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Summary of Crown-funded research on onion thrips and onions — 2002-03

N Martin & P Workman

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New Zealand Institute for Crop & Food Research Limited
Private Bag 4704, Christchurch, New Zealand

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1 Executive summary

In 2002-03, Government-funded research on onion thrips focused on three areas: comparing crop monitoring methods for detecting thrips; natural enemies of onion thrips; and bioassays to compare the susceptibility of onions to onion thrips.

1.1 Crop monitoring

This research focused on monitoring thrips when onion thrips populations are low. The distribution of thrips in the field will be a useful indicator of an invasion. It was planned to sample onion crops before and after the first cluster of insecticide sprays to compare the usefulness of information produced using three sampling methods:

- examining 100 randomly selected plants,
- examining 20 groups of 5 plants, the 5 plants being selected randomly from within a circle approximately 1 metre in diameter, and
- examining 20 groups of 5 plants, the 5 plants being in the same row and adjacent to one another.

The last method is designed to detect levels of aggregation amongst thrips-infested plants. In the Pukekohe area, thrips populations were low in spring and early summer. Only seven crops were monitored and thrips were only found in three crops.

1.2 Natural enemies

In 2002-03, the low numbers of the parasitoid *Ceranisius menes* and the predator *Aeolothrips fasciatum* had little impact on thrips populations in unsprayed main crop and late crop PLK onions at Pukekohe Research Centre. In a survey of organic onions in Hastings that had been sprayed with a neem product, the only natural enemy found was *Aeolothrips fasciatum*.

1.3 Susceptibility of onion bulbs to thrips

A new bioassay is being developed to compare the susceptibility (or resistance) of onion bulbs to onion thrips. Discs 10 mm in diameter are cut from onion scale or leaves of onions or leaks. Each disc is caged with one or five adult female thrips. The discs are changed daily for three days or left for three days. The discs are stained to show the eggs. The most practical method, which we are in the final stage of testing, will probably be to have one thrips per disc and leave it for three days. Using this method, several samples can be taken from the same bulb and the bulb could be allowed to flower and seed collected.

2 Introduction

In 2002-03, Government-funded research on onion thrips focused on three areas: comparing crop monitoring methods for detecting thrips; natural enemies of onion thrips; and bioassays to compare the susceptibility of onions to onion thrips.

3 Monitoring onion thrips in onion crops

This research focuses on monitoring thrips at the time of year when onion thrips populations are low. Their distribution in the field will be an early signal of an invasion. It is also the time when populations are likely to be close to the current action threshold for the commencement of a cluster of insecticide applications.

In 2001-02, nine crops were monitored 2-3 times; the first time being when the first thrips were seen and before the first insecticide was applied. Two monitoring methods were compared:

- examining 100 randomly selected plants, and
- examining 20 groups of 5 plants, the 5 plants being selected randomly from within a circle approximately 1 metre in diameter.

Data have been analysed. Graphical analysis showed that when thrips populations were close to the spraying action threshold (5+ thrips per 50 plants or 0.1+ thrips per plant), the differences in the data gathered by the two between sampling methods were large. This effect was evident on five of eight monitoring dates.

In 2002-03, the sampling protocol was altered to a randomised block to enable edge effects to be better detected. Three monitoring methods were compared:

- examining 100 randomly selected plants,
- examining 20 groups of 5 plants, the 5 plants being selected randomly from within a circle approximately 1 metre in diameter, and
- 20 groups of 5 plants, the 5 plants being in the same row and adjacent to one another.

The last method was designed to detect levels of aggregation of thrips-infested plants. In the Pukekohe area, thrips populations were low in spring and early summer. Only seven crops were monitored and thrips were only found in three crops.

This work will be continued in 2003.

4 Natural enemies of onion thrips in onion crops

During 2001-02, plots of PLK onions were monitored for natural enemies of thrips. Three insect predators, one parasitoid and one fungal, were found:

- *Aeolothrips fasciatum* (Thysanoptera: Aeolothripidae),
- *Buchananiella whitei* (Hemiptera: Anthocoridae),
- *Ceranisius menes* (Hymenpotera: Eulophidae),
- Syphidae (Diptera), and
- *Neozygites pavispora,* entomophogus fungus.

None appeared to be associated with a significant reduction in thrips populations. This research has been published (Workman, P.J.; Martin, N.A. 2002: Towards integrated pest management of *Thrips tabaci* in onions. *New Zealand Plant Protection 55:* 188-192).

