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Recent radio talks

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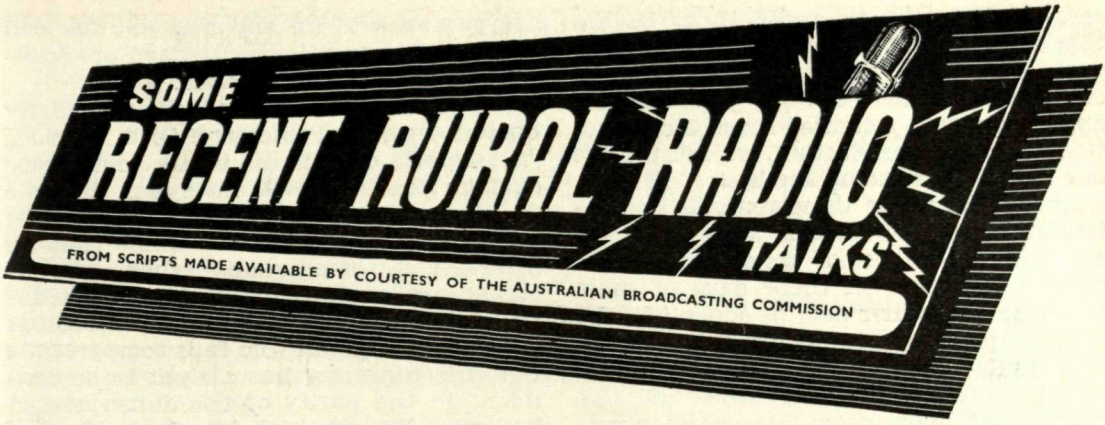


DAIRY HYGIENE IS IMPORTANT

By D. C. MICKLE, Dairy Instructor, Bunbury

RECENTLY I had the unpleasant job of being a witness in a prosecution case where a dairyman was brought before a magistrate because he failed to do necessary work on dairy premises, which were really quite beyond the pale as to their condition of hygiene.

I, together with my colleagues, dislike taking the only course possible, after all else has failed to bring about improvement, but as long as we are charged with the duty of preserving decent hygienic conditions on dairy farms, we shall carry out that work knowing that this action not only has the support of the consumers of our dairy products, but also of the vast number of dairymen who take a pride in the article they produce and the conditions under which they conduct their dairy.

Like all trends in modern industry, the urge if only by economic pressure, is to improve our product, in production, packaging and marketing. Great strides have been made in these efforts and the dairy farmer, in general, is aware of his responsibility concerning the product of his farm.

It is distasteful to him to learn that it sometimes becomes necessary for those in authority to reprimand anyone engaged in the production of dairy products, on the basis of failure to provide satisfactory cleanliness.

The standards laid down in the model by-laws of the Health Act, controlling dairy premises and their operation are not onerous. Important requirements are:—

(1) A proper milking shed with weatherproof roof, well ventillated, with concrete floor, clean yard, and good concrete drainage leading well away from the milking shed. Of course, concrete yards with a wide apron of concrete at the exit of the milking shed are of considerable help towards maintaining cleaner conditions and reducing the dust menace in summer and muddy conditions in winter.

(2) An enclosed milk room or separating room properly ventilated and fly proofed.

(3) Ample supply of **good** water.

(4) A copper or boiler to provide adequate hot water or steam for washing and sterilising.

(5) Convenient cleansing and cooling facilities.

(6) Maintaining clean equipment and premises.

Advice on these matters is readily available from officers of the Dairying Division of the Department of Agriculture and dairy farmers are assured that those offi-

cers are anxious to assist them in the battle for improved quality of our dairy products. With the severe competition existing in the sale of dairy products and apparently with a limited scope for reduction in cost of production, we must place our faith in producing the best.

And so I address these remarks in particular to those dairymen whose premises are not in the best of condition and remind them that, in these days of more thorough and wider field of education, the younger people on farms are not prepared to happily accept uncongenial conditions in dairy farming. Well aware of this simple fact, many dairy farmers have provided and maintained excellent premises in which it is a pleasure to work. Nevertheless bricks and concrete in themselves are a means to an end and **not** the end themselves. A correct standard of cleanliness is of first importance.

To quote the words of a noted dairy bacteriologist, Professor Orla Jensen, "**Systematic** cleanliness is the golden rule of dairy practice." We have seen this rule so often carried into good effect by the careful dairyman that we know that no injustice is being done when circumstances are such as to give us no alternative other than to take legal proceedings against a dairyman who fails to appreciate that the consumer has a right to be confident in the purity of the dairy product he buys. We aim high in our standard of quality for dairy products and only with the full assistance of the dairymen can such standards be maintained.

FARM WATER SUPPLIES

By K. NEEDHAM, Dairy Cattle Husbandry Officer

AN abundant and continuous supply of pure water is essential where stock are kept. It is particularly important on a dairy property. The water supply must conform to certain standards of both chemical and bacteriological purity. The salt tolerance of various species of animals differs, and within a species it varies under different circumstances, e.g., the difference between a dry cow and one in full production.

Chemically, also, water must be free of certain minerals, or, alternatively, have them present in a form in which they may be precipitated, in order to avoid damage, by pitting and scaling, to utensils and equipment with which the water comes in contact. The mineral content also should be such as to permit of the efficient use of detergents in the cleansing operations. Finally, water should be, as far as possible, free of suspended organic matter, as these substances, apart from their probable unwholesomeness, can cause inconvenience by blockage and contamination.

Bacteriologically, waters must be clean, for the health of both man and beast can be seriously jeopardised by the introduction of pathogenic organisms and parasites, many of which are transmissible by means of water supplies. Such diseases as dysentery, cholera, enteric fever and typhoid can be, and have been, caused by water-borne infection. But, even though the supply may be free of micro-organisms harmful to man and animals, it may still contain species which can be harmful to the dairy industry. These species are capable of causing spoiling of milk and cream with resultant monetary loss to the producer.

Water should be available at as low a temperature as possible, both for consumption and for cooling purposes. It should also be free from unpleasant dissolved gases, such as hydrogen sulphide.

It has been estimated that a cow will consume approximately eight gallons of water per day for maintenance of bodily functions and a further two to three gallons a day for every gallon of milk produced per day. The quantity will vary with the climatic conditions and also according to the type of feed consumed. For washing the udder, dairy utensils, milking machines, dairy buildings, drains and yards, a minimum of 2½ gallons per day per cow is required, but this figure

may easily approach eight to ten gallons per cow for adequate treatment.

The water required for cooling milk and cream will vary, depending upon the temperature of the supply, but it may take five to six gallons for every gallon of milk treated. It seems reasonable to suggest an overall requirement for all these activities of from 20 to 30 gallons a day per milking cow. Over and above this, there will still remain the needs of dry stock (8 gallons per head per day), calves (4 gallons per head per day), pigs (approximately 1½ gallons per head per day) and poultry (6 gallons per 100 birds).

Finally, there are domestic requirements which will vary with individual circumstances, depending upon the size of the family and the locations to which running water for domestic use is provided. In respect of domestic requirements, approximately 25 gallons per person per day should be allowed, and, if a septic system is installed, an additional eight gallons per day per person. Where possible, consideration should be given to the provision of a supply for the home garden. This will vary according to choice and requirements, but it has been estimated that a ¼ acre garden will require an average of 500 gallons per day over the year, with up to 1,000 gallons per day for peak periods during the summer months.

The safe upper limits of total salts in water for stock accepted in this State are:

	Grains Per Gallon.
Poultry	200
Pigs	300
Horses	450
Cattle (Dairy)	500
Cattle (Beef)	700
Sheep	900

(437.5 grains equal 1 oz.).

When the total salts exceed these amounts, only practical tests will show whether the water can be used without ill-effect, because varying conditions vary the allowable maximum amount of soluble salts.

For general domestic use and for human consumption on individual farms, the safe upper limit of total soluble salts is considered to be 150 grains per gallon. Water containing up to 300 grains per gallon may be used for showers and baths, especially if a salt water soap is used, and water containing up to 600 grains per gallon may be used in a septic tank system.

For technical advice on the construction of dams and other water facilities, farmers are advised to consult the Officer-in-Charge, Irrigation, Department of Agriculture, Perth, or the Hydraulic Engineer, Public Works Department, Perth.

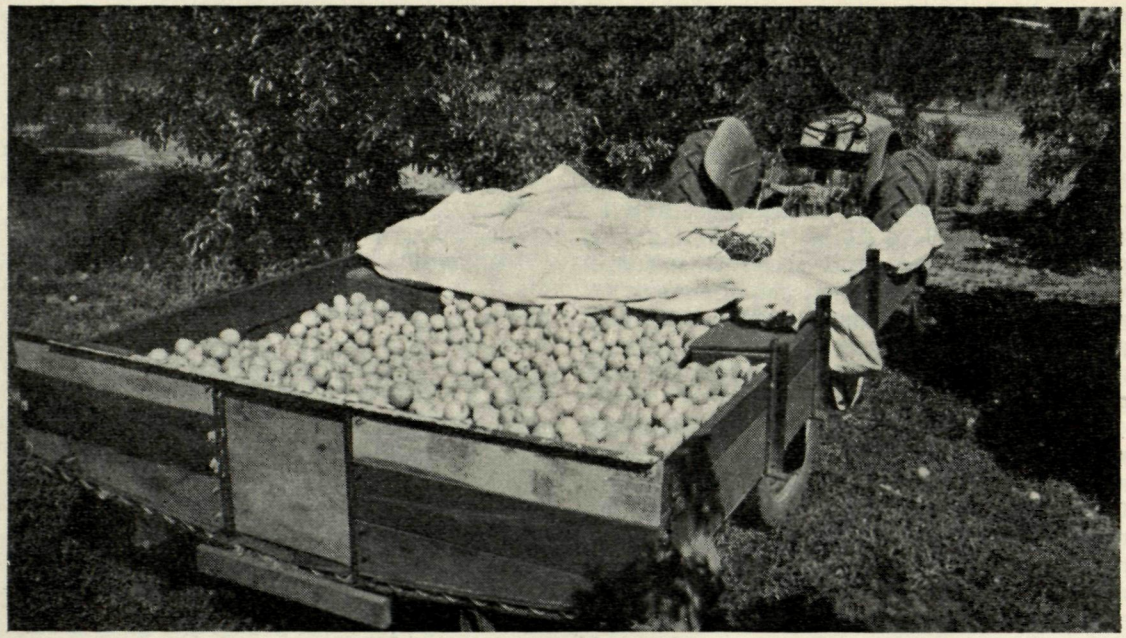
HANDLING THE APPLE CROP

By K. WHITELY, Horticultural Adviser

TOWARDS the end of February the first truck load of export apples usually arrives at Fremantle for inspection before being loaded for shipment to a destination other than the United Kingdom, and is closely followed by many thousands of cases of early-maturing varieties such as Cleopatras, Jonathans and Dunns, for shipment to the United Kingdom and the Continent.

