine acts as a brake when the throttle is closed, so that often the car is being braked unnecessarily. Also when the engine is being driven by the back wheels considerably more fuel is sucked through the carburetter than is the case when the engine is merely idling. The economy in fuel is estimated to be approximately 15 per cent.

The economy in lubricating oil is also very marked, because it is when the car is driving the engine that oil is sucked into the combustion chamber and wasted. Lastly, the life of the engine is increased, because when the free wheel operates the engine revolves slowly, and as a consequence the number of revolutions of the engine for any given trip is reduced enormously. The life of an engine, provided it is properly cared for, depends upon the number of revolutions it makes.

The writer has heard the objection raised to the free wheel that it prevents the engine being used as a brake, which is essential when descending long steep hills. However, all free-wheeling devices are provided with a means of locking the free wheel so that the objection raised has no significance.—"Radiator" in the "Farmer and Settler."

CITRUS FRUITS.

FIELD TRIALS IN SOUTHERN AND CENTRAL QUEENSLAND.

The Director of Fruit Culture, Mr. George Williams, has received the following progress report from Mr. R. L. Prest, Instructor in Fruit Culture, on field trials of citrus fruits in Southern and Central Queensland:—

IN Central and Southern Queensland, co-operative field trials in citrus culture have been conducted by the Fruit Branch during the years 1928 to 1930.

Many of the recommendations and conclusions which follow are in harmony with, and have been set forth as a result of, similar investigations elsewhere.

It was realised at the outset that the problems to be studied, such as low production and lack of vitality of citrus trees were in evidence in all centres, hence the field trials were located on the heavier red volcanic soil and sandy alluvial soil. Many observations made in orchards on other soils have added to the information gained.

No. 1 orchard for field trial is located at Mapleton on the property of the Mapleton Farm College. The trees were twenty-five-year Valencia Late and Washington Navels, and were in a decayed and unproductive condition when the trials commenced.

No. 2 orchard is located on the property of Mr. R. A. Ulcoq, Gayndah, Central Burnett district. There the trees were fifteen-year-old Beauty of Glen Retreat mandarins which were weakly, mottling, with a considerable amount of dead twigs and terminal branches.

No. 3 orchard is located on Mr. V. G. Pack's property at Montville. The trees included twelve-year old Valencia Late, Sabina, and Scarlet and Fewtrel Early oranges and mandarins. Although apparently healthy the trees appeared hide-bound and were not growing freely and bore unsatisfactory crops.

No. 4 orchard is located at Inglenook, Palmwoods. The trees there were six-year-old Valencia Late and two-year-old Beauty of Glen Retreat mandarins. The former were very unthrifty trees.

Fertilisation.

The red volcanic soils are commonly relatively rich; citrus trees on these soils respond to proper fertilisation, as also do those on the deep, well-drained, sandy alluvial soils. On plots Nos. 1 and 3 essentially similar materials were used, but as trees were of greater age larger quantities were applied on No. 1. Plot No. 2 on sandy soil received a slightly different fertiliser.

All plots were dressed with agricultural lime at the rate of one ton to the acre.

	Per tree. lb.
Plot No. 1.—Nitrogen	2.4
Phosphoric acid	2.5
Potash	1.9
No. 1A.—Nitrogen	3.0
Plot No. 2.—Nitrogen	1.3
Phosphoric acid	1.4
Potash	1.4
No. 2A.—Nitrogen	1.9
Plot No. 3.—Nitrogen	1.2
Phosphoric acid	1.6
Potash	1.4

Materials used were sulphate ammonia, dried blood, Nauru phosphate, and sulphate potash. The applications were made twice a year in August and March.

Irrigation.

Plots Nos. 1 and 3 were under natural rainfall, being in the coastal belt. No. 2 received light irrigation; the supply failed, but was re-established in July, 1929.

Cultivation.

During the drier months constant cultivation was carried out until towards the end of October, when a green cover crop of cowpea or bean was planted, to be ploughed under in March-April as weather conditions permitted.

Table I. shows the average tree production prior to 1928, the average tree production for 1928, 1929, and 1930, and the two years' average for 1929 to 1930.

The 1928 crop was generally heavy throughout the State. The trials commenced in the late spring of 1928.

COMMENTS ON YIELDS AND TREATMENT.

Weather, of course, influences greatly any crop grown in the open air. The dry spring and winter of the 1928-29 season had a serious effect on the crop which was exceptionally light throughout the State, the December drop being particularly heavy.

In spite of adverse weather conditions, there was marked improvement from the commencement. The trees increased their vigour, foliage improved, fruiting wood was increased and satisfactorily matured, and a good crop produced.

The fruit was well distributed over the trees, even in size, of good quality, bright, and markedly freer from disease.

With the more favourable growing conditions experienced in 1930 results were even more gratifying. In the coastal belt heavy wastage was experienced during the harvesting of the crop. The figures quoted in Table I. are for cases marketed; wastage is not included.

Though nitrogen appeared to be the most important element required, results indicated the necessity for balancing the food supplies. The three elements generally most rapidly depleted in the soil being nitrogen, phosphoric acid, and potash, were replaced by the addition of sulphate ammonia, dried blood, Nauru phosphate, and sulphate potash. The quantities used must in no way be considered correct for all conditions; they are, however, a guide for any similar set of conditions frequently met with.

In making available the plant nutrients added in the fertiliser, consideration of soil conditions was a most important factor. The absence of adequate supplies of farmyard manure necessitated green crop practice. The summer rains were made use of to grow a leguminous cover crop, which also assisted to prevent soil erosion, as well as taking up extremely soluble plant nutrients preventing them from being lost in the drainage water.

The carbon, oxygen, and hydrogen of plants come largely from air and water and the ploughing under of green plant crops, therefore increase the store of such constituents in the soil. The compounds that result from such crop decay increase the absorptive power of the soil and promote aeration, drainage, and granulation. If the crop turned under is a legume and the nodule organisms are active, the store of soil nitrogen is augmented.

Again added organic material acts as a food for soil organisms, and tends to stimulate biological changes to a marked degree. This biological action is especially important in the production of carbon dioxide, ammonia nitrates, and organic compounds of various kinds which are necessary for plant nutrition.

Nitrogen appears to be the most important element required—not only is it absolutely necessary for the plant's growth, its stimulation of the vegetative parts, and its close relationship to the general tone of the fruit, but also it was not one of the original elements of the earth's crust. During the formation of the soil it slowly and gradually became present through being brought down by rains and fixed naturally through the agency of bacterial acitvity. It now exists in nitrogenous compounds of the more or less decayed organic matter.

One of the possible limiting factors to the crop growth is the lack of water-soluble nitrogen at critical periods in quantities necessary for normal growth. It is the only one of the three common fertiliser elements; when added in excess will result in harmful after effects on the crop. It may delay maturity, lower the quality, and decrease resistance to disease.

Phosphoric acid hastens the maturity of the crop by its ripening influences, and also encourages root development, especially the lateral and fibrous rootlets. Excessive quantities of phosphoric acid ordinarily have no bad effect, for phosphorus does not stimulate any part unduly, nor does it lead to a development which is detrimental. Phosphorus is a balancing power on the unfavourable influences generated by the presence of an undue quantity of nitrogen.

The presence of plenty of available potash in the soil has much to do with the tone and vigour of the plant. By increasing resistance to certain diseases it tends to counteract the ill effects of too much nitrogen, while in delaying maturity it works against the ripening influences of phosphoric acid. In a general way, it exerts a

balancing effect on both nitrogen and phosphate materials, and consequently is important in a mixed fertiliser, if the potash of the soil is lacking or unavailable.

At the commencement of the trials the fertiliser was applied in two dressings, August and March. Later this was altered to three applications a year, and in the case of plot No. 2, four were applied; the smaller and more numerous dressings are recommended. A more even supply of plant nutrients is assured and any losses by leaching are greatly minimised.

TABLE I.

—	——	Plot No.	Average before Trials.	Average for 1928.	Average during Fertiliser Trials.		Average for Two years.	Increase Average
					1929.	1930.		
			Cases.	Cases.	Cases.	Cases.	Cases.	Cases.
I.	Agricultural lime, 1 ton per acre Sulphate of ammonia, 12 lb. per tree Nauru phosphates, 14 lb. per tree Sulphate of potash, 4 lb. per tree	I.	1½	2	2	8	5·0	3·5
	Sulphate of ammonia, 15 lb. per tree	IA	1½	2	2	7	4·5	3·0
II.	Gypsium, 1 ton per acre Sulphate of ammonia, 4 lb. per tree Dried blood, 4 lb. per tree Nauru phosphates, 8 lb. per tree Sulphate of potash, 3 lb. per tree	II.	1½	2	3	8	5·5	4·0
	Dried blood, 16 lb. per tree ..	IIA.	1½	2	2½	6	4·25	2·75
III.	Agricultural lime, 1 ton per acre Sulphate of ammonia, 6 lb. per tree Nauru phosphates, 9 lb. per tree Sulphate of potash, 3 lb. per tree	III.	2	4	3	7	5·0	3·0

TABLE II.

