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INVERTEBRATE PESTS ON ASPARAGUS IN WAIKATO

R.N. WATSON and R.J. TOWNSEND

*Ruakura Soil and Plant Research Station
MAF, Hamilton*

SUMMARY

Several commercial and experimental stands of asparagus (*Asparagus officinalis*) in Waikato were monitored for potential invertebrate pests during the 1980/81 season. Species of generally minor potential to asparagus quality or production included slugs, black beetle (*Heteronychus arator*), potato mirid (*Calocoris norvegicus*), and Australian crop mirid (*Sidnia kinbergi*). Several aphid species present in low numbers during spring and early summer could transmit virus infection. Potato mirid nymphs, springtails, thrips and possibly winter grain mite (*Penthaleus major*) could constitute minor quarantine problems on exported produce. Overwintering management of asparagus appeared to have an important bearing on subsequent pest problems.

INTRODUCTION

Asparagus has few serious invertebrate pests compared with many vegetable field crops (see Hung 1975; Commonwealth Agricultural Bureaux 1978). Several pests specific to asparagus in northern hemisphere countries do not occur in New Zealand, while more general pests affecting asparagus overseas have not become pests of the crop in this country. By contrast, damage to asparagus in New Zealand caused by the potato mirid (Findlay 1975) and black beetle (Watson *et al* 1980) has not been reported in other countries. Asparagus grown for export of fresh produce may be subjected to additional pest problems as a result of quarantine requirements.

Asparagus cultivation in Waikato and Bay of Plenty has undergone rapid expansion, largely for export production (Riley 1980). This region lies outside traditional areas of field scale production of asparagus in New Zealand. Invertebrate pests regarded as likely to be encountered by growers in these northern regions were reviewed by Watson (1980). The present paper reports on the invertebrate populations in several commercial and experimental stands of asparagus in Waikato since late winter 1980.

METHODS

Slug numbers and species composition were determined on three stands of established asparagus from July 1980. Slugs were extracted from 10 cm diameter soil cores by a progressive flooding technique (Barker pers comm). Surface counts, and regular counts from beneath 15 x 15 cm sheets of fibrolite in asparagus were also used for evaluation of molluscicide treatments.

Black beetle studies were conducted on a small experimental area of first year crowns of cv's "Rutgers Beacon" F2 and "Mary Washington" at Ruakura, a second year commercial stand previously damaged by the insect (Watson *et al* 1980), and in a first year stand at Papamoa, Bay of Plenty, which required treatment for black beetle in spring 1980.

These stands, and an asparagus varieties area at Rukuhia, were visited regularly through the summer to observe general insect populations. Pitfall traps and, from December, sticky traps were placed at most of the sites to determine the presence of ground dwelling and flying insects respectively. When the sites were visited for

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inspection of traps, asparagus in adjacent areas was examined for presence of insects on fronds or spears. Sweep-net sampling within the fern canopy was also conducted. Insects were retained for later counting, and identification through the MAF Plant Health and Diagnostic Station, Auckland.

RESULTS AND DISCUSSION

Phytophagous invertebrate species observed and captured in asparagus stands are listed in Table 1. Although recovered from asparagus, not all species were shown to directly affect the crop.

Slugs

Slugs were present on all stands, varying considerably in density (2.7 — 131/m²) in late winter. Numbers declined steadily during spring and reached low numbers in November. *Deroceras reticulatum* (51—70% of slug numbers on three monitored sites), *D. panormitanum* (10—49%) and *Arion intermedius* (1—20%) were the most common species. Two other species formed less than 1% of the population on one site.

Significant feeding damage on the spears, as surface gouging on or near the unopened bracts, was largely restricted to early emerging spears before the main picking period. Low density and growth rates of these spears probably made them vulnerable to attack. Slug feeding later in the season appeared as stripping of surface cell layers from the stems and occasionally the foliage. This damage did not appear to affect frond vigour even when the stem surface was almost totally stripped. The brown garden snail (*Helix aspersa*) was observed to cause similar damage.

Topworking of asparagus during winter to level off the beds and reduce litter carryover appeared to provide an effective means of reducing slug numbers to low levels (Watson 1980).

Hemiptera

Two species of mirid occurred on all sites. Potato mirid (adult 7-8mm long) has been a significant pest in autumn harvested asparagus (Findlay 1975), but was not considered to be of consequence in spring harvested crops. Nymphs of the species were, however, observed on spears in one Waikato crop in spring. They were associated with a slight browning on the unopened bracts. More significantly, presence of the insect resulted in the rejection of asparagus by an importing country. Treatment of the crop with dichlorvos suppressed numbers for a brief period. Numbers on sticky traps at this site were at high levels later in the summer (Fig. 1, site 3).