In 2002-03, main crop and late crop PLK onion were sown, no insecticides were applied and natural enemy populations were monitored. Although *Ceranisius menes* and *Aeolothrips fasciatum* occurred, they were only in very low numbers and had little impact on thrips populations. The natural enemy, *Buchananiella whitei,* did not occur.

In a survey of organic onions in Hastings that had been sprayed with a neem product, the only natural enemy found was *Aeololthrips fasciatum*.

5 Susceptibility of onion bulbs to onion thrips

The early research by Crop & Food Research that compared the susceptibility of onion bulbs to onion thrips used whole bulbs with a 'window' cut through the dry skins to expose a fleshy scale. Each bulb was held in a separate ventilated jar and was infested with a known number of adult female thrips. The bulbs were examined after several weeks when larvae had hatched from eggs. This bioassay had several disadvantages: it was time consuming to assess, took several weeks before results were available, required 50-100 bulbs per treatment and took up a lot of space. During the last two years we have been testing alternative methods with the aim of being able to test the susceptibility of an individual bulb that the plant breeder can then grow on to produce flowers and seed.

The most promising method is to cut 10 mm diameter discs from onion scale or other test material such as leek or onion leaves. Place each leaf disc in a separate sealed dish and add 1 or 5 adult female thrips. The disc can be replaced daily or after 3 days. The thrips feed on and lay eggs into the disc. The discs are stained to show the eggs and eggs are counted under a stereo microscope. Using this method, the number of egg laid by thrips over their life

time was compared on leeks and red and PLK onion bulbs (Fig. 1). The highest fecundity occurred during days 2-4, but even over this period the number of eggs laid in both type of onion bulb per thrips was less than one per day.

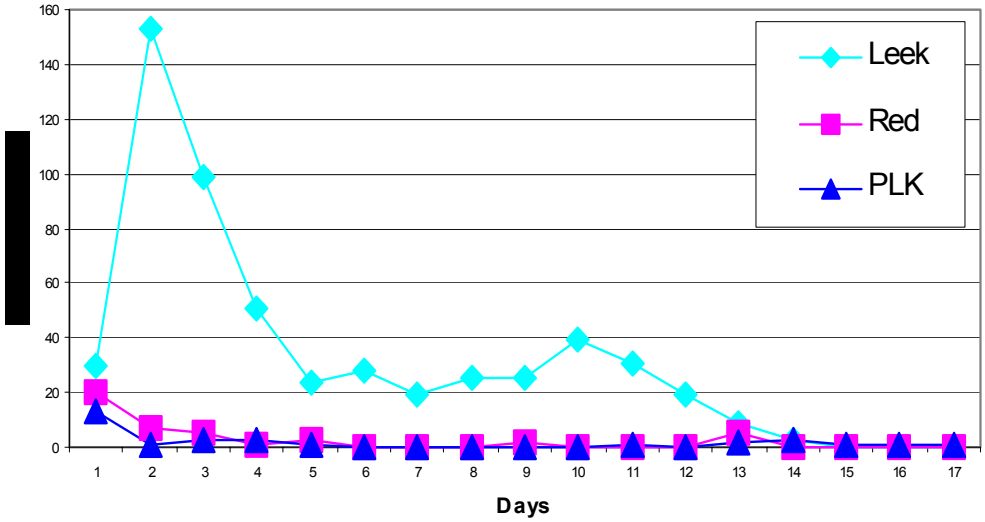

Figure 1: Numbers of onion thrips eggs laid daily by onion thrips into 10 mm diameter discs of leek leaves or onion bulb scale.

A bioassay that used a single thrips per disc that was changed daily would require huge sample sizes in order to obtain significant differences between onion cultivars or the same cultivar grown under different nutrient regimes.

Alternative procedures being compared include increasing the number of thrips per disc and/or increasing the number of days the disc is left in the Petri dish with the thrips. When the number of thrips per disc was increased to 5 per disc, the mean egg/thrips/day decreased markedly (Table 1). The most promising method is enclosing a single thrips on the disc for 3 days. This approach is now being tested.

Table 1: The mean number of onion thrips eggs laid per thrips per day.

Number of thrips per disc	1 female	5 female	5 female	5 females + 5 males	1 female
Number of days disc remained in Petri dish	Changed daily for 3 days	Changed daily for 3 days	3 days	3 days	3 days
Plant-date					
Leek 16 Jun	2.54	1.51	0.95	0.59	
Leek 24 Jun	3.9	1.62	2.07	1.72	
Leek 1 Jul	2.81				5.99
PLK bulb 16 Jun	0.74	0.46	0.16	0.06	
PLK bulb 24 Jun	0.34	0.17	0.42	0.06	
PLK bulb 1 Jul	0.40				0.54