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Insect pests and their control - The Reg-legged earth mite and the lucerne flea

C. F. H. Jenkins

INSECT Pests AND THEIR CONTROL

By C. F. H. JENKINS, M.A., Government Entomologist

THE RED-LEGGED EARTH MITE AND THE LUCERNE FLEA

FOR many years the red-legged earth mite (Halotydeus destructor (Tucker)) and the lucerne flea (Smynthurus viridis L.) have been serious pests of pastures and leguminous crops in Western Australia. Under certain seasonal conditions, damage has also been done to cereals such as oats and barley and every year some damage is done to vegetable and flower gardens. Until recently, the control of both the earth mite and the lucerne flea was uneconomic on large areas due to the cost of material and the heavy application rates which were necessary. Recent investigations with new insecticides, however, have completely changed the picture and have provided farmers with cheap and effective methods for controlling both pests.

THE RED-LEGGED EARTH MITE

The original home of this mite is still doubtful. It has been known as a pest in South Africa since 1908, and has been recorded in Western Australia since 1917. Bunbury was the first district to report the pest and it is believed to have been introduced per medium of vegetables and stores discarded from ships trading between the port of Bunbury and South Africa.

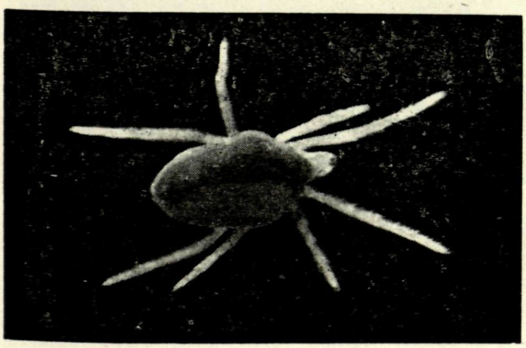


Fig. 1.—Red-legged earth mite, greatly enlarged.

Since its introduction the creature has spread practically throughout the South-West, and is a menace to pastures, flower gardens, and vegetables alike.

GENERAL DESCRIPTION

The name, red-legged earth mite, is really very apt, if somewhat lengthy, for it describes the main characteristics of the mite. The tiny body is velvety black, and the legs, eight in number, are red. The two front legs are somewhat longer than the others, and are used as feelers.

LIFE HISTORY

The winter eggs are laid only in suitably moist situations, and may be attached to the under surfaces of plants such as clover and capeweed. Under favourable conditions an egg hatches within a few days and a tiny larval mite emerges. The young mite differs from the adult in its small size and in the fact that, like an insect,

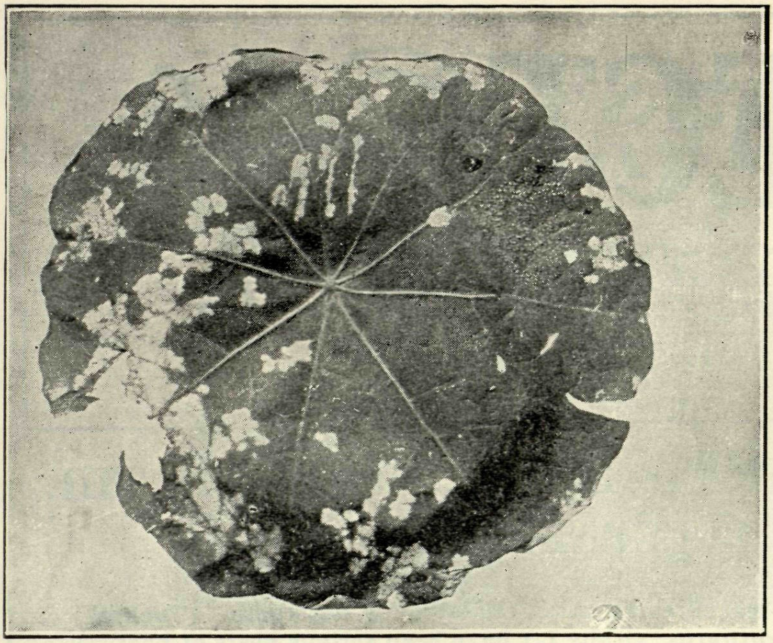


Fig. 2.—Leaf of plant showing typical mite injury.

it has only three pairs of legs. After moulting several times, it gains the full complement of eight legs and becomes mature.

