CONTROL OF MEADOW SPITTLEBUG (*PHILAENUS SPUMARIUS* L.)

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The meadow spittlebug (*Philaenus spumarius*) has a wide host plant range with over 400 hosts recorded in New Zealand including many economically important ones such as strawberries, lucerne, roses and other cut flowers. Weaver and King (1954) reported that nymphs and adults can cause up to 30% loss in yield of strawberries. A count of nymphs amongst roses from a cut-flower grower in the Mosgiel area showed a 25% infestation of buds. This feeding tends to weaken the bud making it fold over and become unmarketable.

In addition, the aesthetically unpleasant frothy 'spit' produced during the nymphal stage causes concern, especially to home gardeners. This froth serves to prevent the nymphs from dehydrating, deters birds and other predators, as well as providing protection from spray.

Present control recommendations (Scott 1984), which are to hose down the plants and then spray with a contact insecticide are not considered adequate. This is because the force of water needed to remove the froth often damages plants and, in addition, the nymphs can be dislodged by hosing and avoid being sprayed while later climbing back onto the plant. Furthermore the nymphs start to replace the froth as soon as it is removed and can be fully protected again within 20 minutes. Mello (1987) showed that a surfactant, Triton X-100 (100% a.i. iso-octyl-phenoxy-polyethoxy ethanol) combined with a pesticide gave good results in controlling the spittlebug (*Deois* sp.) because of the surfactant's ability to disperse froth.

Three preliminary trials were carried out to investigate the potential of insecticides and surfactants to give control of spittlebug. Results were analysed using generalised linear models (Nelder and Wedderburn 1972).

Trial 1 was designed to test the susceptibility of spittlebug nymphs without their protective froth to four insecticides. Twenty nymphs were placed in a container with moist filter paper to prevent dehydration. Without the plant xylem to feed from they were unable to produce their froth. Each insecticide treatment (Table 1) was replicated five times and sprayed to run-off onto the nymphs with a hand held pump sprayer. Untreated controls were sprayed with water. The trial showed that the contact insecticides maldison (Yates Maldison 50), parathion (Folidol M50) and pirimiphos methyl + permethrin (Yates Target) give 100% mortality of nymphs.

TABLE 1: Mean proportion of surviving spittlebug nymphs 3 days after treatment in the absence of froth.

Treatment	g ai/litre	Mean	S.E.
untreated	—	0.90	0.03
carbaryl	1.6	0.46	0.05
maldison	1.5	0.00	—
parathion	0.6	0.00	—
pirimiphos-methyl + permethrin	0.47 + 0.03	0.00	—

Trial 2 was designed to test the effectiveness of insecticides when the nymphs are protected by froth. Individual strawberry (*Fragaria* sp.) plants had ten nymphs established on them. Each treatment (Table 2) was replicated ten times in a randomised block design, and was sprayed to run-off. This trial demonstrated that even when spraying is done as efficiently as possible with full coverage of the plant, the resulting mortality was not as high as in Trial 1 when the nymphs were not protected by froth.

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TABLE 2: Mean proportion of surviving spittlebug nymphs 3 days after treatment in the presence of froth.

Treatment	g ai/litre	Mean	S.E.
untreated	—	0.80	0.04
acephate	0.75	0.56	0.05
carbaryl	1.6	0.48	0.04
maldison	1.5	0.26	0.02
parathion	0.6	0.05	0.05

The systemic insecticide acephate (Orthene 75), although giving significant mortality compared to the untreated, performed significantly less effectively than the contact insecticides maldison and parathion.

Trial 3 investigated the possibility of using a surfactant to penetrate the protective froth produced by the nymphs. Triton X-100, although not commonly used in New Zealand was tested in comparison with Multifilm X-90 (94% a.i. alkyl aryl polyoxyethylene glycol) and also a detergent, Teepol.

The effectiveness of these compounds in breaking down the froth was first tested in the laboratory using techniques described by Mello (1987). This involved placing a sample of froth and a drop of the test material between a microscope slide and a cover slip. The time taken for a series of dilutions (0.025 to 5%) of the test compounds to break down the walls of the froth matrix was recorded. A 1% solution of either of the surfactants or the detergent mixed with water was the most effective. However, although up to 10% solutions of Teepol had no effect on plants, it was found that a solution of more than 0.1% of a surfactant could be harmful (Jones, unpubl. data).

As spittlebugs are xylem feeders the aphicide pirimicarb (Pirimor 50) was included in Trial 3 as it is translocated through the xylem. A proprietary carbaryl and maldison 'dust' mixture (Yates Insect Dust) was also tested. The surfactants and detergent were tested with and without maldison to determine whether their ability to break down the froth lasted long enough for the nymph to become dehydrated, or whether an insecticide was required. The trial was designed the same way as Trial 2 except dwarf bean (*Phaseolus vulgaris*) plants were used.

The trial showed that pirimicarb was not significantly different to the untreated, while the carbaryl/maldison dust, maldison, Teepol, Triton X-100 and Multifilm X-90 reduced spittlebug survival significantly compared with untreated plants (Table 3). Adding a surfactant or detergent to the contact insecticide maldison significantly increased the mortality of the nymphs with Teepol being significantly less effective than Triton X-100 or Multifilm X-90. The effect of concentrations of 0.025% and 1% of Multifilm X-90 in combination with maldison were not significantly different (Table 3).

TABLE 3: Mean proportion of surviving spittlebug nymphs 3 days after treatment in the presence of froth.

Treatment	Conc v/v	g ai/litre	Mean	S.E.
untreated			0.80	0.04
pirimicarb		0.5	0.69	0.05
Teepol	5%		0.48	0.05
Triton X-100	0.025%		0.37	0.05
maldison		1.5	0.25	0.04
Multifilm X-90	1%		0.24	0.04
carbaryl/maldison (0.06% dust)		*	0.15	0.04
Teepol + maldison	1% +	1.5	0.07	0.03
Multifilm X-90 + maldison	0.025% +	1.5	0.02	0.01
Multifilm X-90 + maldison	1% +	1.5	0.00	0.00
Triton X-100 + maldison	1% +	1.5	0.00	0.00

*Plants lightly dusted

In the home garden an appropriate recommendation would be to add 1% v/v detergent to a contact insecticide such as maldison. For commercial growers adding the surfactant Multifilm X-90 at 0.025% v/v to a contact insecticidal spray, such as maldison, would improve efficacy.

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REFERENCES

- Mello, M.L.S., 1987. Effect of some enzymes, chemicals and insecticides on the macromolecular structure of the spittlebug, the Cercopid *Deois* sp. *Entomol. Exp. et App.* 44: 139-144.
- Nelder, J.A. and Wedderburn, R.W.M., 1972. Generalised linear models. *J. Royal Statistical Society Series B* 34: 370-384.
- Scott, R.R., (ed.) 1984. New Zealand Pest and Beneficial Insects. Lincoln University College of Agriculture, Canterbury, New Zealand. 311 pp.
- Weaver, C.R. and King, D.R., 1954. Meadow spittlebug. *Ohio Agricultural Experimental Station Research Bulletin* 741, USA. 99 pp.