PSOCID EGGS ON AVOCADOS MISTAKEN FOR LEAFROLLER EGGS

R.H. BLANK, M.H. OLSON, G.S.C. GILL and J.B. CLARK*

HortResearch, Whangarei Research Centre, Private Bag, Whangarei

**Far North Packers, P.O. Box 66, Awanui*

Keywords: avocado, psocid eggs, leafroller eggs, fruit infestation

Leafroller (Tortricidae) caterpillars may damage avocado fruit by chewing small fruit around the stalk or by webbing leaves to the surface of larger fruit. Leafroller moths lay egg masses on fruit, and fruit with unhatched eggs are either rejected for export or fumigated as they currently have a Maximum Pest Level (MPL) of 0.5% for the Australian market.

Mature avocado fruit were examined for leafroller eggs during the course of another study investigating latania scale *Hemiberlesia lataniae* (Blank *et al.* 1993). Many of the egg masses found had been laid by psocids which were also abundant on the fruit. These psocid eggs were causing high rejection rates from some growers' properties as the packhouse treated them in the same manner as leafroller eggs. Eggs of insects other than leafrollers are classified as an 'injurious pest' and have a 5% MPL. However, packhouse operators are not skilled in identifying all insects and need to make decisions immediately about the need for fumigation. Hatched and parasitised (e.g., *Trichogramma* sp) leafroller eggs are treated as surface deposits which in combination with other major cosmetic defects have a maximum grade defect level of 6%.

This paper reports on the incidence and severity of psocids on avocado fruit and compares this with leafroller eggs. Observations were made during the course of a trial at Awanui, Northland, on the effects on latania scale of buprofezin (Applaud 25W) at 16.7 g/100 litres, fluvalinate (Mavrik 24 % suspension concentrate) at 8 g/100 litres and fluvalinate/buprofezin at 8/16.7 g/100 litres applied on 17/18 October and on 8/18 November (Blank *et al.* 1993).

A minimum of one hundred mature fruit (>72 mm diameter) harvested from each plot of three replicates between 30 November and 2 December were examined under a microscope for leafroller eggs, psocid eggs, nymphs and adults. Psocids were collected from these fruit for later identification.

Psocids

Small groups of nymphs as well as the occasional adult psocid were found on the avocado fruit at harvest. Individuals appeared to be in groups which were clustered either around the stalk or some other region on the fruit. No obvious communal webbing was noticed such as may be found with larger colonies of psocids living on citrus leaves.

The mottled colour pattern of the winged adult and the dull colour of the nymphs meant they were difficult to locate on the surface of the avocado until they were forced to move. When disturbed all stages ran rapidly across the fruit surface before stopping in a new location. Newly hatched nymphs resembled the adult but had shorter antennae and lacked wings. A number of different nymphal instars were observed with wing-buds. The wings of the adult at rest were held roof-wise over the body. Psocids were also found on avocado foliage.

Commonly large amounts of pollen (*Pinus radiata*) collected on avocado fruit which formed in yellow masses, particularly around the basal end or drip point of the fruit. Nymphs were observed to move their mouthparts over clumps of pollen suggesting they were either feeding on the pollen grains or on fungi growing on the pollen. Psocids are generally thought to feed on unicellular algae, lichens, fungal hyphae, spores and fragments of plant or insect tissue (Smithers 1991).

Proc. 46th N.Z. Plant Protection Conf. 1993: 86-88

Observations of psocid nymphs hatching were initially used to confirm the identity of psocid egg masses. Psocids laid clusters of eggs with an average of 8 or 9 eggs/cluster. The ovoid opaque eggs were laid on their side usually in a loose mass and covered with webbing. Egg masses were laid in the naturally occurring hollows on the avocado skin. The webbing reflected light, hiding the eggs underneath, and giving the appearance of a flattened, opaque, featureless cover.

It was therefore not surprising that psocid eggs could be mistaken for leafroller egg masses which are similar in size and laid in the hollows on the fruit surface. The main difference is that under a microscope leafroller eggs have no webbing cover and the individual outline of the tightly packed and overlapping eggs can be easily discerned.

