RUBIDIUM MARKING OF NEW ZEALAND FLOWER THRIPS FOR DISPERSAL STUDIES

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The New Zealand Flower Thrips (NZFT) (*Thrips obscuratus*) has been identified as a vector of brown rot (*Monilinia fructicola*) of stonefruit (Ellis *et al* 1988). Teulon (1989) identified the need to understand thrips dispersal to elucidate their importance as fungal disease transfer agents. Dispersal studies of thrips are inherently difficult due to their small size, and high mobility, and to the lack of a reliable marking method. Attempts to mark thrips using fluorescent dyes (Lewis 1973) were ineffectual as the dye adhered to thrips' wings and impeded their flight. A number of insects have been marked with rubidium (e.g. Graham and Wolfenbarger 1977; Alverson *et al* 1980; Padgham *et al* 1984) but none of these studies have included thrips. Frazer and Raworth (1974) marked aphids with rubidium by rearing them on bean plants grown in a nutrient solution containing rubidium chloride (RbCl). This work showed that small insects can be marked with rubidium by incorporating the chemical into their diet. In this paper the feasibility of marking thrips with rubidium was investigated under laboratory conditions. Loss of rubidium due to subsequent immersion of thrips in trapping solutions was also assessed.

Teulon and Penman (1986) developed a rearing method for NZFT in a perspex cage, feeding the insects a sucrose solution through a parafilm membrane. We incorporated RbCl into this feeding system. A total of 1800 NZFT were removed from gorse (*Ulex europaeus*) using an aspirator which collected 50 NZFT per pooter vial. The thrips were transferred to rearing cages in the laboratory. Fifty thrips per cage, and three cages per treatment were used. Approximately 0.04 ml of a 10% aqueous sucrose solution containing 0, 5, 10, 15, 20 and 30 g/litre of RbCl was placed onto a parafilm membrane stretched over the rearing cage. Another layer of parafilm was then stretched over the first membrane to seal the solution between the two layers and prevent evaporation. Thrips were seen to feed on the sucrose solution. The cages were placed into a humid container (approximately 80% RH) at 23 °C. After 48 hours the thrips were removed. Half of the thrips were analysed immediately for rubidium content; the rest were immersed in a field trap containing a standard thrips trapping solution of 1 litre water, 3 ml of formaldehyde (to stop algal growth), and 2 ml of Tween 20 (a surfactant to facilitate thrips sinking) for 5 days. Thrips were then strained out of the solution with No. 2 filter paper and analysed for rubidium content.

The analytical method was that of Graham and Wolfenbarger (1977). Assays of individual insects for Rb content were not feasible, so five thrips were pooled in a single sample (after Padgham and Cook 1984). Samples of five thrips were placed into beakers containing 1 ml of concentrated sulphuric acid and hydrogen peroxide (ratio 1:1). The insect tissues were digested at 62 °C for 2 hours, and then the solution was made up to 3 ml by adding KCl (2,000 µgK/ml) as an ion suppressant. The solution was then aspirated into an air acetylene flame of a Shimadzu (model AA-670) flame emission spectrometer set at a wavelength of 790.4 nm. Rb standards of known concentrations were analysed to obtain a base calibration curve with which to compare the insect samples. Wet weights were used to calculate Rb concentrations in the NZFT (after Van Steenwyk *et al* 1978). Mean individual NZFT weight was 40 µg for all samples (200 µg for the pooled five NZFT sample).

There was an increase in the concentration of Rb in NZFT as the rubidium concentration in the diet increased (Table 1). There was an associated increase in NZFT mortality at RbCl concentrations in the diet above 15 g/litre. There was no significant difference in the Rb concentration of immersed and non-immersed NZFT ($P < 0.001$).

Proc. 43rd N.Z. Weed and Pest Control Conf. 1990: 117-118

TABLE 1: Mean Rb concentration (ppm Rb/NZFT) in individual NZFT fed RbCl for 48 hours at 23 °C and assayed directly or after immersion in thrips trapping solution for 5 days.

Rbcl conc. in diet (g/litre)	Rb conc. per thrips (ppm/NZFT)		Mean % mortality
	Pre-Immersion (S.E.M.)	Post-Immersion (S.E.M.)	
0	8 (20)	6 (35)	4
5	810 (30)	795 (45)	8
10	945 (60)	910 (90)	6
15	1095 (180)	1065 (135)	8
20	1515 (450)	1470 (360)	34
30	0	0	98

These results show that NZFT can be successfully marked by adding rubidium to their diet. Most significantly, immersing NZFT in the thrips trapping solution did not significantly decrease the concentration of rubidium in the insects. An optimum concentration for marking NZFT of 16 g/litre RbCl in their diet was established. There was no obvious behavioural changes in NZFT marked using this concentration of RbCl. Further work will evaluate mass marking of NZFT for field dispersal studies and ascertain the feasibility of spraying peach flowers and fruit with RbCl to mark field populations of NZFT.

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