A COMPARISON OF EXPULSION METHODS FOR THRIPS AND APHIDS FROM ASPARAGUS SPEARS

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Major importing countries set thresholds for insect infestation levels on imported produce. The difficulty for asparagus growers and exporters is to establish the actual number of insects present in spears. This information is needed so that growers can decide whether or not to fumigate their produce prior to an export inspection. Problems in expulsion of small invertebrates from fresh vegetation can lead to inaccurate estimates of a population (Teulon and Penman 1988). Other workers have flooded spears with chemicals to expel insects (Rohitha *et al.* 1992; Waller 1990), but our preliminary trials with a fluorescent dye showed that penetration was quite poor with this method. The objective of this trial was to find a method to obtain an accurate estimate of the numbers of thrips and aphids in harvested asparagus.

Asparagus spears were collected from 10 selected properties, on 18 and 25 October; 1, 8, 15, 22 and 29 November; and 6 December 1993. Spears were kept in cold chillybins during transport to the laboratory. They were then washed, cut to 180 mm long and kept overnight at 4°C.

Chemicals tested for their ability to expel insects were: maldison (Malathion) soap (Defender, a saponified fatty acid), a penetrant (Pulse) (an organo-silicone copolymer penetrant and surface active agent) and a vegetable oil (containing Canola, unsaturated fatty acids (60%) and the antioxidant E320). Methods tested were:

1. Tapping: bundles of 2-3 spears were firmly tapped 3-4 times over a plate to knock loose insects out.
2. Dipping: Samples were bagged in organza netting and submerged for 30 minutes in the chemical solutions (Table 1) at 17-20°C without agitation. The spears were then removed and the bags and spears rinsed under running water. The expelled insects were then collected in a sieve (250 microns), poured into a petri-dish and counted. The spears were placed in plastic bags and kept at 8°C until they were examined for residual insects.
3. Heat: Samples of spears were kept in an incubator set at 50°C for 24 h, each sample packed vertically in a wire mesh cylinder 80 mm diameter and 180 mm long with a mesh size of 12 x 12 mm. The cylinders were placed in an inverted plastic 1-litre flask of which the bottom part was cut off and covered with organza netting and the whole inverted over a 100 ml collecting jar. The jar contained water and a few drops of Sunlight detergent. Spears were rinsed in water after the treatments and checked for residual insects the same day, along with the liquid in the collecting jar and the water used for rinsing. To test dehydration as an expulsion method, asparagus spears were bagged in organza and placed in a commercial Harvest Maid dehydrator at 50°C for 14 h. The dry spears were then tapped lightly over a white plate. Insects on the plate and those remaining in the dried asparagus were counted.
4. Showering: Chemicals tested were the same as those for dipping with the addition of a vegetable oil (Table 1C). Spears were packed in the same mesh cylinders as described above and placed in a funnel to which an organza collecting bag was attached. This was then placed into a piece of pipe standing on a rack on top of a fish bin containing 30 litres of solution. An FP1 Onga submersible pump with an

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output of 13 litres/minute was placed in the fish bin. A plastic garden rose (diam. 100 mm) was fixed above the spears. Different chemicals and solutions were allowed to shower the spears for 8 minutes after which the spears were washed with tap water and stored at 4°C in a plastic bag for later dissections. The collecting bags were washed and checked for insects in the same way as in the earlier experiments.

The number of spears per treatment varied from 420 in experiments 1 and 2 to 280 in experiment 3. To examine the spears, for remaining insects, they were dissected with a scalpel under a stereo microscope. Bracts were removed and tips very thinly sliced longitudinally to enable a thorough examination.

An average of 0.3 thrips (alate, apterous and nymph) and 0.1 aphids per spear was found over the trial period. In 1992 identification of thrips from four of the 10 asparagus blocks had revealed that 53% were *Thrips tabaci* and 40% were the apterous *Apteriothrips secticornis* (Wong Siu Kai pers. comm.).

Since there were too many zero values in the aphid data we could not do an analysis of variance so we compared means and standard errors for individual treatments.

In the first experiment (Table 1A) a maldison dip and heat were the most effective treatments removing 59.4 and 68.1% of the thrips respectively. Tapping removed less than 10%.

In the second experiment (Table 1B) maldison, at a lower concentration than that used in the first experiment, and soap expelled between 48 and 53% of the thrips respectively and Pulse 56.6%. These treatments were significantly better than tapping (8.8%). Dehydration gave the best result with 74.3% of thrips expelled from the spears.

In both experiments tapping was inferior to any of the other methods for aphids but no distinction could be made between the other methods.

TABLE 1: Mean percentage of thrips and aphids expelled from asparagus spears by various methods used in these experiments.

Treatment/Solution	% expelled	
	Thrips ¹	Aphids (SE) ²
1A. Experiment 1		
Tapping	9.9 a	10.3 (4)
Pulse 0.05% ai	33.8 b	56.4 (12)
Soap 0.25% ai	39.9 b	58.3 (10)
Malathion 0.04% ai	59.4 c	55.4 (11)
Heat (incubator) 50°C	68.1 c	56.1 (11)
1B. Experiment 2		
Tapping	8.8 a	15.7 (7)
Pulse 0.08% ai	56.6 b	50.6 (9)
Soap 0.125% ai	53.0 b	60.9 (7)
Malathion 0.025% ai	48.2 b	58.1 (8)
Dehydration 50°C	74.3 c	73.0 (10)
1C. Experiment 3		
Oil 0.1% (v/v)	10.7 a	17.4 (6)
Pulse 0.05% ai	57.5 b	62.0 (11)
Pulse 0.01% ai	62.8 b	40.6 (12)
Soap 0.125% ai	49.0 b	37.0 (11)
Malathion 0.04% ai	60.3 b	72.2 (9)

¹ Means followed by the same letter are not significantly different (separated by LSD 0.05).

² SE - standard error.

In the third experiment (Table 1C), showering, as used in the United States of America (E. Nigh pers. comms.), was tested. A similar procedure, but without chemicals (hydro-cooling) is used by some growers who have noticed that this method removes a lot of "dirt". Apart from oil, showering with the other chemicals was equally effective at expelling thrips. For aphids, the only important difference was that oil was less effective than the higher rate of Pulse and maldison. Some difficulties with the methods were discovered during the course of this research. Expulsion of unwinged thrips seems to be unreliable when spears are tapped. Tapping seems to be a very unreliable method of expulsion, in particular for wingless thrips. Showering spears with soap, and to a lesser extent with Pulse, produced an enormous amount of foam.

Assessment of thrips and aphids after dehydration may not be practical because insects shrivel up and are difficult to identify. Heating spears in the incubator for a long period makes them very slimy. The spears have to be rinsed to remove the thrips from the slime.

Good estimates of the level of infestation of asparagus spears were achieved.

The most important measure of the success of a method is its consistency from sample to sample. Variation is likely to be less, however, in methods that expel a greater proportion of the insects present.

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