Plot.	Number.	Cost of Fertiliser.	Average Net Return.	Average Increase in Returns (net).
		s. d.	*s. d.*	*s. d.*
I.	I.	4 6 per tree	5 0 per case	17 6 per tree
	IA.	4 6 per tree	5 0 per case	15 0 per tree
II.	II.	3 0 per tree	9 0 per case	36 0 per tree
	IIA.	3 0 per tree	9 0 per case	24 9 per tree
III.	III.	3 0 per tree	5 0 per case	15 0 per tree

The Young Farmer.

NOTES ON MILK AND CREAM TESTING—I.

By OFFICERS OF THE DAIRY BRANCH.

THE following notes are intended to assist students in preparing for their theoretical examination for the milk and cream testing certificate, conducted by the Department of Agriculture and Stock in July each year.

These notes are not intended as a substitute for a text-book, but as a supplementary thereto, and students are advised to procure a standard work on the subject. They should obtain as much practical experience in testing as possible, for in the practical examination ease of manipulation is of paramount importance.

Under the regulations governing the issue of milk and cream testing certificates the following subjects are scheduled:—

(1) Elementary knowledge of the secretion of milk and factors which influence the same.

(2) The composition of milk and cream and factors which induce variation therein.

(3) Estimating by the Babcock method the quantity of butter fat in milk and cream from weight and volume of samples.

(4) Errors which may occur in testing, and how to correct or avoid same.

(5) Estimating solids in milk.

(6) The collection of samples, and means of preserving same.

(7) Recording and computing results of testing.

(8) Methods of testing for acidity, moisture, and preservatives.

(9) The over-run, and factors which influence it.

(10) The legislative measures in the various States.

Text-books recommended: Van Slyke or Farrington and Woll.

Composition of Milk.

The principal constitutents of milk may be classified into—

(1) Water of which normal milk contains approximately 87.1 per cent.

(2) Fat of which normal milk contains approximately 3.9 per cent.

(3) Proteins (casein and albumin) of which normal milk contains approximately 3.2 per cent.

(4) Milk sugar of which normal milk contains approximately 5.1 per cent.

(5) Mineral salts or ash of which normal milk contains approximately .7 per cent.

"*The Dairy Produce Act of* 1920" prescribes that milk shall contain not less than 3.3 per cent. of fat and not less than 8 per cent. of milk solids (not fat).

Water.

The quantity of water normally contained in milk varies at individual milkings and is influenced by certain conditions, such as individuality of the cow, breed, stage of lactation, age, character of food, amount of water drunk, and state of health.

Fat.

Milk-fat is generally called butter-fat, and is a variable mixture of several different compounds called glycerides. Each glyceride is formed by the chemical union of glycerine with some particular acid. There are about ten different acids found in milk-fat, but some are present in small proportions. The principal acids are palmitic, oleic, myristic, butyric and stearic. The compounds formed by each of these acids with glycerine are termed palmitin (i.e., glycerine combined with palmitic acid), olein, myristin, butyrin, and stearin.

Fat Globules in Milk.

The fat exists in milk in the form of exceedingly minute globules. In one drop of milk there may be about 100,000,000 of these fat globules. The size and number of these globules vary in the milk of the different breeds of cows and are also influenced by the stage of lactation, food, health, and age, while they vary in number at different milkings or at different parts of the same milking.

The quantity (or percentage) of fat in milk may be influenced by—

1. *Individuality of cow.*—It is uncommon to find two animals in a herd whose milk contains the same percentage of fat.

2. *Breed of cow.*—The percentage of fat in milk varies in a somewhat characteristic way with the kind of breed of cow. While individual cows vary in test in the same breed there is usually a fairly uniform difference; and if we consider averages we find that they also vary in the different breeds.

3. *Advance of lactation.*—As the stage of lactation advances and the flow of milk diminishes the fat percentages increases after about the third month, although, of course. the actual quantity of fat produced at each milking is less.

4. *Variation of time between milkings.*—As a rule the longer the time between two successive milkings the smaller is the percentage of fat in the milk.

5. *Fat variation.*—The first milk drawn at a milking contains the least fat while the milk last drawn (strippings) is the richest in fat.

6. *Other influences*—External or internal influences, such as climatic conditions, treatment, excitement, sickness, &c., also influence the fat content and the quantity of milk.

Proteins.

The number and nature of the proteins in milk is a matter on which dairy scientists differ, but it is generally recognised that there are three or four of them, the chief of which are casein and albumin.

Casein.—Casein is a combination of carbon, hydrogen, oxygen, nitrogen, phosphorus and sulphur.

It exists in milk not in solution, but in the form of extremely minute, solid, gelatinous particles in suspension similar to the fat globules.

Casein coagulates in the form of curd when milk develops acidity and becomes sour or when rennet is added. Heating to boiling point will not coagulate the casein unless a certain acidity is reached.

In milk, casein is combined with calcium to form a lime salt (calcium casein), and in this form is soluble although pure casein is not. This soluble casein gives milk its white, opaque appearance.

Albumin differs from casein in composition and behaviour. It is not coagulated by rennet or by acids, but remains in the whey. It coagulates by heating. It is found in solution in milk.

Milk Sugar.

Milk sugar is also called lactose. It is present in milk in solution. In general composition it resembles ordinary sugar, but is less soluble in water and not so sweet. It is easily converted into lactic acid by certain forms of bacteria. In cheese-making, milk sugar largely passes into the whey.

Mineral Salts or Ash.

The mineral salts of milk are left in the form of ash when milk is evaporated to dryness and incinerated. It consists chiefly of lime, potash, soda, and magnesia.

General Remarks.

In addition to the foregoing, milk contains many other organic compounds in small quantities in addition to certain gases—carbonic acid gas, nitrogen and oxygen.

It will thus be noted that milk contains water, fat, casein, albumin, sugar, salts, and some other constituents in small quantities.

The fat and casein and some of the salts are in suspension, while albumin, sugar, and the larger portion of the salts are held in solution by the water.

[TO BE CONTINUED.]

POINTS IN CALF-REARING.

Always handle calves quietly and patiently, and so develop in the animal a sense of confidence in the human forster-parent which will remain with the calf till it reaches maturity.

Feed at regular times each day and in regular quantities.

Feed only perfectly clean, sweet milk—the calf is not designed to assimilate any other. Add some constituent to replace the feed value of the cream removed from the milk.

Feed the milk at body temperature. Cold milk requires a great deal of the animal's energy to heat it up to a point at which digestion can take place.

Cleanse feeding buckets as carefully as you would all other dairy utensils. Cleanse the yards and their surroundings to destroy breeding places of flies, which are active carriers of disease.

Provide shade in summer, and shelter from winter wind and rain. It is cheaper to conserve animal energy in this manner than by the use of larger amounts of food.

Always pick up any pieces of rag, paper, twine, &c., found about the calf paddock. Young calves exhibit a delight in picking up foreign substances of thos nature, and ultimately swallowing them, and indigestible material of this description is almost sure to set up a serious form of gastro-enteritis in young calves.

QUALITY IN CREAM.

The test of the cream has an indirect effect on quality in some instances, and for this reason it is always desirable to run the cream at the proper thickness. For the summer months the test should be between 40 and 42 per cent., while during the colder months it may be reduced to from 36 to 38 per cent. A thin cream, that is, a low testing cream, never has the same keeping quality in hot weather, owing to the increased amount of separated milk present and a greater bacterial action. This should be attended to, as the adjustment of the cream screw is only the matter of a moment.

The mixing of warm, freshly separated cream with a cold, ripe cream from a previous separation is very often accompanied with disastrous results as regards quality. It is bad practice for several reasons, one being that the temperature of the bulk of the cream is thereby increased, resulting in increased bacterial activity. Again, if the older cream is very acid and thinly separated, the casein will most likely be precipitated in the form of white specks, which everyone is acquainted with as ordinary curdled cream, or again a "junkety" condition may be indirectly brought about. All these defects may result in the cream being graded second quality.

Fortunately, this practice is fast disappearing, but it sometimes occurs where cream is forwarded daily to the factory. The cream lorry comes soon after the morning separation, and in order to get both separations away the creams are mixed while the morning separation is still warm. "Junkety" cream often occurs where this is done, and to obviate it the morning cream should be cooled before mixing. If a cooler is not available for this purpose, by standing the tub in a can of water and stirring the cream briskly for ten minutes the temperature can be reduced slightly.

Stirring of cream two or three times daily helps to maintain the cream in good physical condition and to liberate any gas which may form. If the cream is left standing for hours before stirring there is a tendency for the heavy portion (casein, &c.), to gradually settle towards the bottom and for the fat to rise to the top, especially if the cream is inclined to be thinly separated. This is not desirable, and stirring will prevent it. A tinned steel or tinned copper stirrer should be used; on no account should a wooden stirrer be employed for this purpose.