With increasing competition from other apple-growing areas of the world it is essential for West Australian fruit to arrive at its destination in the best possible condition. The final outturn will depend in large measure on the way the fruit is handled and stored from the time it is picked until it arrives at its final destination.

To bring the fruit to its harvest stage the grower has given careful attention to such operations as pruning, spraying, thinning and watering, but the results of these efforts could easily be nullified to a large extent by carelessness at harvesting and during the subsequent period of handling before the fruit reaches the consumer. It is in the hands of the grower to make



A bulk-handling trailer in a West Australian apple orchard

or mar the finished case of fruit during this phase.

There are a number of ways by which the grower can improve his packed fruit. For instance, the general practice in the past has been for the majority of growers to use new export cases in the orchard as picking boxes, and these are then forwarded to the central sheds where they are emptied and subsequently used as export containers. During this process many of them become stained during wet weather, and this not only makes the finished article unattractive, but leaves the stained cases open for rejection by the inspectors.

Although the initial cost of special pine picking boxes (5s. to 6s. each) may seem high, the advantages far outweigh the disadvantages inasmuch as they are easier to handle, simpler to stack and reduce bruising of individual fruits by allowing the full picking bag to be lowered right to the bottom of the box before emptying. Also overfilling of bags and boxes, bumping the picking bag against ladder and knees and the dropping of fruit into boxes all cause bruising of the fruit which leads to the detriment of the final product.

A revolutionary method of handling fruit in the orchard has in recent years come into vogue, namely, bulk-handling. This idea is rapidly gaining favour in many parts of the world, mainly on account of the saving in labour, handling costs and the virtual elimination of bruising. Although it had its beginning as an individual growers device it is rapidly gaining favour with sheds and co-operatives and they too are taking advantage of its commendable features.

Two methods are popular. Firstly, a trailer unit with a holding capacity of 70 to 80 loose boxes of fruit which is hauled from the orchard to the grower's packing shed by tractor. By elevating the front end of the trailer after it has been suitably positioned the fruit will gently slide out through a trapdoor at the back on to the elevator. In the second method bins of 20 to 25 loose box capacity are used and these are handled on a fork lift fitted to the front of the tractor. The bin is deposited on a cradle adjacent to the elevator and takes the place of the hopper. If necessary, filled bins may be stacked until needed.

Whatever method is used to handle the crop the following points are worthy of note:—

Apples from young and light crop trees should be kept separate from fruit from heavy crop trees as they do not keep as well.

During the hottest part of the season, picking-boxes should always be placed on the shady side of the tree or the cases covered with bags or other suitable material. With bulk-handling, tarpaulins should be provided.

Care should be taken, too, to avoid picking sunburnt fruit and the sorters should always be on the alert to reject any fruit showing the signs of sunburn.

Colour requirements must be carefully observed when harvesting red varieties when selective picking is essential. Growers should make themselves acquainted with the requirements before picking commences.

A very important factor and one which seriously affects overseas markets is the presence of San Jose scale on apples submitted for export. Growers should, therefore, be extremely careful to segregate any fruit showing signs of this pest.

To summarise, I would say then that the quality of the fruit exported is largely the responsibility of the grower. The care and attention he gives to picking operations to minimise fruit damage, and the selective picking and segregation of substandard lots will determine to a great extent the quality of the outturn and, at the same time, reduce his rejections to a minimum.

RENOVATION OF IRRIGATED PASTURES

BY AN OFFICER OF THE DAIRYING DIVISION

A HEALTHY irrigated pasture should contain a number of valuable species which reach a peak of production at different seasons and between them maintain a high level of pasture production over most of the year. Factors which influence this ideal condition are many, but water-logging due to insufficient drainage, poor grazing management which allows one species to dominate to the exclusion of others, the compaction of the soil due to trampling by the stock, and pugging of clay soils from winter grazing, spring to mind as important causes. Whatever the cause deterioration occurs on many of our irrigated pastures and frequently within three to five years after establishment.

White clover which should be growing during most of the year is productive only in September to January and again in March. Perennial ryegrass makes a contribution in the spring but is disappointing during the autumn when it is urgently required. Paspalum commences active growth in January and February but tends to run quickly into seed-head and declines in production during March. The months of April and May become very difficult with a heavy demand for milk production to preserve quotas and a severe shortage of paddock feed.

Renovation is necessary to restore vigour to the pasture. The process is one of opening up the soil, breaking through the fibrous roots and breaking up the large root crowns without completely destroying the established species.

A number of different types of implements are used such as a tyne cultivator which penetrates the soil and exerts a lifting action, or a rotary pronged implement which enters the soil on an angle and also has a lifting action. In some cases a rotary hoe fitted with special half-turned points instead of hoe blades has proved quite successful. It may be necessary to cross the paddock in two directions to get a good result but any operation which lifts heavy clods and leaves them on the surface is not very effective since it interferes with subsequent growth and with watering.

The timing of the renovating operation is critical. It is urgent to retain as much grazing land as possible during the period April to June and most farmers are loath to carry out renovation work during this period. If renovation is done after this time it is frequently too late, as the soil is wet and does not break up easily.

In addition, the activity of soil micro-organism is at its lowest ebb in the winter and the advantages of renovation could be easily lost. Pasture improvement is delayed until late spring and the pasture is again dominated by paspalum with some improvement in the white clover. Earlier renovation is desirable. April would appear to be a suitable month but even March is not too soon for such an operation.

Where renovation is done early a vigorous growth of annual species such as subterranean clover and ryegrass can be encouraged which will provide a bulk of grazing five or six weeks after the operation has been carried out. Such renovated pastures grow vigorously during the winter, providing autumn and winter grazing on well-drained areas and resulting in a very greatly increased vigour of the perennial pasture species during the spring and summer months. Early watering of a dry-land paddock in February or beginning of March will help to offset the area thrown out of grazing by the renovation programme.

Several other possibilities exist for stepping up production during this period. Sowing of H1 ryegrass at heavy rates of up to 10 lb. per acre immediately following March or April renovations can provide a bulk of growth within six weeks of sowing. Yarloop clover with its capacity for early autumn growth is also very useful at this time and can be sown into the pasture at rates of 4 to 8 lb. per acre.

In parts of New South Wales heavy seedings of oats at this time of the year have proved very successful and a recent development in the Eastern States has been the sowing in autumn of common vetch to provide autumn and winter grazing.

Very little information is available concerning the use of nitrogenous fertilisers at this period but light applications of sulphate of ammonia in the region of ½ cwt. per acre could be used to stimulate production at this time.

Irrigated pastures are costly to establish and costly to maintain. They must be used intensively if they are to give satisfactory returns. Renovation is a very necessary operation to maintain vigour in such pastures.

MORE ABOUT LUPINOSIS

By H. W. BENNETTS, D.V.Sc., Principal, Animal Health and Nutrition Laboratory

SOME time ago I gave a short radio talk about lupin poisoning and lupinosis—two quite distinct conditions which may cause illness and death in stock eating various species of lupins. Now, as a result of reading the detailed accounts of the German studies of lupinosis published in the late 1880's, I have a somewhat better appreciation of this obscure disease.

Since 1950, lupinosis has become a serious problem in this State, and we have recently intensified our investigations to determine the actual nature or mechanism of this condition. On present knowledge, the only certain recommendation for the control of lupinosis is to advise the farmer to keep his sheep off the lupins, a most unsatisfactory solution, particularly in regions where the lupin is an essential factor in land development and sheep husbandry. We hope that increased knowledge may ultimately lead to a better answer.

LUPIN POISONING

To clarify the position I must first discuss the well understood stock ailment known as lupin poisoning. For many years it has been known that a number of species of lupins contain poisonous chemical compounds in the form of bitter alkaloids, which have been isolated, identified and studied. These are constantly present in the lupins and if taken in by animals in excessive amounts induce acute signs of poisoning—madness, convulsions, etc., which may be fatal. These poisons are not cumulative in their effects. Under our conditions of husbandry, on West Australian blue and New Zealand lupins, losses from lupin poisoning are negligible and present no real problem. (Incidentally, sweet lupins containing only harmless amounts of these toxic alkaloids have been bred and are available.)

A DIFFERENT DISEASE

Lupinosis, however, is quite another story. The symptoms and post-mortem appearances are quite different from those of lupin poisoning. Lupinosis is definitely not due to the lupin alkaloids, but to some unknown factor which is most inconstantly present in the plant. The occurrence of lupinosis, is therefore, most erratic and quite unpredictable. In some instances, sheep mortalities from lupinosis have been as high as 30 per cent. in one year, whereas in other years and on other properties in the same region losses may be negligible. The essential feature of lupinosis is marked liver damage. Affected sheep show dullness, loss of appetite, and jaundice. Deaths may occur within a day or two, or may be delayed for many weeks, depending on the extent of the liver damage. In the more chronic cases, there is a marked loss in bodily condition. Many affected sheep recover, following a change of diet.

Cattle and horses are also susceptible. In this State there have been only occasional cases in cattle, whereas sheep are commonly affected.

Many species of lupins have been known to cause lupinosis. So far as I am aware sweet lupins have not been implicated as yet, but I see no reason why they should not be capable of causing lupinosis as well as the alkaloid-containing varieties (the white, blue and yellow lupins of Europe and the West Australian blue and New Zealand blue lupins grown in this State).

