Seed Production

HEMIPTERA AND OTHER INSECTS ON SOUTH ISLAND LUCERNE AND LOTUS SEED CROPS 1980-81.

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SUMMARY

Lucerne (*Medicago sativa*) and lotus (*Lotus pedunculatus*) seed crops have the same pest spectrum. The Australian crop mirid (*Sidnia kinbergi*) was the most numerous pest on both crops. The potato mirid (*Calcorois norvegicus*) was most common when lotus was flowering, but populations declined as lucerne began to flower. The wheat bug (*Nysius huttoni*) was the most numerous in two of 64 lucerne crops. Populations of brown shield bug (*Dictyotus caenosus*) and green vegetable bug (*Nezara viridula*) were high on podded lucerne crops but not on lotus which set seed earlier than lucerne. Symptoms of damage and responses in yield following bug control are noted. Populations of caterpillars and homopterans were sufficiently low to be of little concern to growers. We consider the pale damsel bug (*Nabis capsiformis*) to be the most significant predator in lucerne.

INTRODUCTION

This paper reports on the first survey of insects affecting lotus seed crops and on the results of the sixth and most extensive study of South Island lucerne seed crops (Myers 1921, Timlin unpublished, Macfarlane and Pottinger 1976, Sommerfield and Burnett 1976, Farrell and Stufkens unpublished). Seed pests were reported to be more abundant over the last few years, a period marked by improved pollination and the advent of aphid control with insecticides. In 1980, bugs were associated with dramatic lucerne seed losses between the onset of pollination and harvesting. Our survey concentrated on monitoring seasonal changes and inter-field variations in populations of bugs and the predacious insects that might influence their numbers.

METHODS

The sampling unit was a set of 20 sweeps with a 360 mm diam. net which covered about 18 m². A survey sample consisted of two such units from uniform sectors of fields. Four or five such units were taken when farm insecticide trials were involved. Catches were analysed in the laboratory.

Sixty-four lucerne and twelve lotus fields were sampled between October 1980 and March 1981. Possible alternative hosts (i.e. weeds) were checked for Hemiptera. Lucerne sampling was centred in Marlborough (48 fields) and was supplemented with observations in Canterbury (7), Otago (7) and Nelson (2). A third of the lucerne fields were sampled from three to six occasions throughout the season. Twenty-one crops were either not saved for seed (18) or were not harvested (3).

Mirid damage in a lotus and a lucerne crop was assessed by taking stems (30 lotus, 20 lucerne) from sprayed and unsprayed blocks. Racemes were classed as buds, florets or pods, which were either normal, partly or completely damaged, or without pods.

RESULTS AND DISCUSSION

Phenology of insects and crops

We consider that only five species of insects, all Hemiptera, were likely to have

34th Proc. N.Z. Weed and Pest Control Conf.

Seed Production

reduced lucerne seed yields significantly in 1981. Changes in seasonal abundance of these five species and periods of breeding (judged by changes in adult: nymph ratios) are indicated in Fig. 1. Interfield variation during four periods, starting with flowering lucerne in January, and finishing with hardening seed pods in March, is shown. The Australian crop mirid was the most important species.

The Australian crop mirid or the potato mirid was the major pest of lotus crops. Lotus fields usually flowered 4-6 weeks before lucerne and were harvested during the later half of January and early February. Aphid numbers were declining as lotus began flowering. Pod development was largely completed before the wheat bug and brown shield bug became abundant.

Minor pests of seed crops

Green loopers (*Phrissogonus* spp) were the most numerous caterpillars on both crops, but in lotus the tomato fruitworm (*Heliothis armiger*) was about equal to it in biomass terms. Previously, tomato fruitworm was the only recorded seed pest of lotus in New Zealand (Lancashire *et al* 1980). Populations of all caterpillars did not exceed six per sample, and little pod damage was observed. In lucerne, green looper densities reached 30 per sample on February 18th without apparent damage to pods. Only three light brown apple moth caterpillars (*Epiphyas postvittana*) were found on lotus, and in

Fig 1: Index of abundance (percent frequency distribution) of five pest species and one predator, in Marlborough, Canterbury and Nelson (January-March, 1981). A = Absent, L = Low (1-5 per sample), M = Medium (6-50), H = High (above 50). Ratio = Adults: Nymphs.

Seed Production

lucerne the highest numbers were found from 16-19 March.

Among Homoptera, aphids were the most abundant in the spring on lucerne and lotus, but declined from thousands per sample in October/November to tens or less from January to March. High spring populations may have a carry-over effect on seed yields. Low populations (up to 6/ sample) of grey planthopper (*Septhena cinerea*) were found on 41 to 64 per cent of lucerne fields during January to March. Only adults were present indicating this flatid does not breed on lucerne. None were found south of Marlborough. The adult meadow spittle bug (*Philaenus spumarius*) and a green leafhopper (*Batrachomorphus* sp) were taken in lotus fields.