It is quite well known that milk from newly calved cows will cause trouble when included in the general supply before it becomes normal, but it is not so generally recognised that some cows when advanced in their milking period will secrete abnormal milk, which will affect the cream and cause it to be graded second quality. This is particularly so when a cow has been milking for a long period, say, twelve months or more, as happens when a cow does not go in calf readily. When this type of cow begins to spring, the milk will probably become abnormal, and the cow should be dried off, or the milk fed to the pigs.

Answers to Correspondents.

Liming.

"INQUIRER"—

Liming has passed the experimental stage and is destined to be used extensively on acid soils which exist throughout the State. Liming benefits acid soils by adding to the calcium requirements of the soil and thereby supplying the demands of crops, particularly lucerne, clover, and mixed pasturage. By neutralising acidity and certain poisonous substances found in acid soil, it creates more favourable conditions for the growth and activity of helpful soil bacteria and encourages the growth of the plant roots and renders plant food more available. It improves the texture of the soil and assists in the conservation of moisture. Used in conjunction with commercial fertiliser the returns are improved.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Wild Carrot. Chicory.

W.D. (Goondiwindi).—The three specimens of herbage have been determined as follows:—

No. 1 contained mostly *Apium leptophyllum*, a native plant commonly known as Wild Carrot, not being distinguished from the common Wild Carrot by any distinguishing local name. It is very common in coastal Queensland and the Darling Downs, and I collected specimens at Yelarbon some years ago. Generally speaking, on the Downs it is mostly a weed of cultivation or comes up round stockyards and so forth; in fact, anywhere where the ground has been disturbed. There were a few specimens of the ordinary Wild Carrot *Daucus brachiatus*, mixed with this.

No. 2 was *Daucus brachiatus*, the common Wild Carrot. This belongs to the same genus as the garden carrot. No. 1 to the same genus as the celery.

No. 3 represents *Cichorium Intybus*, the chicory. This plant has been naturalised in parts of the Darling Downs for some years past, and has proved itself a weed in many localities. When it runs wild it loses the large carrot-like tap root for which it is cultivated in certain places as an adulterant of coffee.

Saffron Thistle.

W.R. (Mondure)—

The specimen of thistle is *Kentrophyllum lanatum*, the Saffron Thistle, or Star Thistle, a native of the Mediterranean region that has now found its way as a weed into most of the warm and temperate regions of the world. It is very common in New South Wales and the other Australian States and is found in Queensland, though not so abundantly, we believe, as in the more southern parts of Australia. Some stockowners in South Australia and Victoria have spoken highly of the plant as a fodder in its younger stages, but it soon runs up to a hard stem and becomes quite unpalatable. The plant should be destroyed as far as possible when it first makes its appearance on a property.

Star Thistle.

R.V. (Ipswich)—

The specimen is *Centaurea melitensis*, the Star Thistle, a native of Southern Europe, now a naturalised weed in most warm temperate countries. It is found in various parts of Queensland, but does not seem to be as bad a pest here as it is in some of the Southern States, particularly New South Wales and Victoria. In the former State it is commonly known as "Saucy Jack" or "Wild Irishman," and is one of the worst weed pests they have. It has a certain fodder value when very young, but soon becomes woody and unpalatable. It is an aggressive weed, and should be destroyed when it first makes its appearance on a property.

Sudan Grass.

J.S. (Westbrook, Toowoomba)—

Both specimens represent the true Sudan Grass, *Sorghum sudanense*. Practically all the Sorghums, which include plants very similar in general appearance to the Sudan Grass, such as Johnson Grass and a large African species, *Sorghum verticilliflorum*, known as Wild Sorghum, naturalised in Queensland, contain a prussic acid yielding glucoside, particularly in their younger stages. Used with discretion, however, the plants are undoubtedly very valuable fodders.

Cannas.

H.R. (Cooroy)—

Cannas are not known to be poisonous in any way. One of them, as you probably are aware, is the source of most of the Arrowroot that is prepared in Queensland. The tubers of this particular species (*Canna edulis*) make quite a good food for pigs either raw or cooked. The poisonous principle of young Sorghum is a prussic acid yielding glucoside, and this is not known to occur in Cannas.

Tea Tree.

R.C.B. (Chinchilla)—

The specimen is a species of Tea Tree—*Melaleuca nodosa*.. We were very pleased to get the specimen as the plant is very common on the coast, but yours is the most western so far received. We have had it before, however, from country round Eidsvold and one or two other places in the Burnett district. On the coast the tree usually grows on poor and usually badly drained soil.

Wild Passion Fruit—A Dangerous Plant.

L. L. M. (Malanda, N.Q.)—

The specimen is the Wild Passion Fruit, *Passiflora fœtida*, a tropical American species widely spread over the tropics of the world, and planted as a cover crop in coconut plantations, &c. It is naturalised in most tropical countries, including North Queensland. The ripe fruits are eaten by natives and by children, but nevertheless the plant is a dangerous one, the leaves and green fruits containing a prussic acid yielding glucoside. The plant if eaten in quantity would, therefore, act in the same way as young Sorghum or Sudan Grass, death from eating it being fairly rapid. We should think that, on the whole, stock would have to eat a fair quantity of the plant before any ill-effects became noticeable. The stomach contents forwarded were in rather a decomposed state for examination.

Destruction of Tobacco Bush.

"INQUIRER"—

As the stock are to be allowed to run in the paddock in which the Tobacco Bush is growing, there would be too great a risk to use an arsenical poison. You are advised to try spraying with a 10 per cent. solution of Sodium Chlorate, which is non-poisonous to man or beast. If the bushes are very large and woody, better results will be obtained if they are slashed with a brushhook previous to spraying. Sodium Chlorate may be obtained from A.C.F. and Shirleys Fertilizers, Limited, Brisbane. The price is about 10s. per 14 lb.

Beans.

"INQUIRER" (Port Moresby, Papua)—

The specimen is *Canavallia obtusifolia*, a bean fairly common in Queensland, New Guinea, and the islands of the Pacific. We were very interested in your remarks about its edible qualities, for a friend of ours in the New Hebrides has recently given us the same report. In Queensland we had always looked upon the bean as harmful, though nobody so far as we know had actually tested it. Two species of the same genus are in cultivation, namely *C. gladiata*, the Sword Bean, and *C. ensiformis*, the Jack Bean. This latter is quite a good bean and we think it would be a valuable addition to the vegetables grown in Papua if you have not already got it.

Hexham Scent. Buck Wheat.

R.D. (Purga, via Ipswich)—

The specimen of lucerne-like plant is *Melilotus parviflora*, the Melilot or Hexham Scent, a fairly common weed in Queensland and the Southern States. It was boomed some time ago as a fodder under the name of King Island Melilot, and has a value for growing in light soils where lucerne may not thrive. It is only of annual duration and dies out on the approach of the hot weather.

The other plant with triangular leaves is *Polygonum convolvulus*, the climbing Buck Wheat. It is now and again seen as a weed in Queensland, but is not particularly common. The seeds are a common ingredient of bird seed and chick food.

BUTTER FACTORY PAYMENTS.

A survey of the audited balance-sheets of Co-operative Dairy Associations in Queensland over the financial year 1929-30 indicates that no considerable difference exists in the payments made by the several Associations for their cream supplies.

The following table indicates the average pay by these Associations, and, taking 1s. 3d. per lb. of commercial butter to be the mean average, the amount over or below this figure indicates how closely factories have kept to this average.

In cases where suppliers receive benefits in dividends, deferred pays, or railway freights, such particulars are shown—

	Average Pay.	Above or below 1/3.	Carriage of Cream.
A.	1/4·07 and dividend	+ 1·07	Not paid.
B.	1/3·68	+ 0·68	Railway freight paid.
C.	1/3·54, bonus and dividend	+ 0·54	Not paid.
D.	1/3·53	+ 0·53	Not paid.
E.	1/3·44 and dividend	+ 0·44	Not paid.
F.	1/3·34, deferred pay and bonus ..	+ 0·33	Not paid.
G.	1/3·24 and dividend	+ 0·24	Not paid.
H.	1/3·04	+ 0·04	Not paid.
I.	1/3·01	+ 0·01	Railway freight paid.
J.	1/2·88 and dividend	— 0·12	All paid.
K.	1/2·76, deferred pay and dividend ..	— 0.24	Not paid.
L.	1/2·62 and dividend	— 0·38	Not paid.
M.	1/2·55 and dividend	— 0·45	All paid.
N.	1/2·44 and bonus	— 0·56	All paid.
O.	1/2·42 and dividend	— 0·58	All paid.
P.	1/2·39 and dividend	— 0·61	All paid.
Q.	1/2·25	— 0·75	All paid.

The above rates of pay may be influenced by several factors which must be taken into consideration by the dairy farmer. The following factors are illustrative of the point:—

(*a*) Payment of a dividend, bonus, or deferred pay is equivalent to an increase in the rate of pay.

(*b*) Payment for the carriage of cream by rail or road likewise is equivalent to an increase in rate of pay.

(*c*) Upon the situation of a factory depends the marketing costs to a great extent.

(*d*) The amount of butter manufactured affects the rate of pay. Large supplies reduce the rate of overhead expenses.

