Department of Primary Industries and Regional Development
GOVERNMENT OF WESTERN AUSTRALIA

Journal of the Department of Agriculture, Western Australia, Series 3

Volume 4
Number 3 *May-June, 1955*

Article 12

5-1955

Insect pests and their control - The lucerne flea (Sminthurus viridus L.)

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INSECT Pests AND THEIR CONTROL

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THE LUCERNE FLEA

(*Sminthurus viridus L.*)

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

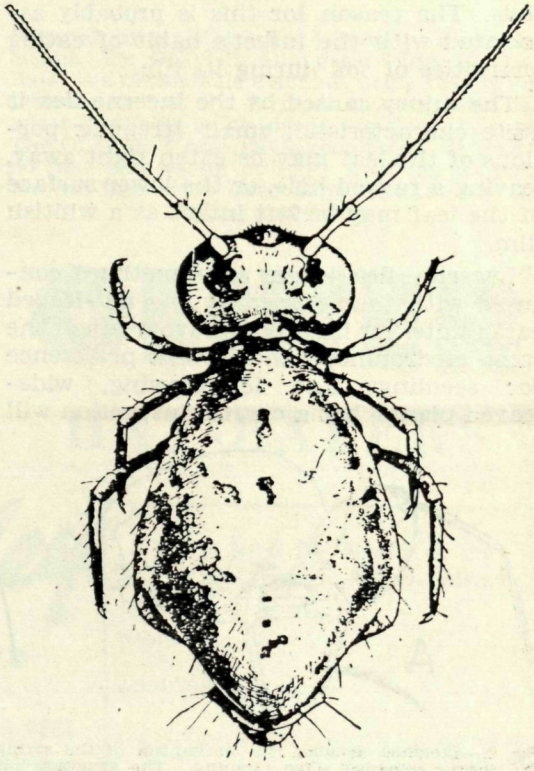


Fig. 1.—Dorsal view of lucerne flea (After Swan.)

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 much smaller. 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 until the next autumn rains again bring about conditions favourable for hatching to take place.

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.

Lucerne flea injury is sometimes confused with that caused by the red-legged earth mite, for both pests favour much the same environment and have a preference for seedlings and low-growing, wide-leaved plants, but a careful inspection will soon reveal characteristic differences in the injury caused by each.

The mite is a sap sucker, and so does not actually remove any of the solid plant tissue. No jagged holes will be seen in leaves attacked by the mite, and leaves bleached by the lucerne flea will be almost transparent when held up to the light. The mite-injured leaves, although bleached, still remain opaque.

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.

The advantage of clean cultivation in the establishment of clover or lucerne will be obvious, bearing in mind the wide host range of the pest, and its liking for capeweed. Although it is not always practicable to plant on clean fallow, where this can be done, serious insect infestation can only take place from dirty fence-lines and headlands, and a good stand may be secured before a high insect population can occur. In the case of lucerne, early spring planting is sometimes possible. The "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 to withstand both lucerne flea and red-legged earth-mite attack than freshly-sprouted seedlings.

