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Control of *Tetranychus urticae* Koch by *Phytoseiulus persimilis* Athias-Henriot in low-chill stonefruit

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Abstract

Infestations of *Tetranychus urticae* Koch and the predator *Phytoseiulus persimilis* Athias-Henriot were monitored in a low-chill stonefruit orchard at the Maroochy Horticultural Research Station, Nambour, during 1983-85. In both seasons *P. persimilis* controlled *T. urticae* before excessive leaf damage occurred and survived applications of fenthion, azinphos-methyl, carbaryl, mancozeb and iprodione applied for various pests and diseases. Other predators of *T. urticae* were also present in low numbers. They included *Amblyseius neolentiginosus* Schicha, *Scolothrips sexmaculatus* (Pergande), *Sthethorus* sp. and a cecidomyiid.

INTRODUCTION

Low-chill stonefruit has the potential to become a profitable alternative crop in the subtropical areas of Queensland which do not meet the chilling requirements of traditional cold-climate varieties (George *et al.* 1986). The major insect pests requiring chemical control are Queensland fruit fly, *Dacus tryoni* (Froggatt), and oriental fruit moth, *Cydia molesta* (Busck). However, two-spotted mite, *Tetranychus urticae* Koch, can also be a problem usually after fruit is harvested. Moderate leaf damage is tolerable in healthy trees but excessive damage can lead to premature defoliation with possible effects on the following season's crop (Bailey 1979).

The predatory mite, *Phytoseiulus persimilis* Athias-Henriot, was discovered in Australia in 1978 (Goodwin and Schicha 1979). Goodwin (1984*a*) found a wide tolerance or resistance to pesticides in this strain which has since been used commercially (Goodwin 1984*b*, Waite 1988). Since 1982, experiments using inoculative releases of *P. persimilis* to control *T. urticae* in strawberries have been carried out at the Maroochy Horticultural Research Station. The predator subsequently became established in bananas, feeding on *T. lambi* Pritchard and Baker, and by November 1983 was found in the low-chill stonefruit orchard. A regular sampling programme was initiated to assess the effectiveness of *P. persimilis* against *T. urticae* in stonefruit and the results are reported.

MATERIALS AND METHODS

The study was carried out in a 0.5 ha experimental block of low-chill peaches and nectarines at the Maroochy Horticultural Research Station, Nambour during 1983–85.

In 1983–84, fortnightly samples were taken consisting of ten leaves selected randomly from each of five trees in four alternate rows. Samples from each row were combined and the number of *T. urticae* and *P. persimilis* (active stages and eggs) were counted under a stereomicroscope. The presence of other spider mite predators was also noted. In 1984–85 this procedure was undertaken weekly. Throughout the study the normal schedule of insecticides and fungicides was applied but no miticides were included.

RESULTS

1983–84

T. urticae and *P. persimilis* first appeared in rows one and three from the western boundary, 50 m from the banana plantation during November (Figure 1). In late November a large *T. urticae* population was distributed throughout the orchard. *P. persimilis* occurred in rows one and three but was not found in rows five and seven (Figure 1). By early December, increased populations of both species were present throughout the block. By 19 December *T. urticae* had almost been eliminated and *P. persimilis* numbers were declining (Figure 2), although row one had an average of 12.9 per leaf. On 3 January both species were still present but difficult to find.

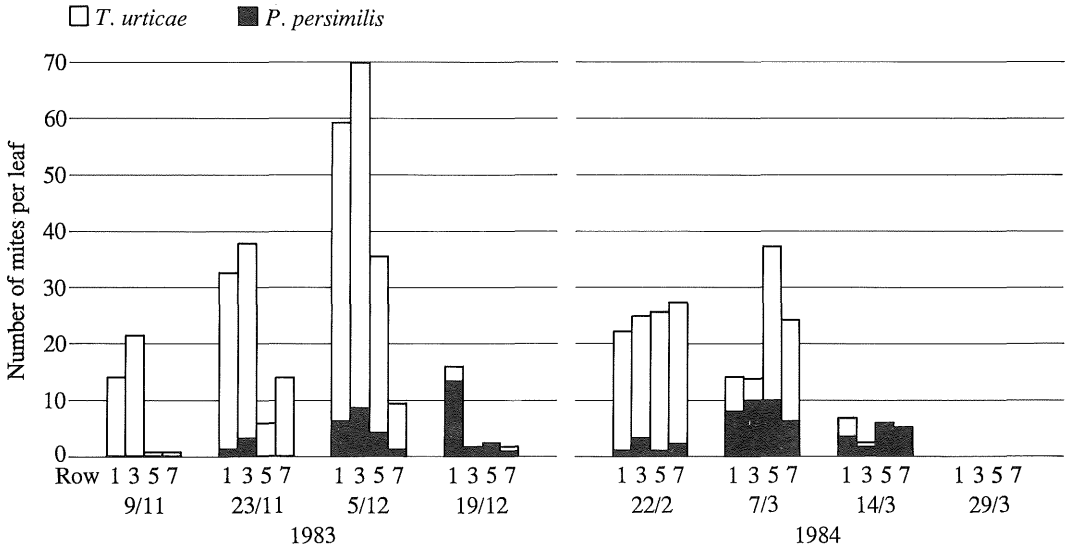

Figure 1. Between-row distribution of mite populations in low-chill stonefruit, Maroochy Horticultural Research Station during 1983–84 season.