(*e*) Erection of new buildings and plant temporarily absorbs money, which would otherwise be available for cream pay, although the increased efficiency resulting from modern buildings and plant soon repays the dairy farmer for his investment.

(*f*) The quality of the cream supply plays an important part in the price question, for on it depends the quality of the butter and the amount received for the sale of such butter.

Consideration of the above factors will, to a great extent, explain the differences that exist in factory payments.

General Notes.

Staff Changes and Appointments.

Mr. S. M. Seamer, Inspector of Stock and Slaughter-houses, has been transferred from Cloncurry to Mount Isa as from the 1st November, 1930.

Mr. S. M. Seamer, Inspector of Stock, has been appointed also an Inspector of Slaughter-houses as from 1st November, 1930.

Mr. N. A. R. Pollock, Senior Instructor in Agriculture, Brisbane, has been transferred to Townsville as from the 13th October, 1930.

Mr. D. H. Robertson, of Albinia Downs, Springsure, has been appointed a member of the Leichhardt South Dingo Board.

The appointment of Mr. F. H. S. Roberts as Entomologist, Department of Agriculture and Stock, Brisbane, has been confirmed as from the 23rd January, 1930.

Police Constable P. J. Hotham has been appointed an Inspector under "*The Slaughtering Act of* 1898," at Imbil.

Animal and Bird Sanctuaries.

The new University site, situated on the Brisbane River at St. Lucia, and another property belonging to the University and situated on the main Moggill road, near the confluence of Moggill Creek and the Brisbane River, and containing respectively 223 acres and 693 acres, have been declared sanctuaries under "*The Animals and Birds Acts, 1921 to* 1924," in which it shall be unlawful for any person to take or kill any animal or bird. Messrs J. Pacey and B. Baker have been appointed Honorary Rangers for the lastmentioned sanctuary, as from the 8th November, 1930.

Proposed Egg Board.

The first egg pool was created in 1923 and it applied to all owners of 100 fowls or more in that part of Queensland east of a straight line drawn from Bundaberg to Goondiwindi. The pool was extended from time to time, and after a referendum of all those concerned it was in 1926 made to apply to owners of fifty fowls or over, instead of 100. This pool still exists, and expires in 1933, but, with the consent of a majority of producers it may, of course, be further extended after that date. The promoters of the pool, however, asked that it should be made applicable to all producers of eggs for sale irrespective of the number of fowls they own. This suggestion was not approved, and subsequently a deputation of poultrymen waited upon the Minister and urged that all poultrymen selling eggs from twenty fowls or over be brought under the pool.

A petition signed by about 190 growers of eggs was handed in asking that the pool be made applicable to all poultrymen selling eggs from twenty fowls or over. A notice of intention to create such a pool was issued on the 21st August, 1930, but later on the proposal was dropped. The question has been again raised, and as a result the Governor in Council has now approved of the issue of a notice of intention to make an Order in Council creating an egg pool to apply to poultrymen selling eggs from 20 fowls or over, this pool to be constituted on the following basis:—

1. All eggs produced for sale by poultrymen with 20 fowls or over within that area to the east of a straight line from Bundaberg to Goondiwindi to come under the pool.
2. Eggs required for the grower's family for food or for his own use for breeding to be exempt from the pool.
3. The board to be five poultrymen's representatives and the Director of Marketing or a deputy appointed by the Minister.
4. All eggs for sale produced by owners of 20 fowls and over to become the property of the board.
5. The pool will be for a period of ten years.
6. At the referendum to decide whether the pool shall be created a vote to be given to all who will come under it.
7. All poultry raisers selling eggs are to be registered.
8. Any merchant who deals in eggs except with the approval of the pool shall commit an offence.
9. The board may levy ½d. per dozen on eggs delivered to it or to its agents.

10. The board is also empowered to make a levy of ½d. per dozen under each of the following headings:—
    (*a*) For establishing an insurance fund against fire or other casualty;
    (*b*) For establishing a reserve;
    (*c*) For establishing a fund for any special object which may be in the common interests of poultry raisers.
11. All assets and liabilities of the existing pool to be transferred to the new pool.
12. A petition for a referendum may be handed in.
13. If a referendum is conducted a 60 per cent. majority will create the pool, and every poultryman who will come under the pool will be entitled to vote; in other words, the egg producers directly concerned will decide the issue.
14. If no petition is received the pool will be automatically established.
15. If the pool is rejected at the referendum, the old or existing pool will continue to function until the 31st December, 1933, just as if this new pool had never been mooted.

Any petition for a poll to decide whether the Order in Council creating an egg pool as above shall be made must be signed by at least fifty growers of eggs, and must reach the Minister on or before 5 p.m. on the 9th December, 1930. The term egg producers will cover—

(*a*) Any person owning 20 or more domesticated fowls, i.e., domesticated hens with or without the males and/or the young thereof;

(*b*) Any person keeping 20 or more domesticated fowls;

(*c*) Each member of any partnership which keeps 20 or more domesticated fowls, provided that each partnership shall have only one vote between them;

(*d*) Each member of any family which collectively owns or keeps 20 or more domesticated fowls, provided that each family shall have only one vote between them.

In order to ensure their names being on the roll of persons eligible to vote on any matters in connection with the proposed egg board, persons who are producers are invited to send their names and addresses at once to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Nominations will be received by the Returning Officer, Department of Agriculture and Stock, Brisbane, until 5 p.m. on the 9th December 1930, for election as producers' representatives on the proposed egg board.

Five representatives are to be elected by producers who, at any time in the last twelve months, produced eggs for sale in the following districts in the State of Queensland. One representative is to be elected for each:—

No. 1 District.—Such portions of the Petty Sessions Districts of Bundaberg, Gin Gin, Mount Perry, Eidsvold, Childers, Maryborough, Biggenden, Gayndah, Gympie, Kilkivan, Wienholt, Nanango, Maroochy, Caboolture, Woodford, and Kilcoy as are east of a line drawn from Bundaberg to Goondiwindi.

No. 2 District.—The Petty Sessions Districts of Redcliffe and that portion of Brisbane north of the Brisbane River.

No. 3 District.—The Petty Sessions Districts of Wynnum, Cleveland, and that portion of Brisbane south of the Brisbane River.

No. 4 District.—The Petty Sessions Districts of Logan, Southport, Beaudesert, Goodna, Ipswich, Lowood, Esk, Marburg, Harrisville, Dugandan, Rosewood, Laidley, Gatton, Helidon, and Toogoolawah.

No. 5 District.—Such portions of the Petty Sessions Districts of Toowoomba, Clifton, Pittsworth, Allora, Warwick, Killarney, Inglewood, Texas, Goondiwindi, Stanthorpe, Highfields, Crow's Nest, Oakey, Goombungee, Cooyar, Jondaryan, Cecil Plains, and Dalby as are east of a straight line from Bundaberg to Goondiwindi.

Each nomination is to be signed by at least ten (10) producers in the district concerned. The elected representatives will hold office for a period of one year as from the date of appointment.

Arrowroot Board Levy.

In 1924, an Order in Council was passed empowering the Arrowroot Board to make a levy on arrowroot-growers at the rate of ¼d. per ton for the administrative expenses of the Board. This levy has been found to be insufficient for the purpose, and accordingly an Order in Council has now been passed increasing the levy to 6d. per ton.

Banana Weevil Borer—Investigation Committee.

By a regulation issued under the Fruit Marketing Organisation Acts on the 21st April, 1927, provision was made for the formation of a Committee of Investigation to inquire into the claims in connection with the reward of £2,500 for an effective scheme of treatment for the control of the banana weevil borer. The Committee of Direction of Fruit Marketing made application for an alteration of the personnel of the Committee, and the present Committee will therefore comprise Professor E. J. Goddard, Messrs. R. Veitch, J. A. Weddell, K. R. Heck, A. E. Maher, and W. Ranger.

Notice to Buyers of Fertilisers.

Farmers and other buyers would be well advised not to accept delivery of any material unless it has affixed to every package a plainly printed label setting out the percentages of nitrogen, phosphoric acid, and potash, and the forms in which they respectively occur. The buyer should also receive an invoice certificate setting out the particulars that should appear on the labels. Such certificate is the seller's guarantee as to the quality of the material. In the absence of such label and invoice certificate, it is obvious that the buyer should at once communicate with the Department of Agriculture, William street, Brisbane. Buyers are urged to examine all goods on the day of delivery, and when in doubt regarding any fertilisers, seeds, stock foods, or pest destroyers, to write at once to the Department of Agriculture, Brisbane, in order that the matter may be immediately investigated.

Christmas Gifts.

The time-worn question of what to give for a Christmas present is solved by the display of seasonal goods at Pike Brothers.

Presents from Pike Brothers are always acceptable, whether the cost be considerable or modest. It will be wise to shop early and have the advantage of being able to make a selection from a wide range, especially from among several exclusive lines that are of very limited stock. There are several unique, new styles of watches, rare and exquisite perfumes, charming lingerie, silk ties, leather goods, pipes, and other suitable gifts, all well worth a thought when planning Christmas surprises.