The German reports on lupinosis are very illuminating. In parts of North Germany, as in West Australia, lupins had been used extensively as sheep feed for 20 to 30 years before any occurrence of lupinosis was recognised. Subsequent to 1875, however, lupinosis became the cause of such serious sheep mortalities that in 1880, following the high decree of the Minister for Agriculture, comprehensive investigations were initiated in the provinces of Brandenburg, Pomerania and Silesia. Accounts of these detailed and very thorough studies recently became available through the good offices of our Departmental Librarian, and translations were made by a member of my staff.

I shall now summarise these European findings which are very pertinent to our own problem, although the methods of animal husbandry are so different. In Europe the lupins were cut and stored as hay, which was later fed to animals in barns. Here, of course, sheep are turned into the paddocks when the lupins are ripe and the animals forage for themselves.

Many thousands of acres in the vicinity of the Midland Railway are carrying dense growths of lupins

The German workers at first failed completely in their efforts to reproduce the disease. Subsequently they found that lupin hay from only certain fields in certain seasons was dangerous, whereas lupins cut from other fields could be fed for long periods with complete safety. It was clearly evident that the factor causing lupinosis was most inconstantly present in the lupin plant. On the other hand the hay which caused lupinosis when fed on the farm was found to be highly "toxic". In many instances typical lupinosis was repeatedly produced in experimental sheep fed only ½ lb. or so of this "toxic" plant material. Sheep drenched with alkaline watery extracts of small amounts of similar material also developed typical lupinosis within several days. It was found that the husks were the most dangerous part of the plant although lupinosis could be reproduced, at times, by feeding the seeds or stalks and leaves. Accordingly, most of the detailed feeding trials and chemical investigations were done with husk material. The factor responsible for lupinosis was not isolated or identified, although its effects on the animal were recorded in detail. These, of course, comprised symptoms and post-mortem appearances, including the microscopic changes in the liver and other organs.

A MYSTERY DISEASE

The experimentally produced condition was identical with the naturally occurring one. The German workers, like ourselves, were unable to understand why lupinosis should suddenly become a problem only after a long period of years during which lupins had been fed with complete safety. They could not relate these occurrances to any change in cultural or husbandry practises, nor to any environmental factors influencing the growth of the plants. The nature of the principle causing lupinosis and the factors which determine its presence or absence in the plant still remain an unsolved mystery. For a time the German workers suspected that mould growth was responsible, but were forced to abandon this hypothesis.

SCIENTISTS BAFFLED

For some years now we have been endeavouring to reproduce lupinosis in experimental sheep in order to test our hypothesis of the actual nature of the condition in the terms of modern knowledge of pathology and biochemistry. We had been baffled because our feeding trials gave consistently negative results. The explanation now seems clear. If only some lupin plants are dangerous it is obvious that it will be difficult to locate really toxic plant material even in paddocks where many sheep have died from lupinosis. We are now concentrating on collecting and testing husk material obtained from such paddocks, preferably small ones.

In the meantime, the problem becomes more disturbing and if possible, more baffling and unpredictable. For the first time this year, for example, we confirmed the occurrence of lupinosis in sucker lambs eating well grown **green** plants and in cattle fed with hay, cut green. Previously we had believed that only the mature dry lupin plant was implicated. In that connection the German workers found that hay cut when the plants were mature or even half ripe was much more dangerous than hay cut at flowering, which seldom caused lupinosis. I have been asked on many occasions if ensiled lupins are capable of causing lupinosis. So far as I am aware there is no definite information on this point. Until further evidence is available it would be foolish to offer any opinion except that caution should be observed in the feeding of lupin silage to stock pending further experience. Although the lupin is very useful in the development of light land and has great value as a fodder for sheep it is in some respects an unpredictable plant. In particular we must learn more about the nature and real cause of lupinosis if the plant is to be used with confidence.

FARMERS CAN HELP

The crux of our difficulty in the further investigation of lupinosis is the failure to obtain plant material which will reproduce the condition when fed to experimental animals. Perhaps some of our farmer friends may assist by supplying lupin husk from likely sources or, even better, lupin hay or silage should these be implicated.

CHANGING PRACTICES IN TOBACCO GROWING IN WESTERN AUSTRALIA

By NORMAN HALSE, Research Officer, Plant Research Division

ALTHOUGH not a major crop in Australia, tobacco is of considerable importance. Every pound of tobacco that is grown in Australia means a pound less that has to be imported and usually paid for in dollars.

Partly as a result of a Commonwealth Government policy and partly due to conditions in the industry, tobacco production in Australia has increased considerably in recent years. Consequently there is an increasing proportion of Australian tobacco in Australian-manufactured cigarettes. In order to avoid any decline in quality of these cigarettes it has been necessary to intensify research into factors affecting the smoking quality of Australian-grown tobacco leaf.

A tobacco plantation at Manjimup

I would like to briefly outline some of the changes which are taking place in tobacco growing at Manjimup in Western Australia as a result of the emphasis now placed on smoking quality.

One of the most serious faults of Western Australian tobacco concerns the mineral constituents in the leaf. These are the chemical elements which have been absorbed by the tobacco plant from the soil. To a considerable extent they determine the burning or smoking quality of the leaf. Tobacco grown on Western Australian soils tends to have an unfavourable balance of these elements, some are present in too great a quantity and some in too small a quantity.

One element which is often present in excess is chlorine. This is absorbed from the soil as sodium chloride, or common salt. Some soils, low-lying swampy areas in particular, contain large quantities of salt, and tobacco grown on these areas is of poor quality. By avoiding such patches of known salt concentration tobacco growers are attempting to reduce the amount of chlorine in their tobacco leaf.

Tobacco growers are also taking steps to modify their product by stepping up the level of elements present in too small

a quantity. The most important of these elements is potash. In the current season, growers will be using a new type of fertiliser for the first time. This fertiliser contains a high proportion of potash and will help to increase the level of this element to what is considered necessary for good smoking quality tobacco leaf.

In order to grow good quality tobacco leaf it is also necessary to control the soil moisture throughout the growing period. In the past Western Australian growers have relied on stored soil moisture plus occasional summer rains. They were thus at the mercy of the elements and in unfavourable seasons a large proportion of the leaf grown was of unmarketable quality.

However most progressive tobacco growers are now irrigating their tobacco and by exercising control over the soil moisture they are able to ensure a better and more consistent leaf quality. The best source of irrigation water is from dams which store water from surface run-off only. This water contains very little salt and is quite suitable for tobacco irrigation. It should be realised that water with only as much salt in it as Perth scheme water is too salty for the irrigation of good quality tobacco.

PROGRESS IN DOUBLEGEE CONTROL

By G. A. PEARCE, Botanist, Weeds and Seeds Branch

DOUBLEGEE is probably the most troublesome weed in Western Australia. At the present time it is not possible to suggest any economical treatment which will effectively control doublegee over large areas, either by the application of chemicals, or by cultural treatments. It may be reasoned therefore that no progress has been made in the search for a method of controlling this weed. However this is not so, even though the information so far obtained has been mostly of a negative nature.

During the past six years, trials have been undertaken each year to test new chemicals for their effectiveness against doublegee. In that time some 20 different chemicals have been used at various rates of application without a great deal of success. Included in the chemicals tested have been many lines specially formulated along with five different types of 2,4-D as well as the various butyric derivatives which have caused so much interest during the past two years.

In the southern parts of the wheat and sheep areas, say south of Carnamah, the results with these chemicals have mostly been the same. Initial symptoms of hormone-like chemicals develop quickly, the leaves twist, a swelling appears at the base of the leaves and plant growth is greatly retarded if not stopped completely. This condition of the plants continues often for three or four weeks, but then the doublegee appears to shake off the ill-effects and begins to make new growth. If the plants are resprayed at this critical stage, the renewal of growth is usually only retarded for a further three or four weeks.

In the northern parts of the State, trials have often given excellent results with relatively low rates of the commonly used 2,4-D derivatives. Farmers also have reported on numerous occasions obtaining good control of doublegee in these northern areas. In most of these cases high proportion of plants are killed, yet sufficient doublegees often survive to enable new seeds to be formed. This means that though the growth of the doublegee has been checked during the one season no progress has been made towards eventual eradication. Another problem with doublegee is that not only is a large quantity of seed formed early in the plant's life, but that a large proportion of this seed can remain dormant in the soil over a period of many years.

The question could quite easily be asked what approach should now be made in an endeavour to solve this doublegee problem.

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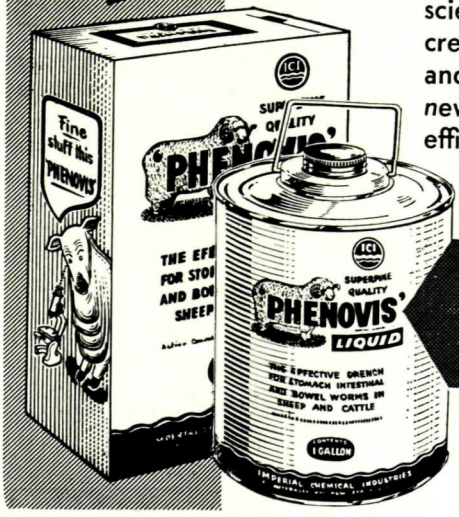

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From the results of our trials it would appear that under certain conditions reasonable control of doublegee can be obtained using chemicals now available.

The doublegees which have always given the most favourable reaction have been those making active growth before the treatments were applied. It is thought that this rate of growth may be closely connected with differences in temperature at various centres. The difference in the average daily temperature between Merredin and Chapman over the three months June, July, August is 5.4; however if this difference fluctuates around the critical temperature at which growth will be made, then the temperature factor could be extremely important.

What is happening to the chemical after it is absorbed by the doublegee plant? That is the burning question at the present time.

To help answer this question, equipment is now being planned to enable weed plants such as doublegee to be grown under controlled conditions. It is hoped that the information obtained will give some lead to a practical method of controlling the doublegee.

SOME USES OF RADIO ISOTOPES IN AGRICULTURE

By E. N. FITZPATRICK, Plant Research Division

IN recent years, radio active forms of elements such as phosphorus, sulphur, calcium, iron and manganese have been produced at nuclear reactors and made available to research workers. These radio active forms are called radio isotopes.