Potato mirid has a wide range of alternative hosts. It over-winters in the egg stage. Eggs are laid into the stems of herbaceous plants. Consequently, carryover of litter in asparagus may encourage the pest. Numbers on sticky traps were highest on sites which were not topworked in winter.

Findlay (1975) suggested that there were two generations in summer, with adults of the first generation appearing from mid-November. Sticky trap results indicated a peak prior to late January, and virtual disappearance of adults by late March (Fig. 1).

After the completion of asparagus picking the nymphs and adults concentrate on the freshly growing tips of spears and fronds. A feeding toxin causes distortion, cessation of growth, wilting and eventually dying back in the branches. Unopened spears may wilt completely. No work has been carried out to establish the effects of this damage on asparagus production.

The Australian crop mirid is smaller than the potato mirid (adult 3 mm long). Nymphs were not observed, but adults were counted on the sticky traps from February (Fig. 1). They remained longer into the autumn than potato mirids. Populations seldom exceeded 1-4 individuals on a plant but appeared capable of considerably affecting the vigour of new fern growth in late summer and autumn. Damage was similar to that of the potato mirid.

The passionvine hopper (*Scolypopa australis*), grey leafhopper (*Sephena cinerea*), cicadas and vegetable bugs were observed on fern growth. They did not appear to affect the crop significantly.

Low numbers of alate and apterous aphids were presents on all asparagus stands in spring/early summer but disappeared by January. This suggested that populations were

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TABLE 1: Plant feeding species from Asparagus stands.

Pest	No. Asparagus stands infected	Pest status
Slugs and Snails		
<i>Deroceras reticulatum</i> grey field slug	6	bcf
<i>D. panormitanum</i> brown field slug	6	bcf
<i>Arion intermedius</i> glade slug	2	e
<i>A. hortensis</i> garden slug	1	e
<i>Milax gagates</i> keeled slug	1	e
<i>Helix aspersa</i> common brown garden snail	2	b
Insects		
Collembola		
<i>Bourletiella hortensis</i> garden springtail	1	bd
<i>Protaphorura armata</i> soil springtail	2	d
<i>Hypogastrura</i> sp. black pasture springtail	6	d
Thysanoptera		
<i>Thrips tabaci</i> onion thrips	4	dbf
<i>Anaphothrips obscurus</i> American grass thrips	1	d
Hemiptera		
<i>Calocoris norvegicus</i> potato mirid	6	adcf
<i>Sidnia kinbergi</i> Australian crop mirid	6	af
<i>Scolypopa australis</i> passionvine hopper	6	b
<i>Sephena cinerea</i> grey planthopper	2	b
<i>Aphis gosspii</i> melon aphid	1	f
<i>Aulocorthum solani</i> foxglove aphid	2	f
<i>Macrosiphum euphorbiae</i> potato aphid	3	f
<i>Myzus ornatus</i> ornate aphid	1	e (f)
<i>M. persicae</i> green peach aphid	3	f
<i>Rhopalosiphum padi</i> cereal aphid	2	f
<i>Toxoptera aurantii</i> black citrus aphid	1	e (f)
Lepidoptera		
<i>Epiphyas postvittana</i> light brown apple moth	4	b
<i>Ctenopseustis obliquana</i> brown headed leaf-roller	2	b
<i>Liothula omnivora</i> bagmoth	3	b
<i>Agrotis ipsilon</i> greasy cutworm	3	e
<i>Mythimna separata</i> cosmopolitan armyworm	1	e
<i>Orocrambus flexuosellus</i> common grass moth (adults only)	6	e
Coleoptera		
<i>Agrypnus variabilis</i> variable wireworm	1	b
<i>Conoderus exsul</i> pasture wireworm (adults)	6	b
<i>Heteronychus arator</i> black beetle	3	a
<i>Costelytra zealandica</i> grass grub	3	e
<i>Gnaphognathus leucoloma</i> whitefringed weevil	1	e
Diptera		
<i>Delia platura</i> onion fly	2	b
<i>Hylemyia deceptiva</i>	4	b
<i>Lioscinella flavoapicalis</i>	4	e
<i>Inopus rubriceps</i> Australian soldier fly	4	e
Mites		
<i>Penthaleus major</i> winter grain mite	2	d
<i>Halotydeus destructor</i> redlegged earth mite	0	cd

a = crop limiting potential
 b = superficial or very minor damage
 c = damage to produce
 d = quarantine contaminant
 e = probably incidental only
 f = vectoring or enhancement of diseases possible.

Fig 1: Adult Hemiptera on sticky traps from four stands of commercial asparagus.

derived from immigrant females, whose offspring failed to thrive and multiply. Of the seven species found (Table 1) *Myzus persicae*, *Aulocorthum solani* and *Macrosiphum euphorbiae* have previously been associated with asparagus in New Zealand (MAF Plant Health, unpublished records). Some other species may have been incidental occurrences.