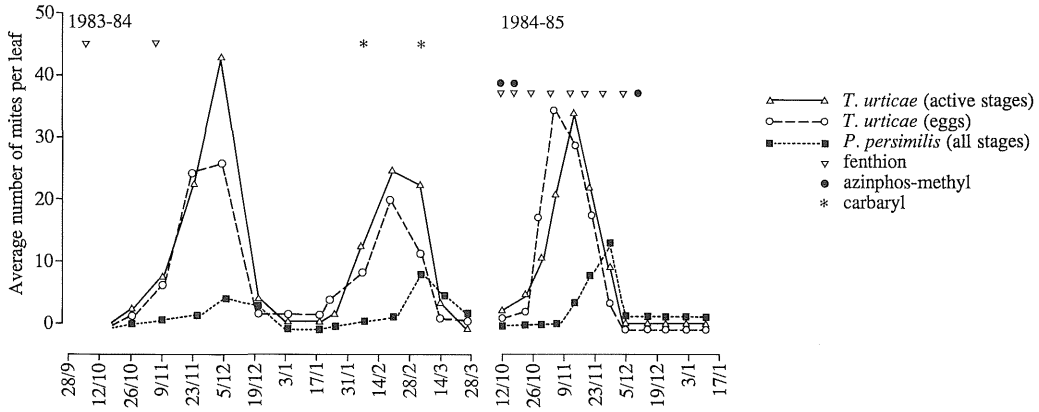

Figure 2. Mite populations and insecticide treatments on stonefruit trees, Maroochy Horticultural Research Station 1983–84 and 1984–85 seasons.

From 5 December other predators were present in low numbers. They included *Amblyseius noelentiginosus* Schicha, *Scolothrips sexmaculatus* (Pergande), *Stethorus* sp. and a cecidomyiid.

Early in February a resurgence of *T. urticae* occurred and on 22 February an average of 24.6 *T. urticae* and 1.1 *P. persimilis* per leaf were present throughout the block (Figure 2). On this occasion the infestation developed uniformly throughout the block (Figure 1) suggesting that it arose from scattered survivors of the previous infestation. *P. persimilis* had apparently survived in low numbers and reacted quickly to the increasing prey population, controlling the infestation by 14 March. No mites of either species were found in the orchard after 28 March.

Fenthion was applied weekly to control *D. tryoni* during the fruiting period from 27 September to 8 November 1983. Carbaryl was applied on 6 February and 6 March to control *C. molesta*, with no apparent detrimental effect on *P. persimilis*.

1984–85

Infestation by *T. urticae* occurred earlier than in the previous season and low numbers were present throughout the orchard on 16 October. *P. persimilis* was detected first in rows one and three as before, again suggesting that it moved into the stonefruit orchard from the banana plantation. Inspection of the bananas in September confirmed that *P. persimilis* was present.

Numbers of *T. urticae* peaked on 15 November whereas *P. persimilis* increased to a maximum level of 13 per leaf on 29 November (Figure 2). *T. urticae* was not detected after 5 December but a residual population of *P. persimilis* persisted for another two weeks. The resurgence of *T. urticae* which occurred during 1983–84 did not eventuate and neither species was recorded after 12 December 1985. During the last two weeks of the infestation, *A. neolentiginosus* was present in low numbers but the other predators present during the 1983–84 season were rarely seen. This was attributed to the more frequent and extended use of the insecticides fenthion and azinphos-methyl applied to control *D. tryoni* and *C. molesta* respectively.

DISCUSSION

The data show that *P. persimilis* can effectively control infestations of *T. urticae* in low-chill stonefruit. At this location, natural colonisation of the orchard by *P. persimilis* occurred each season from a resident population in the adjacent banana plantation. McMurty *et al.* (1978) also reported that *P. persimilis* were usually most numerous on that side of strawberry fields close to weed hosts of *T. urticae* before they dispersed through the whole crop. For *P. persimilis* to maintain a continuous presence at any site over a number of years is unusual, since it is a voracious predator that normally completely eliminates its prey (Overmeer 1985) and then disperses. The large size of banana leaves and the distribution of spider mite colonies over them apparently reduces the efficiency of *P. persimilis* and a continuous low-level presence of both species is maintained. Inoculative releases into low-chill stonefruit should achieve results similar to those reported here although the economics of such releases have not been investigated. The level of control achieved was such that although leaf damage was obvious, no detrimental effect was caused. Some leaves, mostly in the lower canopy were completely yellow from the effects of spider mite feeding. On the other hand a large proportion of the canopy was only slightly damaged or undamaged and fruit yield the following season was unaffected.

P. persimilis established and multiplied under a schedule of weekly fenthion sprays and several azinphos-methyl sprays. It was also unaffected by carbaryl, mancozeb and iprodione. These field observations support the laboratory data of Goodwin (1984*a*).

Brun *et al.* (1983) suggested *P. macropilus* Banks might be better adapted to Queensland coastal conditions than *P. persimilis*. However, from these data and the excellent performance of *P. persimilis* in this area on a range of crops including strawberries (Waite 1988) papaws, bananas and roses (G. Waite, unpub. data 1985) there appears to be no reason to doubt its effectiveness under these conditions. Also, its tolerance of a range of pesticides (Goodwin 1984; Ridland *et al.* 1986 and Charles *et al.* 1985) makes it a useful biological control agent of *T. urticae* in low-chill stonefruit in coastal south-east Queensland.

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