Some radio isotopes occur naturally and such names as radius and uranium are familar to everyone. The materials we are interested in are artificially-prepared radio isotopes produced in nuclear reactors of the type which will soon be in operation at Lucas Heights. The non radioactive element is converted to a radio isotope by more or less "baking it" in the reactor as a housewife bakes a cake. In the same way as the cake accumulates heat and is cooked, the element accumulates energy and becomes radioactive. When it is removed it "cools down" by giving off some of the surplus energy in the form of alpha, beta and gamma emissions.

Fortunately radio isotopes react in the same way as their normal forms. For instance phosphorus 32, the radioactive form of phosphorus, is used by plants and animals, and reacts chemically the same as normal phosphorus. Since very small amounts of radioactive materials can be detected, radio isotopes can be used to label materials so that their subsequent movement can be traced. It is a little bit like adding dye to water and following its movement, or branding sheep so that everyone knows where they come from.

In agricultural research radio isotopes are either used in small quantities as tracers, or radiation is used in large doses to induce genetic changes in plant material.

In plant nutrition the investigation of many problems can be assisted by radio isotopes. For instance, there is a need today for information about the fate of superphosphate applications to soils. We know that only a relatively small percentage of the phosphate applied reaches the plant. We want to know whether the rest is irreversibly fixed; is merely out of the reach of the roots, on or near the surface; or is washed away. It may be that all these actions take place under certain circumstances, so we then want to know under what conditions or in which type of soil each occurs.

Radio isotopes could also give us some guide to the real residual value of fertiliser applications of zinc and manganese, and why varieties and species differ in their susceptibility to various deficiencies.

In other fields there are many uses for rado isotopes. Research workers interested in irrigation can test the evenness of water distribution under various irrigation

methods quickly and accurately by using water containing a dissolved radio isotope. Research with hormone weedkillers can also be assisted. There is always doubt whether a hormone which fails to kill a plant has actually been absorbed. If the material applied is labelled with radioactive carbon its absorption and subsequent movement can be traced.

Entomologists interested in insect migration also use radio isotopes. A batch of insects are labelled with an isotope and then released. Cobalt 60 may be used as it loses its radioactivity slowly. Any labelled insects captured are known to have originated from the batch released and so their distribution followed.

The plant-breeder subjects seeds to intense radiation and relies on the ability of radiation to increase the rate at which natural mutations or "sports" occur. Some success has been achieved with this technique, and in America a rust-resistant oat variety was produced in only 18 months.

Naturally the use of these materials involves some difficulties. For instance a great deal more care is needed than when using non-radioactive material and it is estimated that five times as long is needed per operation. If used in excess, radio isotopes will damage the plant and affect its development. Also some elements lose their radioactivity too quickly to be very much use.

However, despite the limitations, radio isotopes have provided agricultural research workers with a valuable tool which, although it will not produce spectacular advances over-night, will greatly assist well-planned work.

GUILDFORD GRASS – SIGN OF A RUN-DOWN PASTURE

By R. A. BETTENAY, Adviser, Dairying Division

A WEED which is causing much concern, in the Busselton district in particular, is Guildford grass—known botanically as Romulea rosea. Many farmers apparently believe that this weed, which is still spreading in many cases, is capable of smothering out healthy clover stands, but this is not the case.

Guildford grass is one of those annuals which is able to grow under conditions of low fertility, and then, if through mismanagement or deficiency of one or more elements the pasture is weakened, is capable of spreading rapidly and so taking control. If a healthy vigorous pasture is present, Guildford grass will not spread and does not become a problem.

Prevention therefore is better than cure and can be achieved by good pasture management, including correct fertilising, letting the pasture grow to a good height between grazings, and periodical cropping and reseeding. This procedure should maintain a dense pasture and so prevent invasion by Guildford grass.

If Guildford grass is present and has taken charge of a pasture the first thing to do is to determine why the pasture became weakened enough to permit invasion. In the Busselton district the answer is usually potash deficiency nowdays, but in some cases it may well be copper or zinc deficiency if these trace elements have not been used, or may be due to over-grazing. It is useless to attempt control of the Guildford grass without at the same time correcting deficiencies, as an important aspect of control is the competition provided by a healthy pasture. In some cases if deterioration has not proceeded too far and sub-clover is still present, the application of potash at 1 to 2 cwt. per acre is sufficient to encourage the better species and so smother the Guildford grass.

If, as is frequently the case, sub-clover is almost non-existent, ploughing and resowing will be needed. Ideally, for the control of Guildford grass, ploughing should be done in June after the old bulb

is spent and before the new bulbs have formed. Mouldboard ploughing is the best and the depth should be such that the bulbs are turned up to the surface.

This working can be followed either by spring-sown oats planted in August or early September or by a summer-growing crop such as Sudan grass planted in early October or as soon after as the land is dry enough to work.

If the land is winter wet, it may be necessary to leave the ploughing until perhaps September, and in this case it is probably wise to plant Sudan grass. Ploughing at this time is not such an effective control but if assisted by cropping and reseeding, can give satisfactory results. Summer cultivation is not effective as a means of control of Guildford grass.

A Sudan grass crop planted in October-November would be grazed out in March-April of the following year and it is important to then resow the pasture to some vigorous mixture of clovers and grasses, the species used depending on circumstances, and to graze very sparingly the first year so that the pasture can actively compete against those Guildford grass plants not controlled by the working and cropping.

Adequate fertilising to correct any deficiencies must be carried out at the same time and if you are in any doubt as to the fertliiser mixture to use, your local Agricultural adviser will be glad to visit your property and give on-the-spot advice.

SILAGE AND WHEN TO FEED IT

By R. BETTENAY, Adviser, Dairying Division

UNDER the stimulus of the competition being conducted by the Australian Dairy Produce Board Pasture Improvement Committee, in co-operation with the Department of Agriculture, and aided by the increase in mechanisation, the quantity of silage being made on dairy farms in the South-West is being considerably increased. This being so, a question often asked of the agricultural adviser relates to the best time to feed silage to the dairy herd to make the most efficient use of the limited quantity available.

The answer to this question is largely determined by the time the cows calved; if you have late calvers it may pay to feed silage from early December onwards so as to maintain production into the summer months. For this to be successful an early start to feeding is imperative as the protein content of pastures drops rapidly with maturity and this limits production even though paddock feed is still plentiful and of apparently fair quality.

More commonly, with April-May calvers it is better to commence silage feeding about a month prior to calving and to continue until pastures are well away and high enough for rotational grazing to be commenced. By this means—provided of course that the quality of the silage is satisfactory—cows can be calved down in rising condition, and can be kept milking until paddock feed comes away. This works in well with the recommended technique of shutting up most of the farm with the opening rains and not grazing until pasture is about four inches high.

Just how early in the autumn you start to feed silage will depend on the quantity you have. If you have no other source of high protein feed available at that time—that is no summer fodders, irrigation or good summer pasture—cows will require about 60 lb. of good quality silage and this will supply perhaps two-thirds of their food requirements. You should start by feeding smaller quantities and work up to this amount over a few weeks.

This system of feeding cows will require about 60 lb. of silage per head per day for three and a half months—perhaps March, April, May and part of June—and this is equivalent to three tons per cow.

If you are wondering how much your stack or pit contains, calculate on the basis of 50 cubic feet of settled silage per ton.

At the break of the season, the feeding of hay also should start, and most paddocks should be closed. Then when paddock feed is high enough to graze, silage feeding can be discontinued, or the amount fed can be reduced, but the feeding of hay should continue right through the winter and at a reduced rate until well into September.

As a farm policy I believe that silage making should be combined with early calving. If you have silage it is quite safe to calve cows in early April—or even commence about March 20. Then, if the season is late in breaking, silage—provided it is of good quality—will be sufficient to maintain production in the early stages of lactation when, in any case, the hormonal urge to produce milk is at its strongest.

No farmer in the butterfat zone likes milking cows much after Christmas and, as you have found, it is difficult to prevent cows from drying-off at this time regardless of when they calved. Why not resolve this year to commence mating about June 15, and to conserve silage to ensure that early calving is a success. It will pay dividends in longer lactations and higher production.

ANTS IN THE APIARY

By R. S. COLEMAN, Officer in Charge, Agriculture Section

ANTS are possibly the most serious of the pests the beekeeper has to combat, but as bees and ants are fairly closely related to each other, the insecticides that kill the ants, also kill the bees and anything that is obnoxious to the ants is equally obnoxious to the bees.

Many and varied are the methods used by beekeepers to control ants. One of the best is to plough the apiary site before putting the bees down. If you are a constant user of a site and a good friend of the land-owner he may do it for you when putting in his firebreaks. Now that many of the beekeepers have Land Rovers, a light orchard cultivator pulled behind the vehicle can be used for breaking up the ant nests and destroying the ant population on the proposed apiary site. As it is usually only in the summer that the ants are difficult to control this would also give protection against fire.

Another method of stopping the ants which I have found most effective is to spray the ground between the hives with DDT mixture with a watering can. The reason why I use a watering can is that the drops are large and there is no spray blowing into the hive as there would be if a knapsack spray was used and as bees find the smell of DDT obnoxious they avoid the DDT. This means the ants that

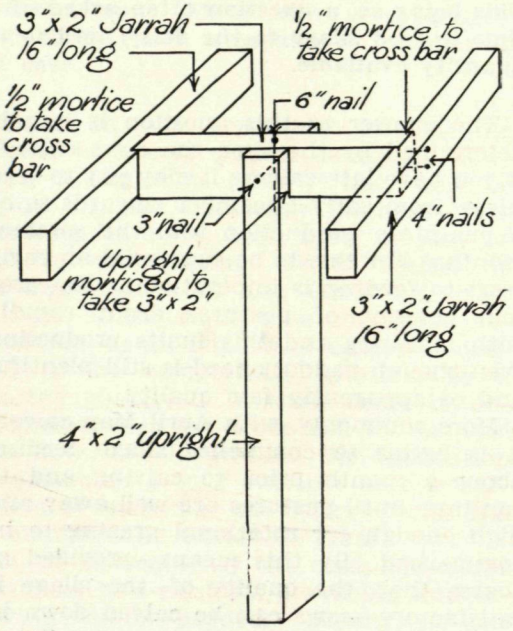


Diagram showing construction of the "Floating H" hive-stand

must walk over the ground to get to the hive are killed by the DDT while the bees are untouched.

