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Effect of Exhalt 800-A Sticker-Extender on the Persistence and Bioactivity of Plictran on Apple Trees

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Plictran[R] (tricyclohexyltin hydroxide) is registered by the U. S. Environmental Protection Agency for the control of phytophagous mite pests on several fruits, nuts, and ornamentals. The active ingredient is effective against newly-hatched larvae, nymphs, and adults of several tetranychid species (ALLISON et al. 1968), but is relatively nontoxic to predacious mites (LIENK et al. 1976, WESTIGARD et al. 1972). In the Northeast, Plictran has been especially useful for management of the European red mite, Panonychus ulmi (Koch), and the two-spotted spider mite, Tetranychus urticae (Koch), on apple trees (ASQUITH 1968, ASQUITH and HULL 1973, LIENK and MINNS 1974, LIENK et al. 1976). We report here our attempts to enhance Plictran's efficacy and possibly reduce its application rate on apple trees by incorporating a sticker-extender into the spray mix.

Previous research has shown that the half-life of Plictran on apples and pears ranges from 2 to 5 weeks across the U. S. (GETZENDANER and CORBIN 1972, TROMBETTI and MAINI 1970). This variation in environmental persistence probably is due in part to differences in exposure of the residue to sunlight. SMITH et al. (1976) have shown that UV light will convert tricyclohexyltin hydroxide to dicyclohexyltin oxide, cyclohexylstannoic acid, and inorganic tin. However, most of the residue recovered from Plictran-treated fruit has been the parent compound (GAUER et al. 1974, GETZENDANER and CORBIN 1972).

MATERIALS AND METHODS

Red delicious apple trees were sprayed to run-off from the ground using a hand gun powered by a truck-mounted hydraulic orchard sprayer operating at 35 ksc. Two-tree plots were treated with 2 different rates of 50 W Plictran ± Exhalt[TM] 800-A (Kay-Fries Chemicals, Inc., Stony Point, N. Y.) on July 6, 1976. Efficacy against European red mite and apple rust mite, Aculus schlechtendali (Nalepa), was determined through 4 independent observations of 10 leaves picked at random at chest height. Counts of all mite stages except eggs were made in the field with binocular microscopes (counting dates given in Table 1). Samples for residue analysis consisted of 100 randomly-selected leaf discs (1.5 cm diameter) from each plot at 0, 1, 8, 14, 22, and 28 days after treatments. The discs were immediately weighed and frozen until analysis.

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Although there are several residue methods available for Plictran analysis (CORBIN 1970, GAUER et al. 1974, GETZENDANER and CORBIN 1972, TROMBETTI and MAINI 1970), we believed a much simpler and more convenient method could be developed using atomic absorption. Plictran and its organic degradation products were extracted from the 100 leaf discs by blending in 50 ml chlorform with a Virtis homogenizer for 2 min. The extract was filtered through glass wool, dried over anhydrous Na_2SO_4, and stored for a maximum of 2 months at 4°C. At the time of analysis, the extract was passed through a glass frit to remove the Na_2SO_4 and reduced in volume to ca. 10 ml. Excess solids were separated by filtration through a fiber-glass filled column (5 x 60 mm) into a 10-ml volumetric flask. The volume was adjusted to 10 ml with chlorform and the amount of tin was determined by direct aspiration of the sample using chlorform as a blank. The operating conditions for the Perkin-Elmer atomic absorption spectrometer Model 305B were as follows: slit setting 4 (1 mm opening), wavelength 2246A; flame adjusted to maximize absorption for each analysis (approximate H_2: air ratio was 58:33); detection limit at scale expansion 1X = 1 ppm Plictran, at 3X = 0.4 ppm; sensitivity at scale expansion 1X = 1.5 µg Plictran, at 3X = 0.4 µg. Recovery from spiked samples averaged 97% and results were not corrected.

RESULTS AND DISCUSSION

Exhalt 800-A did not enhance the efficacy of Plictran against apple rust mite and, with the possible exception of the 7.5 g AI/100 liter application rate (2-day reading), did not increase the bioactivity of the acaricide against European red mite (Table 1).