It takes about a month or more, according to weather conditions, for each generation to develop and commence reproducing, so that there is ample time for several generations to arise during the winter.

OVER-SUMMERING

It is only after cool weather and the winter rains have set in that the red-legged earth mite appears, and it soon ceases to be active when the weather becomes hot and dry. It passes the summer by means of resistant eggs which lie in the soil and successfully withstand the heat and desiccation. Many of these eggs are laid before the mite dies, but others remain in the dried bodies of the female mites and hatch with the next winter rains.

HABITS

The red-legged earth mite is rather a delicate creature and is very susceptible to dryness, consequently it is only a pest

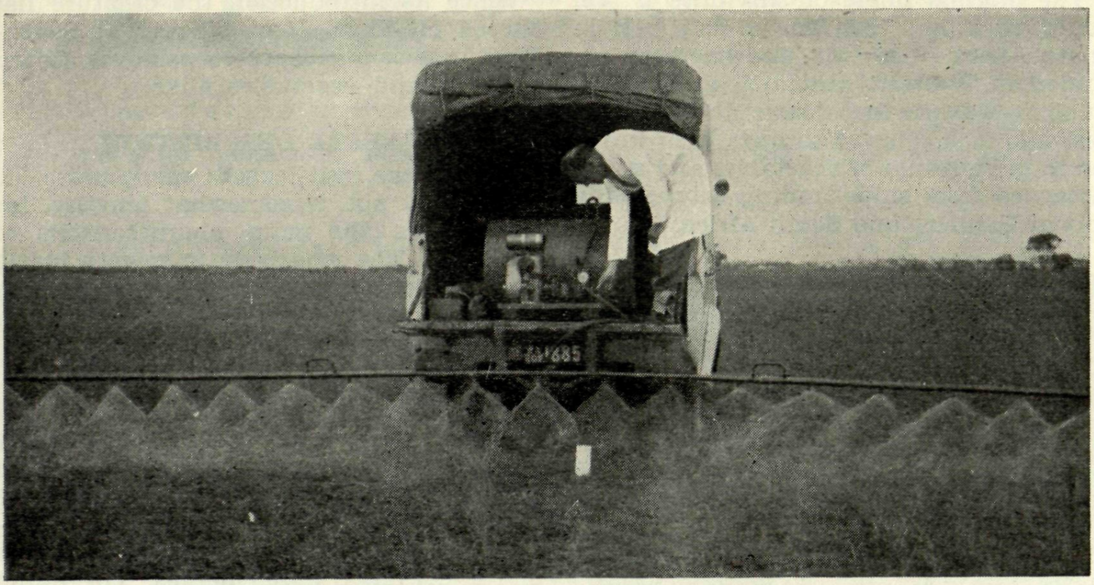


Fig. 3.—The low-volume boom spray has revolutionised pest control methods and provides an effective means of spraying large areas of crop and pasture.

during the winter months. It prefers moist, sheltered situations, and thrives especially where such weeds as capeweed are allowed to grow abundantly.

It is mainly on seedlings that the mite's attack is most serious. As soon as the tiny leaves appear the mites swarm upon them and cause them to bleach and wither. The mouth parts of the creature are adapted for rasping or lacerating the plant tissue, and the exuding sap is sucked up. Typical mite injury is indicated by the silvering or whitening of the attacked foliage, but the absence of actual holes in the leaves distinguishes the injury from the bleaching caused by the lucerne flea.

The mites are gregarious in habits, often feeding in clusters on a leaf or sheltering together in slight depressions in the ground. When disturbed they scatter in all directions, and if on a plant will usually fall directly to the ground.

The name earth mite is quite apt for the creature, as it seldom goes far from that element, and returns there as quickly as possible at the first sign of trouble.