The one most common type of ant in the dryer areas is what is usually called the red meat ant which lives in a large mound and ranges for hundreds of yards around the mound for its food. Scattering DDT around the mound will do quite a lot towards control if the nest can be found by following a trail of ants from the hive to the mound.

A beekeeper acquaintance of mine showed me one very good method to control these ants. He had a wire mesh tea-strainer which he filled with powdered sheep dip and with this he dusted all the openings of the mound, coming back a week or fortnight later to check and treat any openings still being used.

I have found both arsenical sheep dips and the DDT sheep dips effective, but the DDT dip is excellent in the watering can method.

If you keep your bees in the one place all the time, the floating H stand is the best. This is a single upright with a platform on top built to take a hive.

Some beekeepers have made these out of iron, others of wood but the secret is to make it strong so that the platform on top cannot move, for I can assure you there is nothing more devastating than a hive wobbling around on top of one of these platforms.

Other beekeepers suspend their hives on wires running through bottles or on stands that have oil around the legs or have the legs of the stand placed in dishes of oil. Sooner or later however, the protecting layer of oil is apt to be bridged by dust or falling leaves and the ants still reach the hives. I have found that the watering of the apiary with DDT in a grid after all the ground cover is removed is the best control method for ants, and it is certainly the cheapest and the most economical. With the amount of walking which takes place around the apiary the DDT grid is soon destroyed and the ants tend to come back after about four weeks but as it is only half an hour's job to renew the grid it is well worth while, as the cost is very small.

BACTERIAL CANKER OF STONE FRUITS

By OLGA M. GOSS, B.Sc. (Hons.), Plant Pathologist

ARE you one of the many stone fruit growers who have been worried by young trees dying limb by limb over a period of two or three years? If so, your trees almost certainly have the "bacterial canker" disease. It is very serious on stone fruits, particularly plums and once established is very difficult to control adequately. Hence do your utmost to avoid introducing or spreading the trouble in your orchard. For those of you who may not be familiar with the disease, firstly let me briefly describe the main symptoms.

Usually the first thing the orchardist notices is that odd limbs of young trees have either failed to shoot or have suddenly died off whilst in full leaf—the dead leaves remaining on the branch. On closer inspection he will discover that split-like cankers have developed in the bark and that gum is exuding from these slits. The limb appears flattened in the region of the slit and when the bark is shaved off with a sharp knife the lower bark and wood beneath, appears brown instead of the normal healthy green. The root stock is unaffected by the disease and frequently a number of water shoots are found growing up around an apparently dead tree.

The organism causing all this trouble is a small germ called *Pseudomonas syringae* and it has two characteristics which are important in relation to control.

Firstly it is most active during the cooler months of autumn, winter and spring and secondly its spread is facilitated by the presence of wounds. For these reasons

infection occurs mainly during leaf fall and pruning, although resulting disease symptoms may not be obvious until later in summer when the trees are stressed for moisture. Control measures therefore aim largely at preventing the spread of the disease during the susceptible leaf fall and pruning periods.

Firstly, during leaf fall, spray regularly, if possible once a week, with streptomycin antibiotic at the dosage rate mentioned on the bottle, or, if this is too expensive, Bordeaux mixture should afford some measure of control if applied frequently.

Secondly, at pruning, be careful to disinfect your secateurs after pruning each tree by immersing in formalin solution made by mixing one part of commercial formalin with 49 parts of water. For preference, use at least two pairs of secateurs, alternating their use. If the secateurs are not thoroughly disinfected, spread to a number of trees can result. Where possible, avoid pruning diseased trees during the winter.

As the disease is inactive during the summer months, now is the time to do any major pruning such as removal of dead branches, etc., from your diseased trees. Again disinfect any implements used, with formalin and paint over large pruning cuts with streptomycin in lanolin or some other fungicidal dressing to prevent further spread.

The disease is most serious on young trees up to ten years old. Older trees can become infected but are usually more resistant and will frequently live on for quite a number of years even with the disease, whereas young trees will be killed in a few years.

In Western Australia so far, plums, particularly the varieties Wickson and Narrabeen have been most seriously affected, but the disease also occurs on apricots, peaches, cherries and flowering peaches.

A leaflet giving more details of the bacterial canker disease of stone fruit is available from the Department of Agriculture, on request.

POISON PLANTS IN THE HOME GARDEN

By R. D. ROYCE, Acting Government Botanist

IT is a strange fact that some of the most spectacular species of our flora are highly toxic, and it is probable that the same applies to most floras. And so it is that collectors who gather seed of showy plants for propagation in other countries, will obtain many which are poisonous. Thus in Western Australian gardens a number of the most popular shrubs are potentially dangerous.

Some families of plants are more toxic than others; thus in the native flora a large number of pea-flowered plants are notorious killers of stock, while among horticultural plants the potato family or *Solanaceae* ranks high in the percentage of toxic species it contains, although it also includes numerous useful plants, notably the tomato and tobacco as well as the potato.

A number of the plants of this family are grown for the attractively-coloured berries which resemble miniature tomatoes. Generally speaking, the green developing fruit of these plants are relatively high in toxic principle, and if eaten in this condition could cause trouble, particularly with children. When fully matured and coloured, however, most of these fruits are harmless and even palatable. Plants of this family which are commonly grown for the berries are Japanese Holly *(solanum giganteum)* Madeira Winter Cherry (*S. pseudocapsicum*) the egg-plant and the garden chilli.

The thick-stemmed so-called "Potato Creepers," *S. Wendlandii* and *S. Seaforthianum* are commonly grown over fences, and although here they do not normally bear fruit their leaves and stems are toxic.

The potato itself is one of the most prized and most widely used plants of this family, and yet the greened or sprouted tubers—i.e., the actual potato of commerce—are highly toxic. Human beings and all classes of stock, particularly pigs, have been affected by them, while the stems and leaves of this, and of the Cape Gooseberry are recorded as being toxic to most animals and have caused losses.

Perhaps the most spectacular of all the garden plants of this group is the trumpet flower, *Datura arborea,* also known as *Brugmansia.* Both this and the thorn-apple, *Datura metel,* contain poisonous alkaloids, but are widely grown throughout the State.

The night-flowering jessamine is a beautiful and heavily-scented creeper and is a prized exhibit in many gardens. But it too is toxic, and in districts of Queensland and New South Wales where it has become naturalised it has caused losses among cattle. The "shoo-fly," which is only occasionally grown, does not possess any fly-repellent properties, but it is toxic, while a species of *Brunfelsia* closely related to the plant common in gardens here, was formerly used as the source of a deadly arrow poison.

These are but a few of the common plants of one family, the *Solanaceae,* which are grown in this State. Other families as those containing the poppies, legumes, spurges, dogbanes and milkweed, each of which contains a fairly high percentage of toxic species, are all represented in our gardens. Yet the danger is more apparent than real as little trouble has been experienced in the past, and there is no real reason why these plants, if treated with reasonable care, should not continue to be used in horticulture.

THE CABBAGE WHITE BUTTERFLY

By C. F. H. JENKINS, Government Entomologist

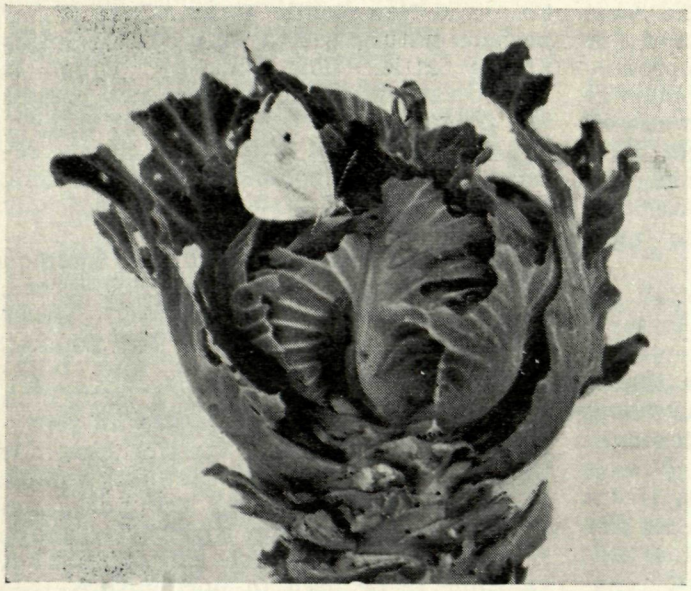
A FEW days ago I was surprised to see a suburban housewife pursuing a white butterfly around the garden with a fly swat. This form of activity is highly beneficial as a slimming exercise, especially during a heat wave, but it is a complete waste of time viewed from the pest control angle. As a matter of fact, the cabbage white butterfly is probably the most maligned insect in the home garden, for it is blamed for a great many disdemeanours of which it is quite incapable. Choice blooms are said to wither after a visit from this butterfly, and it is also blamed for almost any green caterpillar which appears on the scene.

To the vegetable grower, including of course the commercial market gardener, the cabbage butterfly can be a serious pest, but the range of plants attacked is definitely limited. As the popular name suggests, the favourite food plants are cabbages and cauliflowers, but related vegetables such as turnips, swedes, radishes and kale are also attacked.

In the flower garden the butterflies are very active during the spring and early summer, but although they visit almost anything in bloom, they cause no direct damage whatever. Even the caterpillars have very limited scope as far as ornamentals are concerned. for stocks and nasturtiums are about their only choice of suitable food.

The cabbage butterfly is frequently referred to as the cabbage moth, or the white moth, but such names are most inappropriate, because in the first place the insect is a true butterfly, and in the second place the true cabbage moth was a common pest in this State long before the white butterfly arrived.

The cabbage moth is a small greyish creature not much bigger than a clothes moth and consequently the caterpillars are also very small. They can be very destructive however, and in pre DDT days made it almost impossible to grow first-class



Adult butterfly on a cabbage that has been badly damaged by the caterpillars

cabbages or cauliflowers during the summer months.