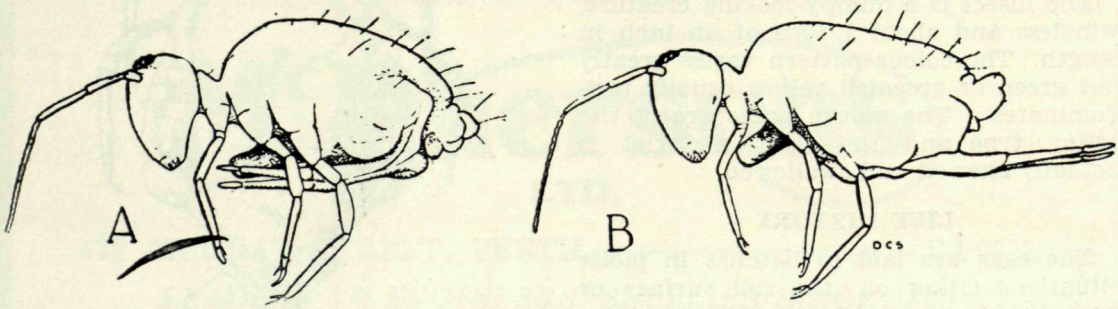
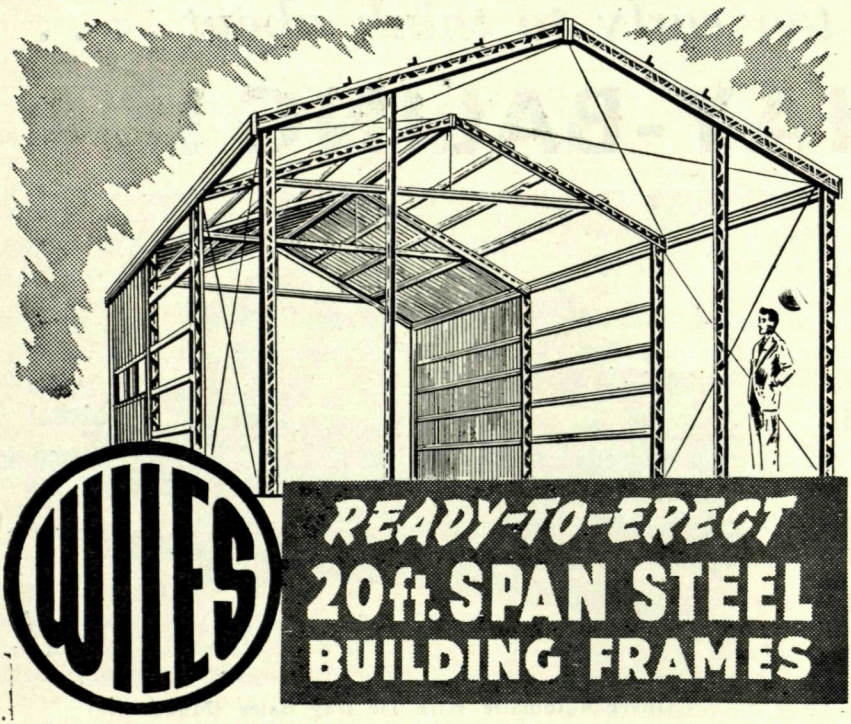


Fig. 2.—Sketches showing the mechanism of the spring. (a) Spring folded under body in the normal position. (b) Spring extended after jumping. The structure projecting from between the middle pair of legs is the base of the ventral tube (adhesive organ). Only the appendages on the near side are shown. (After Swan.)



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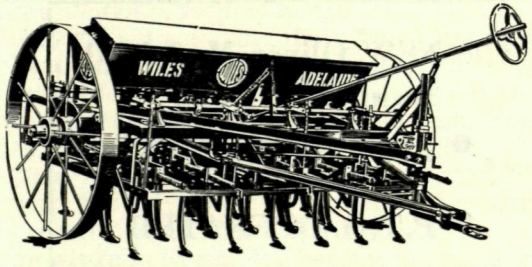

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Biological Control.

A species of predatory mite commonly known as the bdellid mite (*Biscirus lapidarius)* 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 its 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 warm spells, under pieces of bark, slats of wood and other suitable cover. Such material and the adhering mites can 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 & Forte 1948) but the quantities necessary made such chemicals quite unsuitable for field treatments.

Parathion.

Parathion or E605, sold locally under such trade names as Phosphone 20, Folidol,, Thion 40, etc., has proved outstanding against the lucerne flea and is the present standard method of control. Recent work carried out by the C.S.I.R.O. in Western Australia (Wallace, unpublished information) has shown that parathion applied by a boom spray at 1/16th of a pint of 20 per cent. emulsifiable concentrate (= $\frac{1}{4}$ oz. of active ingredient) per acre will give excellent control and that, although higher concentrations have been used in the past, these are seldom necessary. Where efficient ground spraying is being carried out, therefore, 1/16th of a pint of 20 per cent emulsifiable concentrate could be used. Where some loss may occur from wind drift and evaporation as in aerial spraying, $\frac{1}{8}$ pint of emulsion per acre is recommended.

Unfortunately the residual effect of parathion is very slight, and fleas hatching after treatment will be unaffected. The timing of the spray, therefore, becomes important, and treatments should be applied so as to kill the first brood before egg-laying has commenced. Such an application should normally be made about three weeks after the opening rains. If for any reason the early spray is not possible or has been wrongly timed and lucerne fleas are particularly troublesome, then two parathion treatments should be given about three weeks apart. The second treatment should kill fleas hatching from eggs unaffected by the first spray.