It is on leguminous crops such as field peas and clover that red-legged earth mites are most troublesome to the farmer although flax and linseed may suffer heavily and cereal crops are liable to attack. Under favourable growing conditions it is not usual for crops such as wheat and oats to sustain serious damage but when drought or other adverse factors retard plant growth mite injury is accentuated.

THE LUCERNE FLEA

The lucerne flea or clover springtail is best known in this State as a pest of clover pastures, but various plants, including many types of vegetables, are also liable to attack. The insect is of European origin, being widely distributed over that continent. It occurs also on the North coast of Africa, in the Argentine, and in all the Australian States with the exception of Queensland.

The date of its introduction into Australia is not known, but it was noted in South Australia as early as 1884. It was not until 1910 that the pest was observed in Western Australia, and it is believed that baled fodder imported from South Australia was the medium of introduction.

GENERAL DESCRIPTION

The terms flea and springtail imply that the insect is a good jumper, and this is very true, but the creature is not by any means closely related to the true flea. It does not jump by means of well-developed legs, as does the flea, but with the aid of a special organ known as the spring. Reference to the accompanying illustration will show just how this mechanism works.

The insect is a dumpy-looking creature, wingless and about 1/10th of an inch in length. The colour pattern varies greatly but green or greenish-yellow usually predominates. The mouth parts are of the biting type and the plant material is actually chewed and swallowed.

LIFE HISTORY

The eggs are laid in batches in moist situations either on the soil surface or beneath decaying leaves and debris. After being laid the eggs are covered by the

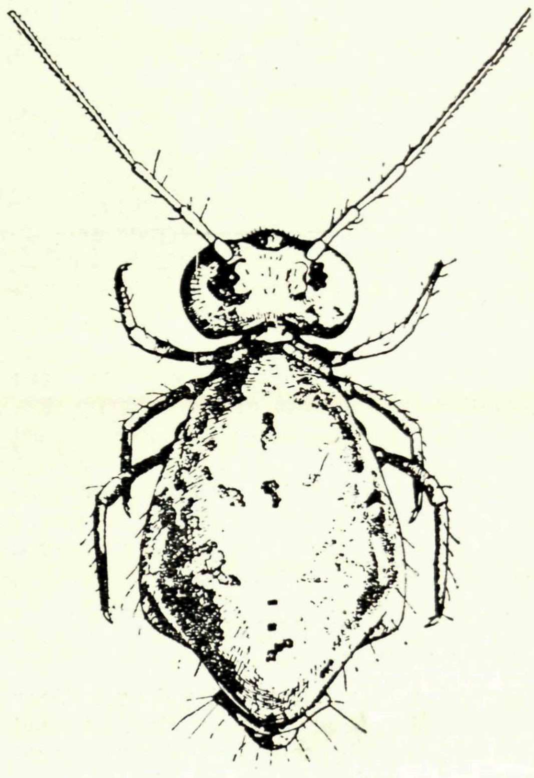


Fig. 4.—Lucerne flea, greatly enlarged.
(After Swan.)

female with a fluid consisting largely of excreted soil, and on drying, this coating renders the eggs very difficult to detect.

In captivity the female has been noted to lay about 60 eggs to a batch and two batches appear to be the average. Under favourable conditions the eggs hatch after three or four days and a "nymph" emerges, resembling its parents in general appearance, but being much smaller in size. The time required for the nymph to develop fully will vary greatly with weather conditions, but is about a month under normal circumstances. As the active period of this pest is approximately from May to October, it is evident that a number of generations can develop during the season.

When warm, dry conditions arise, the eggs fail to develop. They successfully withstand the heat and desiccation of the summer however, and hatch with the first winter rains.

HABITS

The lucerne flea, like the red-legged earth mite, is very dependent upon moisture and quickly succumbs should hot, dry conditions prevail for any length of time. It is seldom a serious pest in sandy localities, but thrives on heavy and slightly acid soils. The reason for this is probably associated with the insect's habit of eating quantities of soil during its life.

The injury caused by the lucerne flea is quite characteristic; small irregular portions of the leaf may be eaten right away, leaving a ragged hole, or the lower surface of the leaf may be left intact as a whitish film.