Central Cane Prices Board.

The Central Sugar Cane Prices Board has been constituted for a period of three years as from the 13th November, 1930, to consist of the following members:—

His Honour Mr. Justice William Flood Webb (Chairman),
Thomas Alfred Powell (Canegrowers' Representative),
Ernest Stanley Smith (Millowners' Representative),
John McClew MacGibbon (Qualified Sugar Chemist), and
Alexander Robert Henry (Secretary).

Highly Efficient Canecutters Earn their Money.

A vigorous defence of the Queensland canecutter was made by Mr. W. J. Riordan (A.W.U.) when giving evidence before the Commonwealth Committee of Inquiry into the sugar industry. These men, said Mr. Riordan, particularly the young Australians and North Queenslanders, were doing work which demanded highly scientific skill, and those theorists who had written books on fatigue had nothing on these virile cutters. It was very seldom that an old man was found in the cutting gangs. The fastest man was selected to make the pace in the field, and a slow man did not last very long. He was quickly dropped. A visitor to the camps could see them being rubbed with embrocation, and even when engaged in cutting they rested for brief periods if they felt that the strenuous work was likely to impair their efficiency. "So far as I am concerned," remarked Mr. Dutton, a member of the committee, "the cutters earn their money."

Barley Board—Skinless Barley Exemption.

A notice was published in the "Government Gazette" recently to the effect that skinless barley had been exempted from the operations of the Barley Board. In drawing attention to this notice it was stated that, accordingly, the Board's operations would, in future, apply only to malting barley. This statement was obviously incorrect, as the Board will, in future, apply to all barley produced in Queensland, including malting and Cape barley, but with the sole exception of skinless barley.

Introduction of Apples and Pears to Warwick-Stanthorpe District.

On the 21st August, 1930, a Proclamation was issued in which it was declared that all fruit of both apples and pears consigned to any railway station between Wallangarra and Warwick, both inclusive, must be accompanied by a certificate signed by an inspector setting forth that the fruit had been examined and found to be free from the disease "Black Spot," and that such consignments must previously be brought to the picking-over shed, Brisbane, and repacked there under the supervision of an inspector before a certificate would be issued. However, it was found that the Proclamation did not have the desired effect, as fruit merchants adopted the practice of consigning their fruit by rail to Mill Hill, and then to Warwick and other stations per motor truck. Therefore a new Proclamation has been issued, rescinding the former one, which declares that all apples and pears shall be permitted to be introduced into that part of the State comprising the petty sessions districts of Stanthorpe, Warwick, Killarney, Allora, and Clifton, only on condition that the fruit is accompanied by a certificate signed by an inspector stating that the fruit has been examined and found to be free from "Black Spot," and that consignments thereof from Brisbane to any place abovementioned were previously brought to the picking-over shed, Brisbane, and repacked there under the supervision of an inspector before the certificate was issued. This will obviate the difficulty at present experienced, as the conditions will apply to all fruit of apples and pears introduced into the Warwick-Stanthorpe district by rail or road.

Fur-Bearing Rabbits—Amendment of Regulations.

Regulations were issued under the Animals and Birds Acts of this State on the 23rd January, 1930, providing for the licensing of Angora, Chinchilla, or any approved fur-bearing rabbits. Provision was made for the taking of all possible precautions for the safe maintenance of these rabbits in enclosures built in accordance with certain plans and specifications.

The Angora is imported in greater numbers into this State, but the Chinchilla rabbits have been secured by a few rabbit fanciers. The Angora is purely a wool rabbit, and is such a delicate animal that no danger is to be apprehended even if the animal managed to escape from an enclosure, as it would quickly die or be destroyed by cats or dogs. On the other hand, Queensland is still hampered somewhat by lack of experience of the habits of the Chinchilla, and a difference of opinion still exists as to whether this type of rabbit is a burrower, although the evidence available tends to indicate that he does burrow. Consequently, it has been thought desirable to postpone the issue of further licenses for the maintenance of the Chinchilla and other fur-bearing rabbits, and it has been declared that no one shall be granted a license under the regulations, as they are now amended, to keep Chinchilla rabbits unless he holds a license to keep such rabbits in respect of the year 1930 or some part thereof.

Briefly, Angora rabbits may still be introduced. No more Chinchilla or other fur-bearing rabbits may be introduced, but those persons who have these rabbits now in Queensland may continue to keep them, but they will not be allowed to dispose of any of the progeny to anybody else. Chinchilla rabbits now on order overseas can be delivered in Queensland to registered dealers on the understanding that they only go to persons who at present keep Chinchillas.

The Romantic North.

Port Douglas beach, in North Queensland, according to the Minister for Mines (Mr. E. A. Atherton), is an enchanting place. In the Legislative Assembly recently, discussing the vote for the Intelligence and Tourist Bureau, he said that couples went motoring on that beach, where they became so enamoured of one another that they stopped the car. In the course of time the tide rose, isolating them from the mainland, and they were forced to remain there till the waters subsided. He advised every one who has not been there to visit North Queensland.

Travelling Schools.

The Queensland travelling manual training and domestic science schools are in operation for the especial benefit of primary school pupils and adults living in places remote from rural schools or technical colleges. These schools provide a short, continuous, intensive course of instruction, and the facilities for training thus provided are highly appreciated by the people of the far north and west. During the year the schools Nos. 1 and 4 travelled as far west as Cunnamulla, 604 miles from Brisbane; the schools Nos. 2 and 3 conducted courses at Ravenswood and at places north of Townsville and including the Atherton Tableland.

General Farm Layout.

In considering the lines upon which a dairy farm should be laid out, there are a few general principles that should be kept in view in all cases. These may be stated as follows:—

1. Easy access to all parts of the farm.
2. Efficient and economical handling of stock and performance of all farm operations.
3. Good drainage.
4. Aspect—protection from weather and openness to sunlight.
5. Economy of working.
6. Safeguarding the contents of separator and cream store-room from contamination from dust and bad smells.

What is its Capacity?—How to Measure a Sheep-dipping Bath.

For the safe and effective dipping of sheep, the dipping powder or liquid must be used at exactly the strength prescribed, and to this end it is necessary that the liquid capacity of the bath be accurately gauged. The following method of measuring is recommended in a bulletin of the Stock Branch of the New South Wales Department of Agriculture:—

1. Take the length of the top, add the length of the bottom, and divide by 2. This gives the average length.
2. Take the width of the top, add the width of the bottom, and divide by 2. This gives the average width.
3. Multiply the average length by the average width by the depth to obtain the cubical contents.
4. As 1 cubic foot equals 6¼ gallons, the capacity of the dip in gallons is obtainable by multiplying the cubical contents by 6¼.

As an example of the method of calculation, take a dip 42 feet long on the top, 17 feet long on the bottom, 6 feet deep, 2 feet wide across the top, and 10 inches wide on the bottom. The figures would be as follows:—

$$\frac{42 + 17}{2} = \frac{59}{2} \text{ feet.}$$

$$\frac{2 \text{ ft.} + 10 \text{ in.}}{2} = \frac{2 \text{ ft. } 10 \text{ in.}}{2} = 1 \text{ ft. } 5 \text{ in.} = \frac{17}{12} \text{ feet.}$$

$$\frac{59}{2} \times \frac{17}{12} \times \frac{6}{1} = \frac{1003}{4} \text{ cubic feet.}$$

$$\frac{1003}{4} \times 6\tfrac{1}{4} = \frac{1003}{4} \times \frac{25}{4} = \frac{25075}{16} = 1{,}567\tfrac{3}{16} \text{ gallons.}$$

In ascertaining the amount of fluid in the bath, measure from the surface of the water. The dip will never be filled right to the top and therefore a measuring stick should be used to obtain a depth, or the measurements marked on the side of the dip.

Another way of ascertaining the capacity of the dipping bath is to measure water into it from a tank of known capacity. First run into the bath, say 3 feet of water and keep a record of the number of gallons required to do this by marking same permanently on the side of the bath. Now continue to add water in 100-gallon quantities, and mark each of these 100-gallon levels on the side of the bath up to 6 inches from the top. A rod may be marked in a similar way, in which case it is advisable to have several rods in case one gets lost.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

CARE OF BABIES IN HOT WEATHER.

As the weather grows warmer babies need less clothing. In some parts of Queensland the weather is changeable at this season, and the baby's clothing should be regulated by the temperature, not by the calendar. Over-clothing causes sweating, and may lead to irritation and inflammation of the skin. Waterproof coverings over wet napkins are very likely to do this, and they should not be used. When it becomes really hot, the baby will be happier if he wears little or nothing besides a napkin and singlet with all his limbs free, but protected by mosquito-netting against flies and mosquitoes. He enjoys kicking his legs and waving his arms freely, and this is one of the advantages Queensland babies have.