Outlines of bug biology

Potato mirids are commonest in spring and early summer. Fourth and fifth instar nymphs were taken from lucerne on 18 October and the first adults were found on 22 October. Populations peaked between the middle and end of December and had virtually disappeared by the end of January (Fig. 1). Alternative hosts include the large flowered mallow (*Malva sylvestris*), Californian thistle (*Cirsium arvense*) and potato haulms.

In unsprayed lucerne, populations of Australian crop mirid, unlike the other species of Hemiptera, continued to increase from flowering until the pods began to harden. Late instar nymphs were on lucerne by 18 October and were found in a sample taken on 18 May. We found highest numbers of nymphs on lucerne, white sweet clover (*Melilotus alba*) and sainfoin (*Onobrychis vicifolia*). These legumes and some clovers (*Trifolium* spp) seem to be preferred breeding hosts. Nymphs were found on wireweed (*Polygonum aviculare*), fathen (*Chenopodium album*) and thistles (*Cirsium* spp).

The wheat bug became the numerically dominant pest on two lucerne crops. Adult numbers peaked between late January and mid-February, a trend recorded by Eyles (1965) in the Manawatu. The higher proportion of adults during peak abundance was probably a sampling artifact because nymphs stay mainly at ground level.

The two species of herbivorous pentatomids were never very abundant (Fig.1). Two sprayed lucerne crops had the highest populations with 16 brown shield bug adults per sample in one and 14 green vegetable bug nymphs per sample in the other. Although their numbers were relatively low compared to the Australian crop mirid, they may have approached the mirid in importance on lucerne crops with green pods, because of their larger size. Average live weights of adults were: green vegetable bug — 300 mg, brown shield bug — 60 mg, Australian crop mirid — 2 mg.

Bug damage

Damage is caused by bugs injecting saliva, which contains digestive enzymes, into buds, flowers, seeds and growing points. The digested cell contents are reabsorbed so that buds become 'blasted' and seeds shrivelled and discoloured. Podless racemes are another feature of bug damage, although this can be due to poor pollination. Blasted lucerne buds are light brown. Affected lotus buds are yellow or pink. Damaged racemes may be overlooked because of replacement growth further up the stem.

We have not yet set economic thresholds, but we predict they will change during the season. Bugs feeding on flower buds can eliminate whole racemes which could have yielded 60 lucerne or 150 lotus seeds each. The same number of bugs attacking green seed pods over the same period will destroy seeds one by one.

The following examples indicate the significance of these bugs:

— On 7 January a 10 ha lucerne paddock was sprayed with trichlorfon. After 6 days Australian crop mirids were reduced to 5/sample compared to 212/sample in a 1000m² unsprayed plot. This short period was sufficient for there to be 30% more totally and partially destroyed racemes in the unsprayed plots.

— 520 Australian crop mirids/sample prevented lucerne seed forming at Tai Tapu.

— 54% of lotus racemes were destroyed in a crop at Dillons Point with 120 potato mirids/sample.

— Fifteen potato mirids/sample reduced lotus seed yields at Tai Tapu by 26% in comparison to plots sprayed with bromophos.

Three lotus crops (near Blenheim) where bugs were controlled, yielded over twice as much seed (400 kg/ha) as the previous season when no insecticide had been used.

Seed Production

The predators

Pale damsel bugs were usually present in 'low' or 'medium' numbers in February and March (Fig. 1). At Kaituna Valley populations reached 51 per sample on 30 March. This species feeds on caterpillars, aphids and bugs (Valentine 1967). Other nabid species include mirids in their diet (Wightman 1969; Wheeler 1977; Gupta *et al* 1980). Detailed analysis of the data may reveal a numerical response that will indicate NZ nabids are also mirid predators.

The influence of nine other predatory insect species on the larger Heteroptera is thought to be minimal due to low numbers of predatory stages, and/or prey preferences. In lucerne, adult ladybirds (three species) were the next commonest predators, but populations declined between January and March. Nymphs and adults of Schellemburg's soldier bug (*Oechalia schellemburgii*) were present in low numbers in Marlborough only and probably fed mainly on caterpillars. Lotus shared five of the six common predators of lucerne discussed by Thomas (1977), the midge being absent.

CONCLUSIONS

Clearly the bug guild is considerably more important than any other group of arthropod herbivores in lucerne and lotus seed crops. They are not a new problem as Macfarlane and Pottinger (1976) found Australian crop mirids at about the same density during 2-11 February 1967 as we observed in early February 1981. Shield bugs were more numerous in 1981 than in previous years. We are convinced that the control of these pests will lead to higher and more consistent yields.

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