Although clovers and lucerne are the favourite food plants of the lucerne flea, capeweed is also a very important host plant and often shows severe injury. Vegetables, such as peas, beans and potatoes, grown in close proximity to weedy land supporting a growth of capeweed may be seriously affected.

CONTROL

Cultural Methods

In order to minimise the depredations of both red mite and lucerne flea, all weed growth, especially capeweed plants, should be reduced to a minimum. Where it is possible to plant field crops such as flax, field peas, etc., on clean fallowed land the damage from mites and fleas will be greatly reduced and infestation will mainly arise from weedy fence-lines and head-lands. Where fallow is not available for the planting of susceptible crops, weedy land should be turned in as early as possible prior to planting so that pests already present in the area will be starved out before the new crop has germinated.

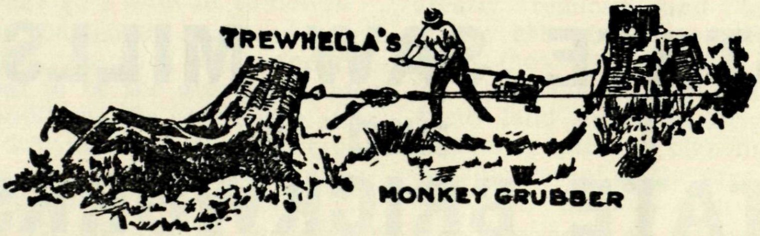
In the case of lucerne, early spring planting is sometimes possible. The mite and flea population gradually diminishes with the advance of summer whereas the growing conditions for the lucerne (if moisture is available) become increasingly favourable. By the following winter the plants should be quite well-established and much better able than freshly-sprouted seedlings to withstand both lucerne flea and red-legged earth mite attack.

Biological Control.

No suitable parasite or predator for the control of the red-legged earth mite has yet been found. The position is somewhat more satisfactory, however, with regard to the lucerne flea.

A species of predatory mite commonly known as the bdellid mite (*Biscirus lapidarius* (Kram)) was discovered in this State in 1932 and its main food was found to be the lucerne flea. In permanent pasture lands the mite has shown it ability to exercise a controlling influence on the flea, but it has by no means solved the lucerne flea problem. For many years the mite was distributed by the Department of Agriculture in order to ensure its introduction into the principal clover growing districts. The creature now has a wide range in the lower South-West, and wholesale distribution has been discontinued. The natural spread of the mite is rather slow and some farmers believe in spreading the predators over their paddocks whenever they find a particularly active colony at work. The mite is a little over 1/16th inch in length, reddish in colour, has a long "snout," eight legs, and two prominent "feelers."

It has a habit of hiding, particularly during dry spells, under pieces of bark, slats of wood and other suitable cover. Such material and the adhering mites can



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be collected in a bucket or other receptacle and transferred to areas where the flea is particularly troublesome.

Chemical Control.

The increase in ley farming which has taken place in many districts in recent years has greatly accentuated the problem of both lucerne flea and red-legged earth mite control. The general reduction in fallowing and clean cultivation makes farmers more and more dependent upon chemical treatments to ensure healthy crops. Recently developed insecticides and the availability of suitable field spraying equipment has revolutionised pest control methods and has made pasture and field crop spraying a really practical proposition.

Early recommendations for the chemical control of the lucerne flea depended upon such materials as arsenate of lead and lime sulphur (Jenkins and Forte 1948) but the quantities necessary made such chemicals quite unsuitable for field treatments.

Malathion.

Many of the new insecticides have been carefully tested against both the lucerne flea and the red-legged earth mite.

Malathion gives good immediate results against both pests and has the added advantage of being non-toxic to the bdellid mite (Wallace, unpublished information) (Anon 1955). It has a low toxicity to man and domestic animals and may, therefore, be used without the necessary precautions associated with parathion. Unfortunately, there is no appreciable residual effect on pasture pests and so the timing of the spray is very important. Treatments should be applied so as to kill the first brood before egg-laying has taken place. Such an application should normally be made about three weeks after the opening rains.