In hot weather babies need rather less food but more water. Let them have water to drink between their feeds. A baby may be thirsty without being hungry, and if you try to satisfy his thirst with milk, which is a food, you may upset him. Be careful in increasing his diet at this season. If he is being fed on cow's milk this should be clean and fresh. As soon as possible after delivery put the milk in a small saucepan, which should be used for this purpose only, and bring it to the boiling point. Unless the milk has been properly pasteurised by a trustworthy process, this should always be done. Freshly boiled or pasteurised milk will keep quite fresh in an icebox for twenty-four hours, but without ice it cannot be expected to keep fresh for more than twelve hours. An icebox can be made of a kerosene tin placed in a box with 3 or 4 inches of dry sawdust all round, and covered by a lid.

Diarrhoea.

Babies who are being artificially fed very easily get diarrhœa in hot weather. It may be caused by overfeeding, by unsuitable food, or by milk which is stale or dirty. If an artificially fed baby begins to have loose motions, all his food and all his milk should be stopped. He should be given one dose of castor oil to clear out any undigested food, and after that he should have nothing but thin barley water slightly sweetened for twenty-four hours. If then he is not quite well you should get medical advice or take him to the nearest Baby Clinic.

Gastro-Enteritis or Dysentery.

This is a serious disease which may begin gradually with loose motions, but sometimes comes on suddenly with fever and much weakness and irritability. The motions may be simply loose at first, but after a time they are seen to contain slime tinged with blood, may be very frequent and attended by much straining. Next month there will be many cases of this disease in Queensland, and some of these babies will die, for this has been so every year. If all our mothers understood how the disease is caused, and why it spreads from house to house, there would be much less dysentery and very few deaths from this cause among our babies.

Dysentery is not caused by the heat. Usually the worst of the epidemic is over before the hottest weather begins, though sometimes it continues right through the summer. Dysentery is not caused by feeding babies on cow's milk, for all disease germs in the milk are killed by boiling or pasteurising. But it is much more common among bottle-fed babies, whatever food they are getting, than among babies on the breast. The disease is caused by dysentery bacilli, and these disease germs are conveyed by flies from closet-pans or other filth to the babies' food. Not only must the food be most carefully protected from flies, but so must the bottles and teats after they have been scalded. Even breast-fed babies are not safe if they have dummies pinned on to their frocks to invite the disease-bearing flies to settle on them.

Protect your baby against this enfeebling, painful, dangerous, and often fatal disease by natural feeding, by avoiding the dangerous dummy, and by carefully protecting its artificial food from infection by flies.

Barley-water.

To make barley-water, take one tablespoonful of pearl barley, wash it carefully, add to 1 pint of water, and simmer for one hour. Then make up to 1 pint from the kettle, and strain carefully. Prepare fresh twice daily.

CONSTIPATION IN BABIES.

Breast-fed babies are never really constipated. Their motions are always soft, though they may be passed at long and irregular intervals. This sluggishness of the bowels arises from two causes—(1) Giving castor oil to the baby; (2) want of proper training.

Castor Oil Not Necessary for the Newborn Baby.

The first effect of castor oil is to empty the bowels. Its second effect is to prevent them from acting. The harmful and unnecessary practice of giving castor oil to a newborn baby starts an irregularity which is kept up and increased by repeated doses of castor oil. There results a condition artificially manufactured by the mother or nurse, which she calls "constipation."

Once or twice a day the baby should be allowed to lie without his clothes, or with only a singlet, and exercise his legs and abdominal muscles by freely kicking, for fifteen or twenty minutes in warm weather. This will often induce a motion. If necessary he must be held out over a pan, just touching its rim. It is a good plan to hold out a baby after each feed. He will pass water, thus keeping his napkin dry, and will often pass a motion. If the baby's training has been long neglected, these methods may not suffice. It may then be necessary to pass a soap pencil dipped in oil, or inject a few teaspoonfuls of plain boiled water into the bowel. Gently kneading the abdomen, beginning low on the right side, upwards to the ribs, across, and down on the left side, should help. Medicines should not be necessary.

Bottle-fed Babies.

Bottle-fed babies suffer from the same mismanagement and need the same treatment. With them the condition is more troublesome, for cow's milk is often constipating and causes firmer motions, often in solid masses, and sometimes in small round lumps like pebbles. The food may need adjusting, and it would be wise to consult a clinic nurse if possible. See that the baby drinks enough water. He may be taking more milk, especially if this is dried milk, than he should. The substitution of malt-sugar in the form of Mellin's Food, Maltogen, or Extract of Malt, for some or all of the sugar in his food, is often helpful, so is prune juice given as a medicine. If drugs are necessary, fluid magnesia, milk of magnesia, and liquid petroleum oil may be given in teaspoonful doses once or twice a day. No other medicines should be given except on medical advice.

A Very Important Point.

This is very important. Whatever medicines are given for constipation, much depends on the way the medicine is given. If too large a dose is given, or if it is given every second or third day, or once or twice a week, the irregularity of the bowels is increased, and the constipation may become permanent. The medicine should be given every day at the same time, in just sufficient doses to produce its effect and no more. The dose must be determined by trial. Once a daily regular action has been established, the dose should be slowly made less, and after a time may be left off. Used rightly, the medicine will help to cure constipation; used wrongly, the same medicine will make it worse.

THREADWORMS.

Children with threadworms generally suffer from an itchiness at the seat especially at bedtime. This may make them restless and prevent them from going to sleep. The itchiness is caused by the worms coming out of the anus and crawling about. More serious symptoms from threadworms are extremely rare in Queensland. "Picking at the nose" is not a sign of worms.

The only way to be sure that a child has threadworms is to see them in the motions. This is not difficult. They are about the size of cotton thread, about half an inch long, and are probably alive and wriggle. All sorts of things in the motions, for instance the stringy parts of bananas, are sometimes mistaken by mothers for worms. If you are in doubt, put the things into a small bottle with methylated spirits and show them to your doctor. Children should not be given medicines for worms that they have not got.

Causes.

Every threadworm grows from an egg which has been swallowed. These eggs are very small and can be seen only with a microscope. The young child swallows some of these eggs accidentally, perhaps from the fingers of another child. When the worms crawl out to lay their eggs and so cause itchiness, he crushes them with his fingers, which become covered with these invisible eggs. Even though the hands are washed clean, there remain many eggs under the finger nails. All young children put their fingers into their mouths at times, and so they are continually reinfecting themselves, and increasing the number of their worms. Older children who suffer from worms will be found nearly always to have the habit of biting their nails.

Treatment.

If the worms are numerous, medical treatment will give relief. Strong medicines are necessary, and as these may be dangerous, they should be given only under medical direction. Injections of strong salt and water (as much salt as the water will dissolve) given after the bowel has been emptied will often bring away many worms, and these injections are harmless. Though many worms may be brought away by medical treatment, there are nearly always a few left behind. From these the child will probably reinfect himself, and in a few months may have as many as before.

The real cure of threadworms depends on the mother. Make the child sleep in good thick "combinations," so that his fingers cannot get at the worms to crush them. Smear some vaseline around the anus before he goes to bed to prevent the worms crawling and causing itching, or ask your doctor for some ointment which will kill the worms when they come out. If reinfection is prevented, the few worms left will die out of themselves.

VEGETABLES.

Vegetables will require constant attention next month, particularly in the Granite Belt area. Tomatoes and potatoes should be carefully watched in order to prevent loss from Irish blight, and no time should be lost in spraying these crops should this disease make its appearance in any part of the district, as it can be prevented by spraying with either Bordeaux or Burgundy mixture. These fungicides effectually protect the plants to which they are applied if used in time. If leaf-eating insects, such as beetles, grasshoppers, and caterpillars, are doing damage as well, add 3 or 4 lb. of arsenate of lead to the 100 gallons of spraying mixture used for the prevention of early and late blight (potato macrosporium and Irish blight), so that the one application will be effectual for both classes of diseases.

Keep all kinds of vegetables well worked, stirring the land frequently to retain moisture, and taking care to prevent the formation of a surface crust should rain fall. Remember that vegetables require plenty of moisture; therefore leave nothing to chance, but do your best to retain all the moisture in the soil you possibly can.

FLOWER GARDEN.

To make the flower-beds gay and attractive during the autumn and winter months is not a matter of great difficulty. Prepare a few shallow boxes. Make a compost, a great part of which should consist of rotten leaves. Fill the boxes with the compost; then sow thinly the seeds of annuals. Keep the surface of the soil moist, and when the young seedlings are large enough to handle, lift them gently one by one with a knife or a zinc label—*never pull them up by hand*, as, by so doing, the tender rootlets are broken, and little soil will adhere to the roots. Then prick them out into beds or boxes of very light soil containing plenty of leaf mould. Keep a sharp lookout for slugs and caterpillars.

All kinds of shrubby plants may be propagated by cuttings. Thus, pelargoniums, crotons, coleus, and many kinds of tropical foliage plants can be obtained from cuttings made this month. After putting out cuttings in a propagating frame, shade them with a piece of calico stretched over it. Be careful not to over-water at this season. Propagate verbenas, not forgetting to include the large scarlet fox hunter. Verbenas require rich soil. Palms may be planted out this month. If the weather prove dry, shade all trees planted out. With seed-boxes, mulch, shade, water, and kerosene spray, all of which imply a certain amount of morning and evening work, the flower garden in autumn and winter will present a charming sight.