TABLE 1

Control of European red mite and apple rust mite on Red Delicious apple with Plictran ± Exhalt 800-A applied as a single spray. Sodus, New York, 1976.

Material and formulation	Rate (g AI/100 liter)	% reduction in population (days after treatment)		
		Apple rust mite[a]	European red mite[b]	
		8	2	9
Plictran 50W	7.5	76	49	96
Plictran 50W + Exhalt 800-A	7.5 + 120	59	76	93
Plictran 50W	22.5	76	84	99
Plictran 50W + Exhalt 800-A	22.5 + 120	76	87	99
Exhalt 800-A	120	59	85	78

[a] Control population of 506 mites/leaf.

[b] Control populations of 93 (2 days) and 105 (9 days) mites/leaf.

A previous study by ASQUITH (1973) showed that another adjuvant, Bio-film™, also had no significant effect on Plictran's control of European red mite on apple. Of interest is the fact that Exhalt 800-A applied alone gave moderately good mite control (Table 1).

Fig. 1 indicates that the addition of Exhalt 800-A to the spray mix did not alter the initial miticide deposit at the lower application rate. However, after 8 and 14 days, there was a 78% and 51% increase, respectively, in Plictran residues in the presence of the sticker-extender. This difference disappeared in 3 weeks. At the higher rate, Exhalt 800-A increased the initial Plictran deposit substantially resulting in a greater leaf residue (34-72%) for at least 2 weeks after treatment. The half-life of Plictran when applied alone at 22.5 g/100 liter was ca. 22 days. This agrees with results of GETZENBANER and CORBIN (1972) who found half-lives of ca. 16 days (15 g/100 liter) and 32 days (30 g/100 liter) for Plictran on apple fruit.

The recommended rate of Plictran for mite control on apple in New York is 22.5 g AI/100 liter. It was our hope that the addition of Exhalt 800-A would enhance Plictran's persistence and bioactivity to allow use of the 7.5 g rate. However, even though there was an increase in Plictran levels on foliage in the presence of Exhalt, it was insufficient to give economic control at the lower rate.

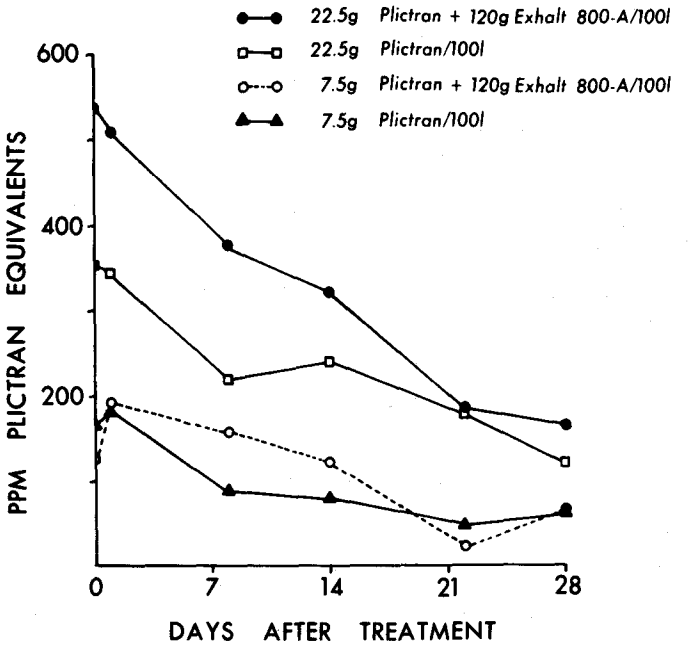

Fig. 1.-Effect of Exhalt 800-A on Plictran Residues.

Our studies also included an evaluation of the effect of Exhalt 800-A (120 g/liter) on the efficacy and persistence of azinphosmethyl (30 g/liter) on plum foliage. The treatment and sampling techniques were similar to those used for Plictran, and residue analysis was accomplished as previously described (KUHR and LIENK 1974). Unfortunately, the fruit crop was too low to permit efficacy determinations against plum curculio. However, our residue data showed that the effect of Exhalt 800-A on azinphosmethyl degradation was marginal giving an average increase in insecticide residue of 27% over a three-week period.

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