The caterpillars of the cabbage white butterfly are velvety green in colour, and may match their food plant so accurately as to be easily overlooked, at least in the early stages. For this reason infestations are often firmly established before a grower becomes aware of them, and when ragged leaves and damaged hearts tell the story, control may be difficult.

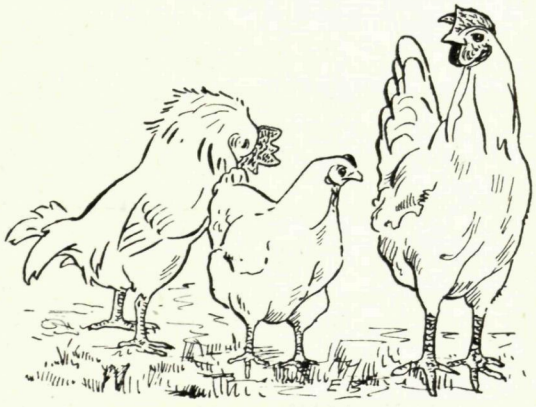
The cabbage butterfly is a comparative newcomer to Western Australia, having been first recorded in 1942, but the pest is now widespread over the southern portions of the State. Unfortunately it does not have to depend upon cultivated plants for an adequate food supply, for such prolific weeds as mustard, wild radish and wild turnip maintain a high butterfly population.

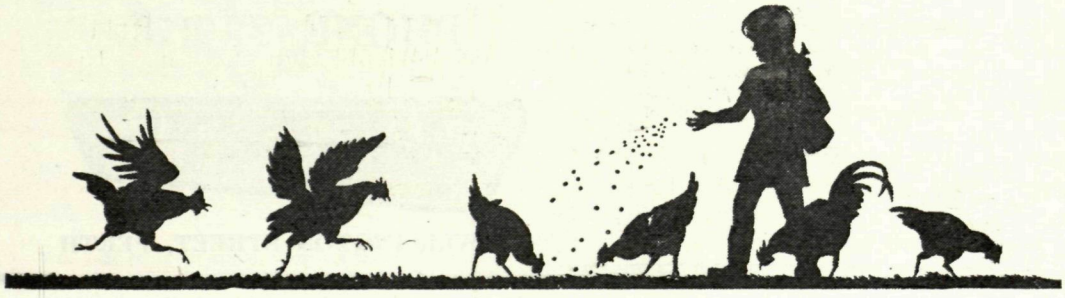
The native home of the cabbage white is Europe, but it was accidentally introduced into North America about 1858, and since then it has spread to many parts of the world. Although some of the spread from country to country has undoubtedly been helped by contaminated plant material and ships' stores, the butterfly's remarkable powers of flight have also been an important factor. For instance in Europe there is a more or less regular movement of butterflies from the Continent to England each spring, and it is probable that the infestation of Tasmania was caused by butterflies making their own way across Bass Strait.

DDT dusts and sprays will usually give good control of both cabbage butterfly and cabbage moth caterpillars. Some market gardeners however, prefer an allied chemical known as DDT or TDE.

Several attempts have been made to establish parasites of the white butterfly and two very useful wasps are now active in most areas. One species, which was imported in 1943 attacks the butterfly chrysalis, and another type, introduced about 1950 attacks the caterpillars. Both wasps are very small and lay their eggs into the immature stages of the butterfly. The resulting maggots feed internally and prevent the development of the adult insect. Evidence of parasite activity can sometimes be seen on cabbage and cauliflower leaves in the form of yellow silken cocoons. These little clusters are formed by the wasp maggots after they have left the dead caterpillars.

There are some home gardeners who depend more on black magic than science for protection against cabbage butterflies and I am told that egg shells mounted at each corner of the cabbage patch are sure cure. The official recommendation however, is early and careful spraying.





SUMMER TREATMENTS FOR SAN JOSE SCALE

By C. F. H. JENKINS, Government Entomologist

THE importance of San Jose scale to the Western Australian apple industry has changed greatly during the last couple of seasons because of stricter quarantine laws overseas. In the past, San Jose scale has been just one of the "rank and file" orchard pests, but its new status could easily place it ahead of fruit fly and codling moth as far as the export trade is concerned.

The scale has been known in Western Australia for over 50 years, and although its importance has fluctuated from season to season and infested lines have always been barred from shipment overseas, the pest was not a major hazard to the apple industry. At the present time, however, the finding of a single San Jose scale by inspectors in various European countries could lead to the banning of a complete cargo.

The reason for this stricter enforcement of quarantine regulations is not very easy to understand, as the scale has a wide distribution in Southern Europe, America and Africa. Great Britain and some of the northern European countries are apparently free from scale, and quite rightly wish to remain so. But as they have imported millions of cases of apples in the past without serious consequences their change of policy seems unduly severe.

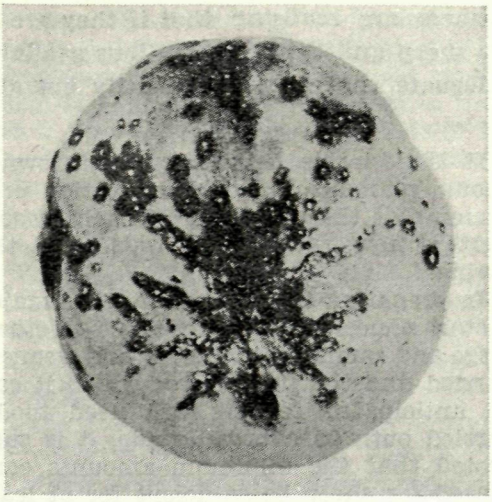


Fig. 1.—San Jose scale on apple, showing the scales themselves and the typical discolouration caused by them

At the present time however, all the Western Australian orchardists can do is to try to ensure that ample clean fruit is available to comply with the most rigorous inspection system. It is still too early to forecast the effect of seasonal conditions on the scale, but many growers are apprehensive in view of the heavy build-up of the pest last summer. As a result of last year's experience, and following a vigorous drive by the Department of Agriculture, most growers have applied their dormant sprays much more thoroughly than usual and should reap the benefit.

Bearing in mind the necessity for absolutely clean fruit however, not just good control as in the past, at least one summer treatment for San Jose is urgently recommended. However carefully the oil or lime sulphur sprays were applied during the winter there is always the danger of a few scales persisting in cracks, on the tips of branches or in other situations not thoroughly drenched with spray. To fully appreciate this aspect of the problem, perhaps a little more detail on the life history of the pest would be helpful. The female insects produce living young during the warmer months of the year, and these tiny crawlers settle down on shoots and fruit to grow to maturity. Once firmly settled the young scales lose all powers of locomotion, and under the shelter of their dark waxy covering spend their days sucking the plant juices. During their feeding activities the scale insects inject saliva into the plant cells and this results in bright red stains appearing on young twigs and green or pale coloured fruit.

Parathion is the most effective of the new insecticides for summer treatment against San Jose, but many orchardists will probably prefer to use something less dangerous. A very useful mixture which

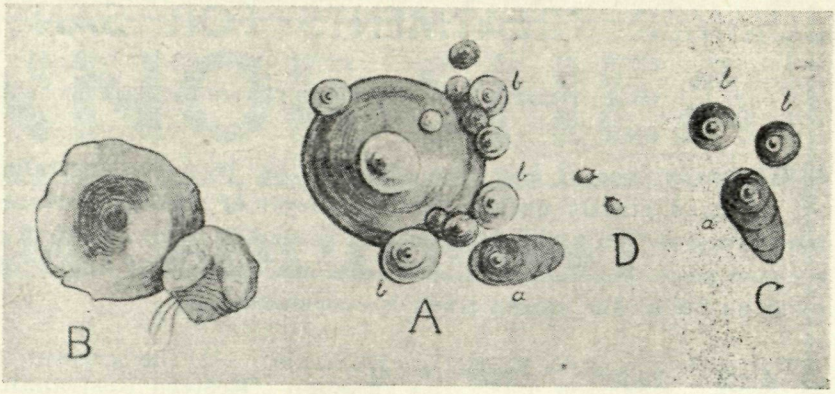


Fig. 2.—Various stages of San Jose scale, all enlarged about 15 times

A—Adult female with immature young at various stages on and around her; B—Adult female scale turned over to reveal the insect itself with the bristle-like mouth-parts exposed; C—Adult male with two immature winter-stage scales; D—Young crawlers soon after birth

will be found helpful not only against scale insects but for leaf hoppers and mites, is a mixture of white spraying oil and malathion. The formula recommended is—

White spraying oil—1 gallon.
50% Malathion—1¼ pints.
Water—100 gallons.

To be effective this spray must actually hit the young scale insects, and so a thorough treatment reaching the inner branches and fruit as well as the leaves is absolutely essential.

Some growers may find it hard to accommodate themselves to the changed conditions and may feel inclined to depend on the dormant sprays and hope for the best. But if the present scale ban is maintained by importing countries, the stakes are far too high to be taken lightly. The prudent grower therefore, will certainly apply one summer spray, and perhaps a second, if there is any indication of scale activity.

PREPARATIONS FOR FODDER CONSERVATION

By H. G. CARISS, Agricultural Adviser

THE supplementary feeding of stock carried in the cereal and sheep areas is an accepted practice, and more and more farmers are realising that if they are to obtain maximum production per acre from their sheep and cattle, the rations available to them at all times of the year, must be adequate, not only in quantity but also quality.

The provision of fodder reserves which are required for the dry and leaner periods of the year should not be on a "catch as catch can" basis, but should receive particular attention as they are of such considerable importance. The availability of adequate supplies can mean a difference, not only in production per head but can obviate any necessity for the forced disposal of good breeding and producing stock.

Conserved fodder is made up of several types, the concentrates being the grains, and the bulk feeds are hay, (either cereal or meadow) and silage.

It is desirable that every stock owner should plan his fodder conservation programme at the beginning of each season, that is now, rather than wait until the spring.

In preparing the programme, the major factors concerned are the types of stock, large and small, breeders, dry and weaners carried and the period over which it can be anticipated feeding will need to be carried out. As a broad guide, it is suggested that the minimum amounts conserved for sheep be sufficient for at least three months hand feeding on the basis of ½ lb. of grain and 1 lb. of hay per head

per day; for cattle, 5 lb. of grain and 10 lb. of good quality hay per head per day, for approximately the same period.