KITCHEN GARDEN.

A first sowing of cabbages, cauliflower, and Brussels sprouts may now be made in covered seed beds, which must be well watered and carefully protected from insect pests. Sow in narrow shallow drills; they will thus grow more sturdy, and will be easier to transplant than if they were sown broadcast. The main points to be attended to in this early sowing are shading and watering. Give the beds a good soaking every evening. Mulching and a slight dressing of salt will be found of great benefit. Mulch may consist of stable litter, straw, grass, or dead leaves. Dig over all unoccupied land, and turn under all green refuse, as this forms a valuable manure. Turn over the heavy land, breaking the lumps roughly to improve the texture of the soil by exposure to the sun, wind, and rain. In favourable weather, sow French beans, cress, cauliflower, mustard, cabbage, celery, radish for autumn and winter use. Sow celery in shallow well-drained boxes or in small beds, which must be shaded till the plants are well up. Parsley may be sown in the same manner. Turnips, carrots, peas, and endive may also be sown, as well as a few cucumber, and melon seeds for a late crop. The latter are, however, unlikely to succeed except in very favourable situations. Transplant any cabbages or cauliflowers which may be ready. We do not, however, advise such early planting of these vegetables, because the fly is most troublesome in February. For preference, we should defer sowing until March. Still, as "the early bird catches the worm," it is advisable to try and be first in the field with all vegetables, as prices then rule high. Cucumbers, melons, and marrows will be in full bearing, and all fruit as it ripens should be gathered, whether wanted or not, as the productiveness of the vines is decreased by the ripe fruit being left on them. Gather herbs for drying; also garlic, onions, and eschalots as the tops die down.

CONTROL OF WEEDS—SOME USEFUL MEASURES.

Once some species of weeds become firmly established, eradication is practically impossible; effective control of these is only possible before they have become established. Where weeds have taken possession and landowners realise that cutting is impossible, they look with hope to the use of chemicals as a means of destruction; but the question of cost must be considered, and although chemicals have been found to be effective in destroying weeds, on the whole the cost in such cases is prohibitive.

The old method of destroying plants by hand-hoeing or cultivation still remains as practically the only effective one that can be adopted. Provided the weeds are attacked in time and every care is exercised in cutting out new plants as they appear, weeds can be kept in control by this means at a comparatively low cost. Nevertheless, from various causes, weeds may eventually become so firmly established that other methods must be adopted, and the following suggestions are made so that farmers and graziers may adapt them to their needs in accordance with the severity of the infestation and the means at their disposal.

Destruction by Cultivation.—Certain weeds that are crop pests have roots or underground stems of such a nature that the plant reproduces freely from them, and, as a consequence, these weeds (amongst them are Johnson grass, sorrel, bindweed, &c.) are difficult to control. The most effective means of controlling weeds of this type is to plough the land deeply about September, and to cultivate it in such a way that the soil moisture is dried out. This can usually be done by cultivating the land very deeply with springtooth or rigid tine cultivators.

The object should be to loosen the land as much as possible, and at the same time to bring the roots to the surface. Provided the weather remains dry, this method is fairly effective, and if the weed is not killed entirely it is thinned out to a considerably extent. Obviously, however, the method is only successful when the weather is fairly dry, and it does not give good results in districts with a heavy rainfall.

Smothering Crops.—In conjunction with the cultivation method, smothering crops can be used with excellent results. After cultivating the land thoroughly in the way suggested, a rapid-growing crop such as wheat or oats should be sown. The cultivation of the land puts it in good condition for the crop, and the rapid growth under fairly favourable conditions prevents weed growth and establishes control.

Enforced Germination.—Another method of bringing weeds under control by cultivation is to work the land in such a way that the most favourable conditions are created for the germination of seed, and then to destroy the seedlings. Every farmer knows that when crop seed is being sown the soil must be put into a favourable condition for germination, and if the object is to destroy weeds, similar conditions must prevail.

The time and method of cultivating the soil will depend on the habits of the weed. If the weed is one which grows in the spring the soil workings must be made with the object of having the soil in proper condition at that period, while on the other hand if they are winter-growing seeds the soil must be prepared for favourable germination during the autumn.

Generally the practice should be to plough the land at least a month or two before the period when germination is expected, to allow weathering, and then to work with cultivator and harrows to reduce the soil to a fine tilth. In some cases, especially if the soil is in a loose condition, it may be advisable to use a roller in order to make it firm, as germination always occurs more satisfactorily when the seed is in a firm soil with from 1 inch to 2 inches of loose, fine soil on the surface. The young seedlings are then destroyed by the subsequent cultivations given to preserve the mulch and to prepare the seed-bed for the crop.

For weeds such as saffron thistle, star thistle, and others of a similar character which infest the wheat-growing areas, this is the most effective method, but to control these and other weeds which affect the wheat crop it is necessary to adopt a system of long fallow and to have the land under cultivated fallow for about twelve months.

Orchard Notes for January.

THE COASTAL DISTRICTS.

All orchards, plantations, and vineyards should be kept well cultivated and free from weed growth; in the first place, to conserve the moisture in the soil, so necessary for the proper development of all fruit trees and vines; and, secondly, to have any weed growth well in hand before the regular wet season commences. This advice is especially applicable to citrus orchards, which frequently suffer from lack of moisture at this period of the year if the weather is at all dry, and the young crop of fruit on the trees is injured to a greater or less extent in consequence.

Pineapple plantations must also be kept well worked and free from weeds, as when the harvesting of the main summer crop takes place later on, there is little time to devote to cultivation. If this important work has been neglected, not only does the actual crop of fruit on the plants suffer, but the plants themselves receive a setback.

Banana plantations should be kept well worked, and where the soil is likely to wash badly, or there is a deficiency of humus, a green crop for manuring may be planted. Should the normal wet season set in, it will then soon cover the ground without injury to the banana plants. When necessary, banana plantations should be manured now, using a complete manure rich in potash and nitrogen. Pineapples may also be manured, using a composition rich in potash and nitrogen, but containing no acid phosphate (superphosphate) and only a small percentage of bonemeal, ground phosphatic rock, or other material containing phosphoric acid in a slowly available form.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Fruit fly should receive special attention, and on no account should infested fruit of any kind be allowed to lie about on the ground to become the means of breeding this serious pest. If this is neglected, when the main mango crop in the South and the early ripening citrus fruits are ready, there will be an army of flies waiting to destroy them.

Be very careful in handling and marketing of all kinds of fruit, as it soon spoils in hot weather, even when given the most careful treatment. Further, as during January there is generally more or less of a glut of fresh fruit, only the best will meet with a ready sale at a satisfactory price.

Grapes are in full season, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends very much on the condition in which they reach the market and open up for sale. Well-coloured fruit, with the bloom on and without a blemish, always sells well, whereas badly coloured, immature, or bruised fruit is hard to quit.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe, and there is no better way to spoil its sale than to try and force it on the general public when it is sour and unfit to eat.

Bananas for sending to the Southern States require to be cut on the green side, but not when they are so immature as to be only partially filled. The fruit must be well filled but show no sign of ripening; it must be carefully graded and packed and the cases marked in accordance with the regulations under the Fruit Cases Acts and forwarded to its destination with as little delay as possible.

Pineapples should be packed when they are fully developed, which means that they contain sufficient sugar to enable the fruit to mature properly. Immature fruit must not be marketed, and if an attempt is made to do so the fruit is liable to seizure and the sender of the fruit to prosecution under the abovenamed regulations. Further, the fruit must be graded to size and the number of fruit contained in a case must be marked thereon. Immature fruit must not be sent. For canning, the fruit should be partly coloured; immature fruit is useless; and overripe fruit is just as bad. The former is deficient in colour and flavour and the latter is "winey" and of poor texture, so that it will not stand the necessary preparation and cooking.

Should there be a glut of bananas, growers are advised to try and convert any thoroughly ripe fruit into banana figs.

The fruit must be thoroughly ripe, so that it will peel easily, and it should be laid in a single layer on wooden trays and placed in the sun to dry. If the weather is settled, there is little trouble, but if there is any sign of rain the trays must be stacked till the weather is again fine, and the top of the stack protected from the rain. To facilitate drying, the fruit may be cut in half lengthways. It should be dried till a small portion rubbed between the finger and thumb shows no sign of moisture. It can be placed in a suitable box to sweat for a few days, after which it can be dipped in boiling water to destroy any moth or insect eggs that may have been laid on it during the process of drying and sweating. It is then placed in the sun to dry off any moisture, and when quite dry it should be at once packed into boxes lined with clean white paper. It must be firmly packed, when, if it has been properly dried, it will keep a considerable time. It can be used in many ways, and forms an excellent substitute for raisins, sultanas, currants, or other dried fruits used in making fruit cakes and other comestibles. Banana figs will be found useful for home consumption, and it is possible that a trade may be built up that will absorb a quantity of fruit that would otherwise go to waste.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

January is a busy month in the Granite Belt, and orchardists are fully occupied gathering, packing, and marketing the crop of midseason fruits, consisting of plums of several kinds, peaches, nectarines, pears, and apples. The majority of these fruits are better keepers and carriers than those that ripen earlier in the season; at the same time, the period of usefulness of any particular fruit is very limited, and it must be marketed and disposed of with as little delay as possible.