In order to ensure residual action against the red mite it is best on all occasions to use a malathion-DDT combination in the following proportions:—

½ oz. of Malathion plus 1 oz. of DDT per acre.

Parathion.

Prior to the successful testing of malathion, parathion was the most effective chemical for lucerne flea control, the recommended dosage being ¼ oz. of active ingredient (1/16th pint of 20% emulsion) per acre. At such a concentration, parathion was not effective against the red-legged earth mite and the addition of 4 oz. of DDT (1 pint of 20% emulsion) per acre was recommended. The high toxicity of parathion to man and domestic animals rendered an effective substitute very desirable.

DDT.

Where the red-legged earth mite is not associated with the lucerne flea 4 oz. of DDT per acre will give satisfactory control. DDT is ineffective against the lucerne flea, however, and may even encourage the increase of this pest due to the adverse effect of DDT on the bdellid mite (Wallace 1954 *a*). In most circumstances, therefore, it will be safest to use the malathion-DDT combination already recommended.

OTHER NEW INSECTICIDES

Benzene-hexachloride (BHC or "Gammexane") gave some promise in early experiments (Jenkins and Forte 1948 and

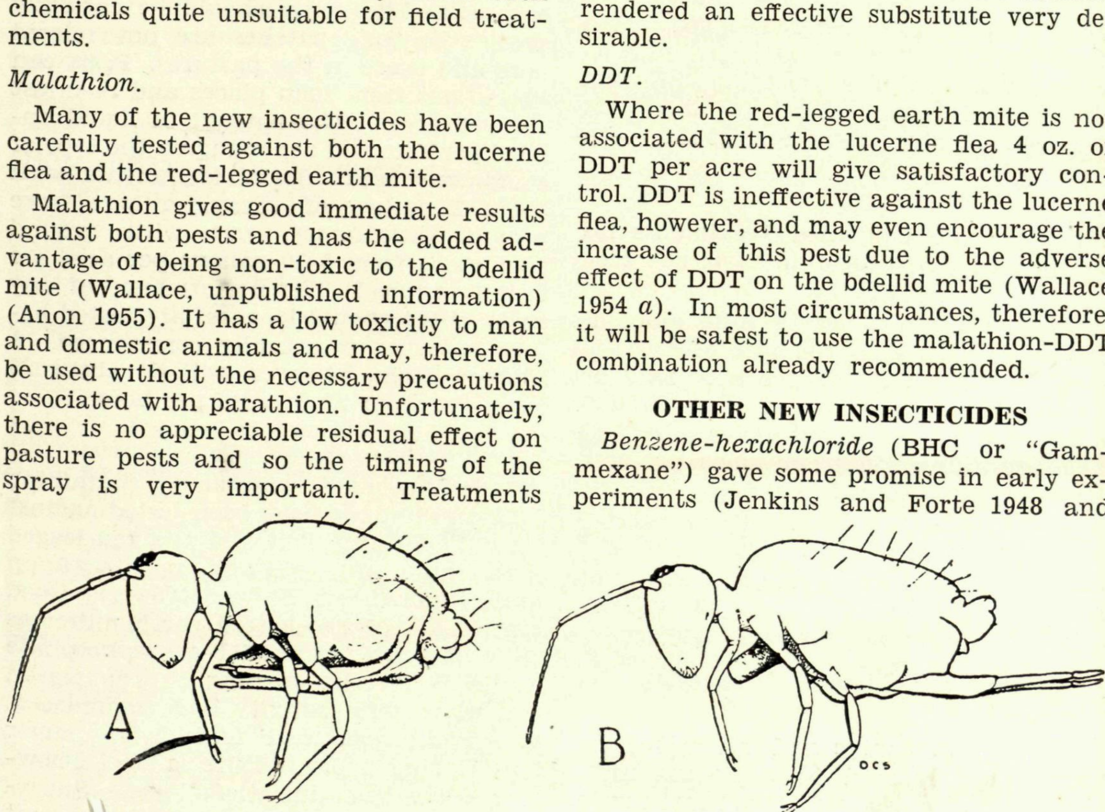

Fig. 5.—Sketches of lucerne flea showing the mechanism of the spring. (a) Spring folded under body in the normal position. (b) Spring extended after jumping. The structure projecting from between the middle pair of legs is the base of the ventral tube (adhesive organ). Only the appendages on the near side are shown.