Aphids were found on early emerging spears (e.g., *Aulocorthum solani*, *M. persicae* and *Myzus ornatus*) and fronds. Aphid colonies mostly clustered around the axils of freshly growing foliage. Although not in themselves potentially damaging in the numbers present, aphids are vectors for two or more viruses affecting asparagus. Virus is present, generally in non-symptom forming levels in New Zealand (R.T. Baker pers comm) but the effects on production have not been established. Losses in excess of 20% have been reported overseas (Wiessenfels and Schmelzer 1976). *Myzus persicae* was the main species implicated in virus infection. Control of aphids, especially during crop establishment are among measures recommended for virus control (Wiessenfels *et al* 1976).

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Diptera

The onion fly (*Delia* = *Hylemyia platura*) occurs in the Waikato as a minor pest of seedling maize and other crops including vegetables. It is a minor pest of asparagus overseas (Hassan 1974). Larvae bore into asparagus spears below ground level. Damage in asparagus was not encountered, although adults were recovered in two stands in the autumn.

Large numbers of a related species (*Hylemyia deceptiva*) were recovered on all sites with sticky traps. Maggots were recovered from the base of asparagus fronds which had prematurely senesced in February. Most of these stems, however, also bore deep cracks, giving entry to fungal pathogens. Larvae of the insect had commonly been recorded from pasture and lucerne. They are regarded as both primary and secondary plant feeders (MAF, Plant Health, pers comm).

Lioscinella flavoapicalis larvae were also commonly found at the base of similarly affected asparagus stems. This species has previously been associated with rotting and fresh brassica stems and maize (Cumber and Eyles 1961), but was regarded as saprophytic by Spencer (1977).

Common pasture pests

The potential for black beetle to damage first year crowns of asparagus has been covered elsewhere (Watson *et al* 1980; Watson 1980). The peak adult feeding period in spring (late September to early December) coincides with a period when only one to several shoots are produced by first year crowns. The loss of these shoots may result in death of the crown. Harmful effects of black beetle in established asparagus were not observed.

A number of other common pasture insects were observed in asparagus, especially after establishment from pasture. Some of these were observed to attack asparagus roots or shoots, e.g., Australian soldier fly (*Inopus rubriceps*), whitefringed weevil (*Graphognathus leucoloma*) and variable wireworm (*Agrypnus variabilis*). Large numbers of soldier fly adults were observed in asparagus during flights in autumn. These insects are not expected to persist in significant levels after the first year. Other species (*Costelytra zealandica*, *Conoderus exsul*, *Wiseana* sp, *Mythimnia separata* and *Agrotis ipsilon*) were also recovered, but no direct feeding on asparagus was established. These insects were probably associated with weeds in the asparagus beds.

In addition, several species of caterpillar were observed feeding on foliage, also in non-damaging numbers. They fed either on the surface cell layers, or on the foliage needles.

Quarantine pests

Apart from nymphs of potato mirid, several insects constitute potential quarantine problems, largely by virtue of their small size and concealment beneath partially opened bracts. Tests showed that normal washing of produce cleaned most contamination, including aphids and collembola. Thrips, most frequently *Thrips tabaci*, were particularly prone to concealment, and may require dipping in mild insecticide solution or other suitable irritant to clear the produce for export (Riley *et al* 1975).

The winter grain mite (*Penthaleus major*) was found at two sites. The species can be confused with the red-legged earth mite (*Halotydeus destructor*), which occurs in eastern districts of the North Island. Areas which contain the latter species are completely restricted from exporting produce to USA.

Predatory insects

A large variety of predatory insects were observed. These included ground dwelling rove beetles and carabids. Adult ladybirds and syrphid flies were abundant on foliage and may have contributed to aphid control. Various species of predatory hymenoptera, hemiptera and acarina were also observed.

CONCLUSIONS

Pests which appeared to have some damage potential included black beetle on establishing asparagus, slugs early in the spring and mirids. Some insects were present as residual populations from previous land use and are not expected to have any consequence on asparagus after the first year. Others were associated with weed growth

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within asparagus stands. Several species may constitute quarantine problems on export produce, largely by concealment beneath bracts.

Further work is required to determine the effects of mirids on crop vigour and the role of aphids in virus infection. The incidence and effects of virus in asparagus production also requires investigation.

Over-wintering management appeared to have an important bearing on the incidence of some potentially important pests. These were encouraged by the carryover of litter on beds which were not cultivated during winter. No-cultivation regimes and return of stubble are measures adopted to reduce soil compaction. It may prove beneficial to remove autumn trash where cultivation is not practiced. Control of weeds may also reduce the incidence of some insects.

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