With the great increase in production, owing to the large area of new orchards coming into bearing and the increasing yields of those orchards that have not come into full profit, there is not likely to be any market for immature or inferior fruit. There will be ample good fruit to fully supply the markets that are available and accessible. Much of the fruit will not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central District, and, if they are very carefully selected, handled in a manner to prevent any bruising, and properly graded and packed, they should carry as far as Townsville. Growers must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first-class condition is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit, to grade it for size and colour, to pack it carefully and honestly, placing only one-sized fruit, of even quality and even colour, in a case and packing it so that it will carry without bruising, and, when opened up for sale, will show to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior, badly graded, or badly packed fruit is very likely to find when the returns for the sale of this fruit are to hand that after paying expenses there is little, if anything, left. The expense of marketing the fruit is practically the same in both cases.

Then why "spoil the ship for a ha'p'orth of tar" after you have gone to the expense of pruning, spraying, manuring, and cultivating your orchard? Why not try and get a maximum return for your labour by marketing your fruit properly? The packing of all kinds of fruit is a fairly simple matter, provided you will remember—

(1) That the fruit must be fully developed, but yet quite firm when gathered.

(2) That it must be handled like eggs, as a bruised fruit is a spoilt fruit, and, when packed with sound fruit, spoils them also.

(3) That only one-sized fruit, of an even degree of ripeness and colour, must be packed in a case.

(4) That the fruit must be so packed that it will not shift, for if it is loosely packed it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

If these simple rules are borne in mind, growers will find that much of the blame they frequently attribute to the fruit merchants or middlemen is actually the result of their own lack of care. Fruit that opens up in the pink of condition sells itself, whereas any fruit that opens up indifferently is hard to sell on any except a bare market, and on a glutted market is either unsaleable or realises such a poor price that the grower is frequently out of pocket and would have been better off had he not attempted to market it.

If spraying with arsenate of lead, and systematic bandaging, has been properly carried out, there will be comparatively few codlin moths to destroy the later ripening pip fruits; but if these essential operations have been neglected or carelessly carried out a number of moths will hatch out and the eggs laid by them will turn to larvæ that will do much damage, in some cases even more than that caused by the first broods that attack the fruit as soon as it is formed. Where there is any likelihood, therefore, of a late crop of moths, spraying with arsenate of lead must be continued if the late crop of pip fruits is to be kept free from this serious pest.

Fruit fly must be systematically fought, and on no account must any fly-infected fruit be allowed to lie about on the ground and breed this pest, to do further damage to the later ripening fruits.

Citrus orchards will need to be kept well cultivated in the drier and warmer parts of the State, and, where necessary, the trees should be irrigated. If scale insects are present, the trees should be either sprayed, or, better still, treated with hydrocyanic acid gas.

Western grapes are in full season, and if they are to be sent long distances by rail then they are all the better to be cut some hours before they are packed, as this tends to wilt the stems and keep the berries from falling off in transit. The fruit must be perfectly dry when packed, and should be as cool as possible. It must be firmly packed, as a slack-packed case always carries badly and the fruit opens up in a more or less bruised condition.

Farm Notes for January.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as suitable weather is experienced. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed is sown, of kinds and in quantities to suit local conditions, the circumstances being kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in this way will "trap" moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, in the same direction as the rows are running, using light lever harrows with the tines set back at an angle to obviate dragging out of plants, but the work should not be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and liberty millet (panicum). In favourable situations, both "grain" and "saccharine" sorghums may still be sown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing artificial grasses may be expected to lose some of their succulence in autumn, and more of it in winter and early spring, the cropping "lay-out" to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture-holding capacity of the soil. Planter's friend (sorghum) may be sown as a broadcast crop at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Strips of land should be prepared also for a succession sowing about the second week in February, and for winter-growing fodder crops.

Plate 196.—Station Homestead, Eurella, *via* Roma.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	December, 1930.		January, 1931.		MOONRISE. Dec. 1930.	Jan. 1931.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	4.52	6.30	5.3	6.47	1.55	3.38
2	4.52	6.30	5.3	6.47	2.53	4.41
3	4.52	6.31	5.4	6.47	3.51	5.46
4	4.53	6.32	5.4	6.48	4.52	6.49
5	4.53	6.33	5.5	6.48	5.57	7.50
6	4.53	6.34	5.6	6.48	7.0	8.42
7	4.53	6.34	5.6	6.49	8.5	9.24
8	4.53	6.35	5.7	6.49	9·6	10.12
9	4.53	6.35	5.8	6.49	10.1	10.37
10	4.54	6.36	5.9	6.49	10.47	11.9
11	4.54	6.37	5.9	6.49	11.26	11.42
12	4.54	6.38	5.10	6.49	...	...
					a.m.	a.m.
13	4.54	6.38	5.11	6.49	12.1	12.19
14	4.54	6.39	5.12	6.48	12.35	12.53
15	4.54	6.39	5.13	6.48	1.8	1.37
16	4.55	6.40	5.14	6.48	1.40	2.25
17	4.55	6.40	5.15	6.48	2.16	3.19
18	4.56	6.41	5.16	6.48	2.55	4.15
19	4.56	6.41	5.17	6.47	3.40	5.11
20	4.57	6.42	5.17	6.47	4.32	6.7
21	4.57	6.43	5.18	6.47	5.27	7.5
22	4.58	6.43	5.19	6.47	6.23	7.58
23	4.58	6.44	5.20	6.47	7.20	8.50
24	4.59	6.44	5.21	6.47	8.15	9.42
25	4.59	6.45	5.21	6.46	9.12	10.31
26	5.0	6.45	5.22	6.46	10.4	11.26
					p.m.	p.m.
27	5.0	6.46	5.22	6.46	10.57	12.21
28	5.1	6.46	5.23	6.46	11.49	1.20
29	5.1	6.46	5.24	6.45	12.41	2.22
30	5.2	6.47	5.24	6.45	1.36	3.24
31	5.3	6.47	5.25	6.45	2.34	4.28

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Phases of the Moon, Occultations, &c.

6 Dec.	○	Full Moon	10 40 a.m.
13 „	☽	Last Quarter	6 7 a.m.
20 „	●	New Moon	11 24 a.m.
28 „	☾	First Quarter	1 59 p.m.

Perigee, 10th December, at 11.42 a.m.
Apogee, 26th December, at 5.48 a.m.

Mars, having apparently travelled through the constellation Cancer and reached the border of Leo on 28th November, will proceed barely 3 degrees further amongst the stars of the latter constellation until 19th December. It will then seem to come to a standstill and move backward about 5½ degrees into Cancer, until 4th May next year.

Mercury will reach its greatest elevation, 20 degrees above the western horizon, at sunset on the 20th.

Venus will be shining with unusual lustre at Christmas time, reaching its greatest phase on the 28th. It will be apparently amongst the stars of the head of Scorpio.

Mercury will set at 7.34 p.m. on the 1st and at 8.8 p.m. on the 15th.

Venus will rise at 4 a.m. on the 1st and at 3.3 a.m. on the 15th.

Mars will rise at 11.8 p.m. on the 1st and at 10.19 p.m. on the 15th.

Jupiter will rise at 9.29 p.m. on the 1st and at 8.24 p.m. an the 15th.

Saturn will set at 8.49 p.m. on the 1st and at 8.0 p.m. on the 15th.

The Southern Cross, having reached position V. about 6 p.m. on the 1st, will be coming into view in the south-east about 11 p.m. and will reach position IX. about 2 a.m.

4 Jan.	○	Full Moon	11 15 p.m.
11 „	☽	Last Quarter	3 9 p.m.
19 „	●	New Moon	4 36 a.m.
27 „	☾	First Quarter	10 5 a.m.

Perigee, 7th January, at 12.48 a.m.
Apogee, 22nd January, at 11.18 p.m.

The Earth will be at its least distance from the Sun, 91,330,000 miles, on the 3rd.

The Moon will be passing from west to east of Jupiter, early in the morning of the 5th when both are in the north-west and Jupiter 5 degrees to the southward of the Moon.

The Sun will pass from west to east of Saturn on the 5th, about half a degree on its southern side. Saturn will then be on the far side of its orbit, 978,000,000 miles from the Earth, whereas the Sun will be only 91,500,000 miles away.

Mercury will pass from west to east of the Sun on the 6th on the side of its orbit nearest to the Earth; but being 2 degrees to the northward will avoid a transit of the Sun's face. On the 28th it will be at its greatest western elongation, 25 degrees, and rise one hour 52 minutes before the Sun.

On the opposite side of the sky Jupiter, on the 6th, will reach a position in its orbit which brings it nearly to its least distance from the Earth.