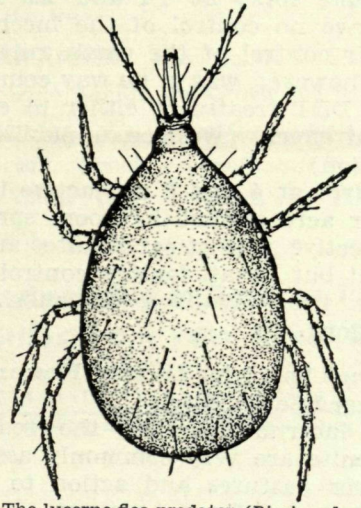

Fig. 3.—The lucerne flea predator *(Biscirus lapidarius).*

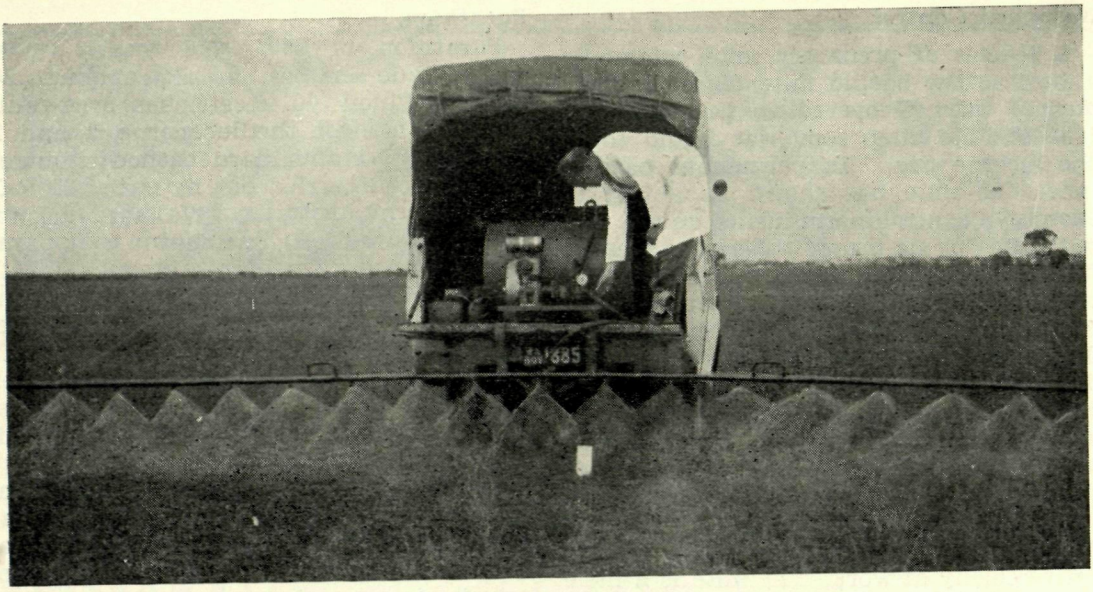

Fig. 4.—The low-volume boom spray, one model of which is shown here, has revolutionised pest control methods and provides effective control over lucerne flea.

Other New Inseticides.

DDT has proved quite useless against the lucerne flea and indeed its application may increase the flea population due to the toxic effect on the bdellid mite (Wallace 1954 *a*).

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

Lindane spray at 1.1 and 2.3 ozs. 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).

Dieldrin at 4 and 8 ozs. active ingredient per acre applied by boom spray was not effective against earth mites and gave a slight but unsatisfactory control of the lucerne flea. (Wallace, unpublished information).

Combined Spray for Lucerne Flea and Red-legged Earth Mite.

The lucerne flea and the red-legged earth mite are very commonly associated in clover pastures and action to control both pests is often necessary.

Unfortunately parathion is of little use against the red-legged earth mite (Wallace 1954 *b*) and DDT will not control the lucerne flea, but a suitable combination of these chemicals can be used to control both pests.

The dual purpose formula which is recommended is $\frac{1}{4}$ lb of DDT and $\frac{1}{4}$ oz. of parathion per acre. This means that when proprietary 20 per cent. emulsions of the chemicals are used, it will be necessary to apply 1 pint of DDT emulsion, together with 1/16th of a pint of parathion per acre. When stronger or weaker proprietary preparations are used, the quantity should be decreased or increased proportionately. As pointed out under the heading of parathion, when any loss by wind drift or evaporation is likely the concentration of parathion should be increased to $\frac{1}{8}$ pint of 20 per cent. emulsion per acre.

Method and Time of Application.

Low volume boom 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 outbreak. The spray should be carefully applied so that patches are not missed here and there in the pastures. Fleas will soon spread out from such places and quickly 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.

Necessity for Treatment.

Farmers would be well advised to consider carefully the losses which are caused annually by the lucerne flea and the red-legged earth mite. Regular routine spraying over large areas is not recommended. To assist in the establishment of newly planted legumes and to protect special crops, treatments are well worth while. The detrimental effects of DDT upon the bdellid mite predator of the lucerne flea should be borne in mind, however, and, in the main, insecticides should be applied to areas where actual damage is apparent or expected, and not in a wholesale manner merely as a general preventative measure.

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