Hatched psocid eggs without magnification appeared as a small white fleck on the avocado fruit. The nymphs on hatching ruptured one end of the egg leaving a ragged exit hole in the egg shell. They also destroyed the webbing cover in escaping from the egg mass. In contrast, the leafroller larvae made a neat one-way split in the exposed end of the egg. The hatched leafroller egg mass was left intact and, on superficial examination, also appeared as a white fleck.

Fruit infestation and control

Untreated avocado fruit had a low level of leafroller egg infestation (4.3%) with only 0.6% contaminated with unhatched leafroller eggs. In contrast, 21% of fruit had psocid eggs, 16% with unhatched eggs. Psocid nymphs and adults infested 35% of untreated fruit.

Buprofezin applied alone had no significant effect (ANOVA $P > 0.05$) on leafroller eggs, psocid eggs or nymphs and adults (Table 1). Fluvalinate significantly ($P < 0.05$) reduced fruit infestation by psocid eggs but not the numbers of egg masses per fruit, giving an overall 72% control compared to untreated fruit. Fluvalinate significantly ($P < 0.05$) reduced both the incidence and numbers of nymphs and adults/fruit giving overall a 94% reduction compared to untreated fruit. The fluvalinate/buprofezin also significantly ($P < 0.05$) reduced the incidence of psocid egg infestation (72% control) as well as significantly ($P < 0.01$) reducing the incidence and numbers of nymphs and adults on fruit (99% control).

TABLE 1: The effect of insecticide spray treatments on hatched and unhatched leafroller eggs, unhatched psocid eggs and live nymphal and adult psocids on avocado fruit.

Treatment	% fruit infested			Number/infested fruit		
	Leafroller eggs	Psocid eggs	Psocid nymphs and adults	Leafroller eggs	Psocid eggs	Psocid nymphs and adults
untreated	4.3	15.7	35.0	1.1	1.3	2.3
buprofezin	3.3	15.0	21.7	1.1	1.5	1.8
fluvalinate	1.7	5.0*	4.3*	1.0	1.3	1.4*
fluvalinate	1.0	4.7*	1.0**	1.0	1.1	0.7**
/buprofezin						
SED	2.89	3.82	9.17	-	0.16	0.38

*significantly ($P < 0.05$) different from untreated

**significantly ($P < 0.01$) different from untreated

Unhatched leafroller eggs were not found on treated fruit and levels on untreated fruit were too low to justify making comparisons. Instead, unhatched and hatched leafroller eggs have been combined to make comparisons between treatments. Hatched leafroller eggs may have been present on the fruit prior to the application of treatments and this may also have prevented a true comparison between treatments. Buprofezin had 21% fewer leafroller eggs than untreated fruit, whilst fluvalinate and fluvalinate/buprofezin had 64 and 79% fewer leafroller eggs.

Pest status

Psocids are generally not considered as horticultural pests although cosmopolitan species associated with humans and their products can cause a nuisance (Smithers 1991). Psocids on avocado should clearly be given 'passenger' rather than 'pest' status.

The concern about psocids is therefore that their egg masses bear a superficial resemblance to leafroller egg masses. If confusion occurs then both types of egg masses are treated as a quarantine pest (0.5% MPL). The second concern is that even if psocid eggs are correctly identified and allowed an 'injurious pest' status (5% MPL) then this still necessitates high levels of fruit rejection for export of up to 21%, as found in this study. Either way the grower may be forced to consider control measures against an insect which is clearly not injurious.

Further work on the biology of these insects could lead to opportunities for avoidance of these unwanted passengers. However, the quarantine status given to psocids for avocados will very much determine what future work needs to be done.

ACKNOWLEDGEMENTS

We wish to thank Mrs J.M. Kelly and Mrs N.B. Tapper for technical assistance.

REFERENCES

- Smithers, C.N., 1991. Psocoptera. Pp 410-420 *In*: The Insects of Australia, Division of Entomology, CSIRO, Canberra.
- Blank, R.H., Olson, M.H., Clark, J.B. and Gill, G.S.C., 1993. Investigating two bee-safe materials for controlling latania scale on avocados during pollination. *Proc. 46th N.Z. Plant Protection Conf.*: this volume