In addition, it is desirable to have on hand at the end of the season at least half as much as the above annual needs.

In most districts, it is a good plan to sow some acreages specifically to provide for these requirements. In the more favoured districts of course, the major proportion, if not the whole of the hay supplies can often be procured by the cutting of good meadow hay, which latter is a particularly good form of bulk feed for both sheep and cattle.

At the beginning of the season many farmers like to have available cereal crops for use as green fodder and if these are carefully managed, they can also provide excellent reserves of fodder for the summer, either harvested or as standing crops. The cereal crops also are the source of the grain supplies.

If a good season is experienced, it is possible that a proportion of those crops originally intended for fodder can be disposed of and so add to the farmers income. If the season is poor, then he has insured against a difficult period for his stock.

Another factor of importance to be considered is that quantity is not everything and it is very desirable that all fodder conserved, and particularly the hay portion, be of the best quality. It is quite well known that the association of a legume with a grass makes the best meadow hay. The same applies with cereal hay, that the addition of a legume such as peas or vetches, improves the quality and particularly the protein content, which is of such great importance to the animal. The conserving of good quality material will mean less handling, less waste and better animals.

Over the last two years, a fodder conservation competition has been conducted in the cereal and sheep areas and the results have shown that it is possible for farmers in both light and heavy rainfall districts to make provision for adequate supplies of good quality conserved fodder and by good management carry greater stock numbers, keep their stock in better health and ensure high production per acre.

SUDAN GRASS SURVIVED DRY SUMMER

By R. A. BETTENAY, Agricultural Adviser.

THE dairying districts of W.A. have just come through one of the driest summers ever experienced and the dry period was further accentuated by a very dry spring. Yet despite the dryness it is interesting to see that some crops of Sudan grass, even on hillside country, have given good growth and carried a lot of stock. Other crops failed to germinate when planted in the spring and either did not come up at all or had a partial germination with small falls of rain experienced during February and March in some districts. The difference between successful crops and other complete failures is most striking and it is worthwhile investigating to see how the successful crops were grown.

Water, of course, is the first essential for a successful crop. In some years good falls of rain are experienced during the spring-summer period but such falls are not reliable and cannot be counted upon to get the Sudan grass established. Farmers then, who have no irrigation, have to rely on winter rains and have to work the soil in such a way as to conserve winter rainfall for a spring-sown crop. To do this early fallow is essential, as during October and November a rapidly growing pasture can transpire the equivalent of one inch of rain per week. Our sandy soils in the top two feet can only hold in the order of two to three inches of available water and hence the necessity to kill pasture growth in the early spring to conserve moisture for the Sudan grass crop.

Many farmers are unwilling to plough up land in the early spring, feeling that

they cannot spare the paddock, or at least that the feed it would grow during October would be very useful to have. However, as explained, leaving the paddock under pasture during this time robs the soil of the moisture so essential for the establishment of the summer crop and it would be better to either cut for silage in early October or graze the paddock heavily and then cultivate. Sudan grass is rather deeper-rooted than our normal pasture species and can, in most soils, make use of the water stored in the top four feet. In dry land conditions it should be planted not later than early December and provided there is sufficient moisture in the surface soil for germination and early establishment, Sudan grass can survive quite extensive droughts because of its deep-rooting ability.

Finally for successful establishment do not be afraid to sow the Sudan grass deeply to get down to the moist soil. I have seen very successful crops of Sudan grass in paddocks where the seed was sown to a depth of approximately six inches by ploughing it in. The seed will not germinate without moisture and, if fallow was prepared too late to keep the surface soil moist, you either have to rely on summer rains to germinate the seed, or get the seed down to the moisture. In our climate where summer rains are very unreliable the latter is a far more satisfactory alternative.

In dry-land conditions, Sudan grass should be sown at the rate of 10 to 12 lb. of seed per acre if broadcast, and 8 to 10 lb. if drilled in. A mixed fertiliser containing adequate sulphate of ammonia should be used but it is difficult to make a definite fertiliser recommendation without taking onto consideration the soil type and previous fertiliser treatment.

Finally our experience has shown that the so-called sweet Sudan grass cannot be recommended, as it is less vigorous than the ordinary commercial Sudan grass, and does not recover as well after grazing.

ROOT MAGGOT FLIES

By J. A. BUTTON, Entomologist

COMMON names for insects are seldom chosen, but "come about," as it were. Hence we find ourselves compelled to use (whether we like it or not) such terms as "Two-tooth longicorn" or "Tropical itch mite," or occasionally something as unattractive sounding as "Bean root maggot fly."

But, attractive or not these names are usually remarkably apt—as is the case with Root maggot flies.

These belong to a family of flies which includes many pests of economic importance—some attack cabbages, some beans, and peas, and some onions. Many gardeners and probably most commercial onion-growers will be all too familiar with them. But there are, doubtless, some backyard growers who have been puzzled to see their hoped-for bean crop fail to emerge, or else struggle through only to wilt and rot before they have grown six inches. They haven't noticed the small maggot which has burrowed its way into the soft damp tissue of each plant.

It is always the maggot which causes the damage and the parent fly was probably thought to be an ordinary house-fly. In fact, there is a strong general resemblance although the maggot fly is somewhat longer and covered in fine hairs.

The most important species locally are the Bean root maggot fly and the Onion fly. Consequently, beans and onions are most frequently damaged—although cabbages are sometimes attacked.

The eggs of the Bean root maggot fly are normally laid in cracks in moist soil close to the host plant. It usually takes three or four days for the eggs to hatch and the maggots to enter the germinating seed. Breakdown in the tissue rapidly follows and is aided by bacterial action. The maggot stage may last from two to several weeks before pupation occurs. If the weather is suitable adults may emerge

from the pupal cases in a fortnight and give rise to further generations, or in less favourable conditions, this stage may be extended to several months.

When the attack is a severe one, plants may be reduced to a pulpy mass, but in lighter infestations, plants though pale and unthrifty, may survive.

In view of what has been said it will be obvious that the plants should be given every opportunity to get through quickly. Hence seeds should be planted as shallow as possible and the soil should be worked to prevent cracks forming. Organic manure is particularly attractive to the flies and surface applications of fertilisers such as blood and bone and stable manure should be avoided as far as possible.

Overseas experience indicates that the most satisfactory control with chemicals involves seed treatment with insecticides. A process of wet pelleting with insecticides, a fungicide and a sticking agent has been most successful, and has been used to protect both bean and onion crops.

However, the inconvenience of these methods and the spasmodic nature of the trouble locally, led us last year to test a number of insecticides applied directly to the trenches after planting—the crop concerned was beans. Without entering into detail, it will be sufficient to mention here, the insecticides which gave the most promising results. They were applied with a knapsack in the normal way at a slow walking pace.

Chlordane—at the rate of 10 oz. of actual insecticide per acre.

Dieldrin—at the rate of 3 oz. per acre and Diazinon also at 3 oz.

For the backyard gardener a 2 per cent. chlordane or a ½ per cent. dieldrin solution will be quite satisfactory.

Similar treatments should also be useful against the onion fly, but in this case post-emergence surface treatments may be necessary at a later stage. A knapsack may be used and a six-inch strip of soil about the base of the plants sprayed.

This treatment should be equally useful against maggot flies in cabbages and cauliflowers.

It is hoped that further work along these lines will be possible next season and this should enable us to make more specific recommendations for local conditions.

FALLOWING FOR CROPPING

By A. S. WILD, Assistant Superintendent of Wheat Farming

THE introduction of fallow as a general practice from 1912 onwards, marked a substantial step forward in the progress of agriculture in the Western Australian wheatbelt. Within more recent years, it has been paralleled by the introduction of early strains of subterranean clover and the development of the ley farming system, mainly in lighter types of soil in districts with an annual rainfall of more than 14 in. In such areas, fallowing may be said to be supplanted by this more profitable system which however, must be adapted to ensure the adequate control of certain diseases and pests affecting cereal crops.

Well-fallowed land is still necessary for good crops on heavy land in the lighter rainfall areas. There are a number of reasons for fallowing and the degree of importance of these may vary from farm to farm and even from year to year.

The late winter and early spring fallowing of land and preparation for planting during the following year is in itself a convenient way of distributing the seasonal work on the farm. The relatively slow ploughing operation is undertaken at a less pressing time of the year, leaving the limited seeding period free for cultivation work of final preparation and actual sowing. Such an advantage was however, more evident in the days of horse teams rather than the present time of mechanised traction, but it is still important, especially when delay of the opening rains shortens the planting season.

Weed growth can be controlled by the ploughing and cultural operations undertaken at opportune times over the extensive period between ploughing and planting. A thorough early ploughing turns in the weeds before they become deep-rooted and preferably after they have been grazed back by sheep.

A subsequent spring cultivation is usually required to control further weed growth and either break up larger clods or, if carried out to a shallow depth and in the wet condition, to prepare a consolidation of the seed bed on the more friable soil types. Cultivation during the summer period with its general dry conditions in this State, is not necessary or profitable. Early rains prior to or during the early part of the normal planting season, when the soil conditions are still warm, promote a quick germination and rapid early growth of weeds. A working must be carried out to destroy these and prepare a good tilth into which to plant.

The control of weeds from ploughing to planting—is closely associated with the control of serious fungal diseases, especially those allied to take-all, and also to the control of insect pests including webworm

The provision of a fallow, bare of host plants, including barley-grass and speargrass, and the planting on to a clean seed bed on which surviving fungal spores have germinated and died through lack of grass plants to parasitise, considerably reduces the chance of a serious infection of take-all.

The most important advantage of fallow in the lower rainfall districts in from the greater conservation of moisture for the subsequent crops. The old concept of mulching reducing evaporation is not strictly correct. Fallowed land however, permits better penetration of spring rains much of which would be lost on hard-surfaced, unploughed land. Also, ploughing largely eliminates weeds which, otherwise, would use moisture during late spring.

The availability of plant nutrients within the soil as distinct from those applied through the drill is a major effect of fallow. Nitrogen is undoubtedly the most important element involved.