(After Swan.)

Swan and Lower 1951) but subsequent work has shown it to be of little practical use (Wallace 1954 *b*) especially in view of the remarkable effectiveness of parathion and malathion.

Lindane spray at 1.1 and 2.3 oz. per acre gave no control of the lucerne flea but fair control of the earth mite. The latter, however, was in no way comparable to the DDT treatment either in early or residual effect. (Wallace, unpublished information.) (Anon 1955.)

Dieldrin at 4 and 8 oz. active ingredient per acre applied by boom spray was not effective against earth mites and gave only fair immediate control of the lucerne flea. The residual effect against the latter pest, however, was good. (Wallace, unpublished information.) (Anon 1955.)

Tests have been carried out with a number of other new insecticides (Wallace, unpublished information) (Anon 1955) including endrin, dilan, chlorthion and diazinon. None was comparable with DDT for the control of the red-legged earth mite, but chlorthion proved equal to malathion for lucerne flea mortality. Endrin gave a good immediate kill of both pests with some residual effect against the earth mite.

Individual and Combined Treatments for Red-Legged Earth Mite and Lucerne Flea Control

Where red-legged earth mite alone is troublesome, DDT at the rate of 4 oz. (1 pint of 20% emulsion) per acre may be used. For lucerne flea control, malathion at the rate of ½ oz. of active ingredient (2 tablespoonfuls of 50% emulsion) per acre should prove effective.

As both pests are commonly associated in pastures, however, a combination of ½ oz. of malathion, plus 1 oz. of DDT (¼ pint of 20% emulsion) per acre is recommended for general pasture spraying.

Method and Time of Application

Spraying.

Low volume sprays and aircraft have been effectively used to apply materials for lucerne flea and red-legged earth mite control. As already stated, if one spray treatment only is contemplated it must be carefully timed to kill the newly hatched fleas before egg-laying has commenced. The residual action of the DDT against red-legged earth mite makes the timing less important with regard to that pest. When the first spray has been delayed or wrongly timed with regard to lucerne flea, a second treatment three weeks after the first may be necessary to control a bad

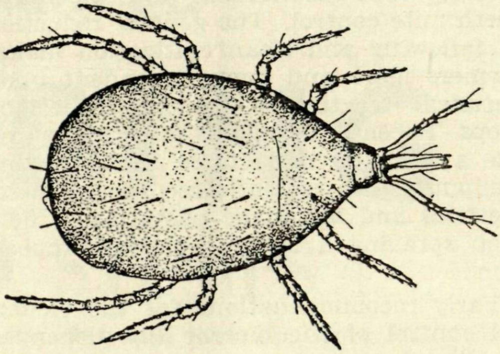

Fig. 6.—The bdellid mite, greatly enlarged.

outbreak. The spray should be carefully applied so that patches are not missed here and there in the pastures. Pests can spread out from such places and re-infest sprayed areas. The amount of liquid applied per acre will depend upon the type of equipment used. Aerial treatments with about 2 gallons of spray per acre have proved satisfactory, but with ground equipment from 5-10 gallons per acre are usually applied. The performance of any spray outfit should be carefully tested before spraying is actually commenced. A 30 foot boom, however, will do about 20 acres per hour at 5 miles per hour.

Top-dressing.

Superphosphate mixtures containing DDT and lindane have been tested against both the lucerne flea and the red-legged earth mite with varying results (Anon 1953; Erlich 1954; Wallace 1954 *a*). Good control of the red-legged earth mite has been obtained with DDT-superphosphate applied after the opening of the season and when mite activity had commenced. The results obtained from late summer top-dressing on dry pasture paddocks, however, have been unsatisfactory. Superphosphate-lindane mixtures have not given effective control of the lucerne flea under local conditions.

