ECO₂FUME® FOR CONTROL OF ONION THRIPS

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Contamination of export onions with onion thrips (*Thrips tabaci*) threatens New Zealand's largest vegetable export commodity. Ten live thrips in 400 onion bulbs is regarded as the maximum number allowed for import of onions into European markets. Eco₂fume® is a novel formulation of phosphine gas (2%) in liquid carbon dioxide which has been evaluated as a replacement for methyl bromide for post-harvest control of onion thrips. Laboratory trials determined the most appropriate phosphine concentrations and duration of exposure for thrips control. Tarpaulins and shipping containers were used for semi-commercial evaluation of Eco₂fume in terms of effects on thrips adults, nymphs and eggs. Phosphine residues were measured in samples of treated onion bulbs, and onion bulb quality was evaluated. Eco₂fume shows promise for control of adult thrips. Mortality was high at low rates (200-300 ppm phosphine) for 24 h. Eggs were more difficult to kill than nymphs and adults. Eco₂fume offers a viable alternative to methyl bromide for post-harvest treatment of onions, although issues about how to use it commercially must still be resolved. These include duration of fumigation (only 2 h required for methyl bromide), methods of sealing the fumigation container and the timing of fumigation between harvest and shipping.

CONTROLLED ATMOSPHERE FOR RASPBERRY BUD MOTH (*HETEROCCROSSA RUBOPHAGA*) CONTROL

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Raspberry bud moth (*Heterocrossa rubophaga* Lepidoptera: Carposinidae) is the most costly insect pest for the New Zealand raspberry industry, damaging canes, fruit and leaves. Exporters must declare their produce "bud moth free" and have used post-harvest fumigation with methyl bromide to achieve eradication. However, with the forthcoming phasing-out of methyl bromide, alternative post-harvest disinfestation strategies must be found. One such strategy may be the use of controlled atmospheres. We report on a study which examined the effect of controlled atmospheres comprising various oxygen and carbon dioxide percentages, as well as different temperatures and durations of exposure to controlled atmospheres, on the mortality of different non-diapausal larvae lifestages of raspberry bud moth. It is shown that temperature has the greatest effect on mortality, with high mortality achieved after relatively short durations (between 10 and 25 h) for temperatures of 35°C or more for both high and low CO₂ levels. Carbon dioxide appears to enhance swifter mortality, but O₂ has little effect in the range 2-20%. All insect stages (instars 2-5) exhibit a similar response to a high CO₂ (60%), low O₂ (2-8%) atmosphere, although it seems that the larger insects are somewhat more robust to these treatments.