Beneficial soil organisms multiplying and operating under favourable conditions, break down organic matter to available nitrogen which nourishes the growing crop. Conditions favourable to this process are moisture, warmth and air, and the longer period under which this can operate within a 12-month period, the more nitrogen will be available from the existing organic material within the soils for use by subsequent crops. Early fallow —from land ploughed in June and July as against August and September, can result in better weed control, more effective control of disease and increased plant food to produce high yielding crops.

However, it should not be overlooked that fallowing adds nothing to the soil. It increases the amount of available nitrate nitrogen through the action of soil bacteria on the organic matter in the soil. The soluble nitrate nitgrogen is quickly lost both by growing the crop and by leaching. Too frequent fallowing and cropping will soon result in soil nitrogen depletion. This can be avoided by a suitable rotation with periods of pasture.

FEEDING FOR MILK QUALITY

By L. C. SNOOK, Animal Nutrition Officer

MILK which is sold for human consumption must be clean and of good quality. To safeguard the public, the Milk Board lays down definite standards which must be satisfied in all milk which is placed on the market. Such milk must be reasonably free from living organisms, it must contain 3.2% of butterfat and 8.5% of solids-not-fat. It is the latter fraction, the solids-not-fat, which contains the most valuable constituents to the consumer and is the source of most trouble to the producer.

In the "bad old days," regulations were needed because milk was sometimes produced under unhygienic conditions, and the milk could be adulterated with water. Today, however, the dairy industry is faced with quite a different problem, a problem which persists despite endeavours by the dairymen to prevent it. At certain periods of the year a considerable volume of the milk which is forwarded to the receiving depots is deficient in solids-not-fat. There is no question of adulteration or carelessness but simply a change in the quality of the milk produced by the cow.

This has meant that quite a few honest dairy farmers have faced the threat of prosecution for selling what appeared to be good milk. Not unnaturally this has produced a widespread feeling of disquiet throughout the industry.

WORLD-WIDE PROBLEM

The problem has appeared all over the world. In fact, it has become so general that the argument has been advanced that the standards set for milk quality are too high. It would be a negative step, however, to lower standards. In fact, it should be the object of producers to improve quality and so encourage increased consumption. Quite correctly, the authorities have refused to lower the standards. Milk of good quality **can** be produced and it is the responsibility of the industry to see that **only** good quality milk is sold.

This is all very well but the matter cannot be left on this idealistic plane. We must be certain that the dairy farmer can produce the high quality milk which we demand. It is important, therefore, to consider the factors which determine the quality of the milk yielded by the dairy cow.

BREED INFLUENCES

When I was a student I was taught that the quality of the milk was determined almost entirely by the breeding of the cow. We were told that the volume of milk could be influenced to a large degree by feeding and management, but that the "richness" was determined irrevocably at birth. With certain reservations this teaching was correct. Dairymen must face up to the fact that the breed of the cow **is** the most important factor which determines the quality of the milk. Unfortunately, milk is purchased according to its volume. This means that the most profitable cows are those which produce a large volume of milk which will just pass the standard.

Under the present system this state of affairs must be accepted. I wish to make it clear, however, that the problem of milk quality exists simply because it is profitable to maintain herds which produce a lot of milk containing the maximum permissible amount of water. In fairness it should also be emphasised that many producers now realise this fact. There has been a strong swing to the use of bulls which will improve milk quality. It will take many years, however, to effect an appreciable change in the make-up of our dairy herds. Meantime, can anything be done to help the dairyman with a milk quality problem?

FEEDING FOR MILK QUALITY

Yes, much can be done by correct feeding practices. During recent years much has been learnt concerning the influence of food on milk quality. By using this knowledge the owners of herds producing milk of borderline quality should be able to eliminate the worries which now beset them.

In general, lack of butterfat in milk is not a problem. At times, however, sudden falls in the batterfat content have bewildered dairy farmers. These falls, in the main are due to lack of roughage, and are most commonly seen when herds are placed on lush green pastures in the early winter months. Under such conditions the butterfat content can fall to less than 2%. The effect can be so marked that butterfat producers who have placed their herds on early oat crops have wondered what has gone wrong with their separators—very little cream was obtained from large volumes of milk. Fortunately this decline in butterfat on lush crops can be corrected by the provision of roughage. Hay is the ideal supplement and this should be fed generously during the autumn and winter. If hay is scarce, use can be made of whatever roughage is available. It may be pertinent to mention that the roughage should not be put through a hammer mill. It has been found that if the roughage is reduced to a powder, it is no longer effective in lifting butterfat percentages. It seems that coarse roughage **as such** is necessary.

Equally definite advice can be given concerning the nutritional factors which influence the solids-not-fat content of milk. These factors have received intensive study abroad, particularly at the National Institute for Dairy Research in Britain. These studies have shown very clearly that the main cause of a seasonal decline in the percentage of solids-not-fat is a lack of easily-digested carbohydrate in the diet. This finding fits in very well with observations made under local condi-

tions. It is significant that the solids-not-fat problem occurs during those portions of the year when feed is scarce. For example, farmers on irrigated properties tend to run into bother during the early winter months when the growth of pasture on low-lying land is at a minimum. In contrast, farmers without irrigation tend to run into trouble during the late summer when the dry grazing has become depleted. I have noticed that a solids-not-fat problem rarely occurs in a herd of fat cows. In fact, in most problem herds the top cows are lean.

It follows that the dairy farmer must feed generously during those periods when his milking cows will otherwise be somewhat short of good quality food. Crushed cereal grains are the ideal supplement and proprietary dairy meals should be equally effective. The farmer can select whichever is the cheapest, or most convenient, and feed this **at a generous level** to the top-producers, whenever there is any likelihood that the grazing may be deficient in quality or quantity.

USE ROUGHAGE CAREFULLY

Care must be taken in the use of roughage, particularly hay of poor quality. Such roughage will not satisfy the energy requirements of a high producing cow and if little else is available, the quality of the milk will be affected. It is important to realise that roughage has a contrasting effect on the amount of butterfat and the solids-not-fat, secreted in the milk. As has already been mentioned, a reasonable allowance of hay must be given to cows on lush green feed in order to prevent a drop in the percentage of butterfat. But if hay, particularly poor quality hay, becomes the main item of diet, then the percentage of solids-not-fat can fall. Here again dairy farmers will find that this statement fits in with their own experience. It is recognised that the solids-not-fat percentages fall during the periods of the year when hay becomes the main feeding stuff. Likewise, the problem disappears when the pastures are good, the cows are fat, and there is no suggestion of any shortage of easily digested food.

It seems, therefore, that the problem of milk quality can be summarised as follows:—

Most of the cows in quite a few dairy herds produce milk which contains little more than the minimum requirements of butterfat and solids-not-fat.

Because there is only a small safety margin, any upset in feeding habits can result in sub-standard milk and the risk of prosecution.

Seasonal declines in butterfat content are most likely to be due to an excessive intake of lush greenfeed. The decline can be arrested or prevented by the feeding of hay.

The main cause of a fall in the solids-not-fat fraction in milk is the shortage of readily available, easily digested carbohydrate. This is most easily supplied in the form of crushed cereal grains, or proprietary dairy meals of high energy value. Excessive use of inferior hay, or unpalatable roughage, will accentuate the fall in solids-not-fat which results from a shortage of good-quality food.

In other words, with better breeding and better feeding, the dairy farmer himself can completely overcome all the uncertainties associated with the production of sub-standard milk.

THE RABBIT—FRIEND OR FOE?

By A. R. TOMLINSON, Chief Vermin Control Officer

THE title might be thought to imply that I am uncertain of the correct classification of the rabbit. However, there is no doubt whatsoever in my mind. Rabbits are the deadly foe of every farmer, of our State, and of Australia. They should be treated as such.

Unfortunately there does not appear to be this certainty in the minds of some farmers, local authorities and others concerned. Ever since rabbits first appeared there has been a certain degree of tolerance for them. In some cases this has

been clearly evident such as with those farmers who have farmed rabbits for the trappers. In most instances however it probably has been quite an unconscious reaction. This would include those farmers who have conscientiously carried the control measures required of them legally, but have not worried much if there were a few rabbits left or even if there were more than a few.

There are of course those who have refused to compromise and have kept up a continuous and remorseless campaign to destroy rabbits. These farmers are unfortunately only too few and even now there are plenty who openly admit they like to have some rabbits around to feed their dogs, to have for an occasional meal and to provide sport by way of shooting for themselves or their friends.

The time has come for us to decide completely and finally one way or the other. Is the rabbit a vicious menace to be treated as an undesirable and unwelcome pest which must be destroyed on sight, or is it to be regarded as a half harmful and half harmless animal?

That is what the New Zealanders faced when they came to grips with the rabbit menace. Their answer was to de-commercialise rabbits as a primary move. As a result the sale or purchase of rabbits in any way is banned and consideration is being given to preventing any type of rabbit being kept.

Some Vermin Boards and farmers here have already realised the implication of these steps, and have asked for similar action to be taken here. I read also recently that the secretary of the Graziers' Association of Victoria who has just visited New Zealand has recommended the de-commercialisation of rabbits throughout Australia.

There can be little doubt that no campaign to control rabbits effectively can be successful if rabbits are regarded as being of any value. The fact that the damage rabbits do in eating pastures or crops is not so spectacular as a wild dog killing a sheep should not blind anyone to the fact that rabbits are just as dangerous a menace. Seven of them will eat as much as a sheep, so just as surely they deprive the farmers of their sheep numbers or of their full wool and meat production. They also destroy crops, cause soil erosion and their cost to the community is enormous. The C.S.I.R.O. estimated that each rabbit cost the farmer who maintained it 10s. a year in reduced stock production alone. This does not include the hundreds of thousands of pounds of other losses or expenditure on the routine control work to prevent their overwhelming the country. Two rabbits may cost £1 but in one area of our State last season it was reported that five successive breedings had occurred. With five kittens in each litter, each of the original pairs became 27, with a cost of £13 10s.

I do not think that it requires much consideration to decide which way the answer should be. Rabbits are a menace to our primary production and economy so they are a foe of everyone from the farmer to the city dweller. They should not be regarded as being of any value whatsoever or be tolerated under any circumstances. No effort should be spared to destroy them by every means available with the aim of getting as near to extermination as possible.