Necessity for Treatment.

It has been shown (Wallace, unpublished information) that an overall gain of 14% in total yield can follow the elimination of the red-legged earth mite from clover pastures. Where heavy mite and flea infestations are observed early in the season, therefore, spray treatments should be well worth while. On the other hand the wholesale spraying of uninfested or lightly infested pastures, as practised by many farmers, as a general preventive measure, is neither economical nor desirable.

WARNING

Operators handling parathion and other dangerous insecticides should follow the safety precautions recommended by the Department of Public Health and printed on the insecticide containers. Contact with liquids should be avoided, and the spray mist should not be inhaled.

Stock should be excluded for at least a week from paddocks treated with such materials.

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FOX POISONING

Numbers of foxes are still being destroyed in areas covered by the "1080" rabbit poisoning units. Some were dying as the result of eating poisoned rabbits (secondary poisoning) but many cases of primary poisoning occurred where farmers use poisoned apple baits instead of oats.

Tests were recently conducted in the Geraldton and Moonyoonooka areas in an attempt to determine which baits were most acceptable to foxes. Baits tested included fats (mutton, beef, lard and butter) fruits (dates, raisins, apricots and apples) and cereals (bran and pollard).

Beef and mutton fats proved superior to butter, while lard baits were left untouched. Dates were the best of the fruit baits but were only about one-third as attractive as the fats. Except for a few raisins, the remainder of the fruit baits were left, untouched.

A furrow trail was not found to be particularly effective in this area as most foxes appeared to travel along gullies. However where a furrow intercepted the fox trails the track indicated that the animals often followed the furrow for a short distance. Where a sheep paunch was trailed along the furrow a slight increase in activity was noticed.

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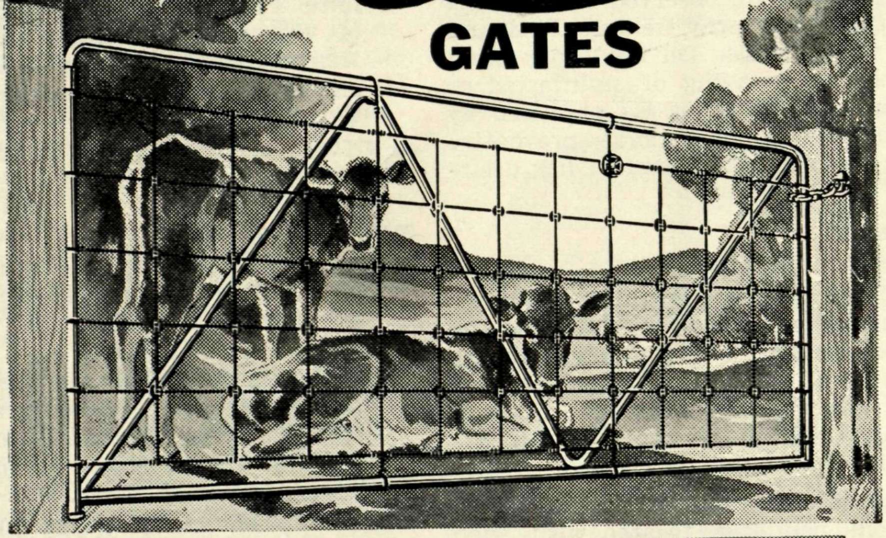

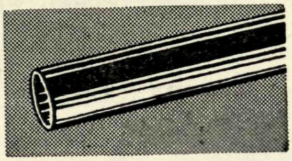

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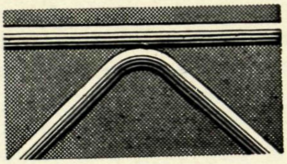

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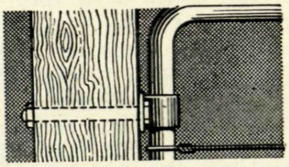

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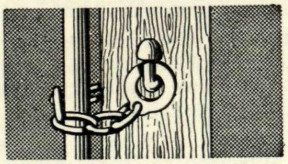

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