

Pome Fruits—Chemical Control

The Effect of Leaf Age on the Length of Residual Activity of Agri-Mek in Apple Foliage as Determined by Twospotted Spider Mite Mortality

Elizabeth H. Beers and Astrid Andersen

Washington State University Tree Fruit Research and Extension Center, Wenatchee, WA

*Keywords:* twospotted spider mite, *Tetranychus urticae*, European red mite, Agri-Mek, abamectin, Volck Supreme Oil, Vendex, pear, apple

This study was conducted in a mature 'Delicious' orchard at the Tree Fruit Research and Extension Center in Wenatchee, WA. A cohort of leaves (the most recently expanded leaf on a vigorous vegetative shoot) on 10 trees was tagged on 5 May. The treatment arrangement was a 3x3 factorial. The first factor was leaf age at time of spraying (2, 6, or 12 weeks, or 19 May, 16 June, and 28 July, respectively). The second factor was pesticide treatment (Agri-Mek 0.15EC 11 g ai/acre plus 0.25% Volck Supreme Oil; Vendex 4L 454 g ai/acre; and an untreated check). Treatments were applied with a handgun sprayer operated at 250 psi to the point of drip.

The residues were bioassayed ca. weekly from 7 days after treatment through 1 Sept. Ten leaves were collected on each bioassay date. A 2-cm leaf disk was cut from each leaf and floated upside down in a jelly cup of water and cellucotton. Ten adult female TSM were loaded on each leaf disk and evaluated for mortality after 72 h at 25°C. Dead and moribund mites were classed as dead, and mites that were not found on the leaf disk were not included in analyses. Treatment mortality data were corrected for check mortality with Abbott's formula.

Among the Agri-Mek-treated leaves, there were striking differences in the residual mortality patterns of the 2, 6, and 12 week-old leaves (Fig. 1A). Leaves sprayed when 2 wk old produced high levels of mortality (>90%) up to 45 days after treatment. Leaves sprayed when 6 weeks old produced high levels of mortality up to ca. 21-31 days after treatment. Leaves sprayed when 12 weeks old had low initial (7 days post-treatment) rates of mortality (<70%), which declined rapidly thereafter. The rate of declining mortality of mites challenged with Vendex residues was roughly the same regardless of leaf age at time of spraying (Fig. 1B). Initial mortality was ca. 84-93%, with a sharp drop at 14 days (20-56%).

The differing residual mortality patterns of these two materials appear to be a function of their mode of action. Agri-Mek is absorbed into the leaf, providing a reservoir of toxicant, but surface residues disappear quickly. Thus, this material is not subject to the same factors that would affect surface weathering which is common to most pesticides (precipitation, volatilization, photodecomposition). On the other hand, residual activity is greatly influenced by the initial absorption of material in the leaf. Factors that appear to affect absorption are primarily leaf surface characteristics (waxiness, pubescence) and adjuvants that aid in penetration of the leaf epidermis. As apple leaves age, factors such as high light intensity or water stress episodes probably induce changes that decrease penetration or absorption (e.g., thickness of wax layer).

This study may elucidate some of the variability that has occurred in past tests with Agri-

Mek. Observations indicated that it was more effective on pear than on apple, although it was speculated that the mite species predominant on pear (twospotted mite) was more susceptible than the predominant species on apple (European red mite). The importance of the tree species (probably related to leaf surface characteristics) as opposed to mite species in determining the field performance of this material was pointed out by Beers et al. 1990 (J. Econ. Entomol. 83: 961-964). The current test points out clearly that the time of application is also a critically important factor in the resulting field performance.

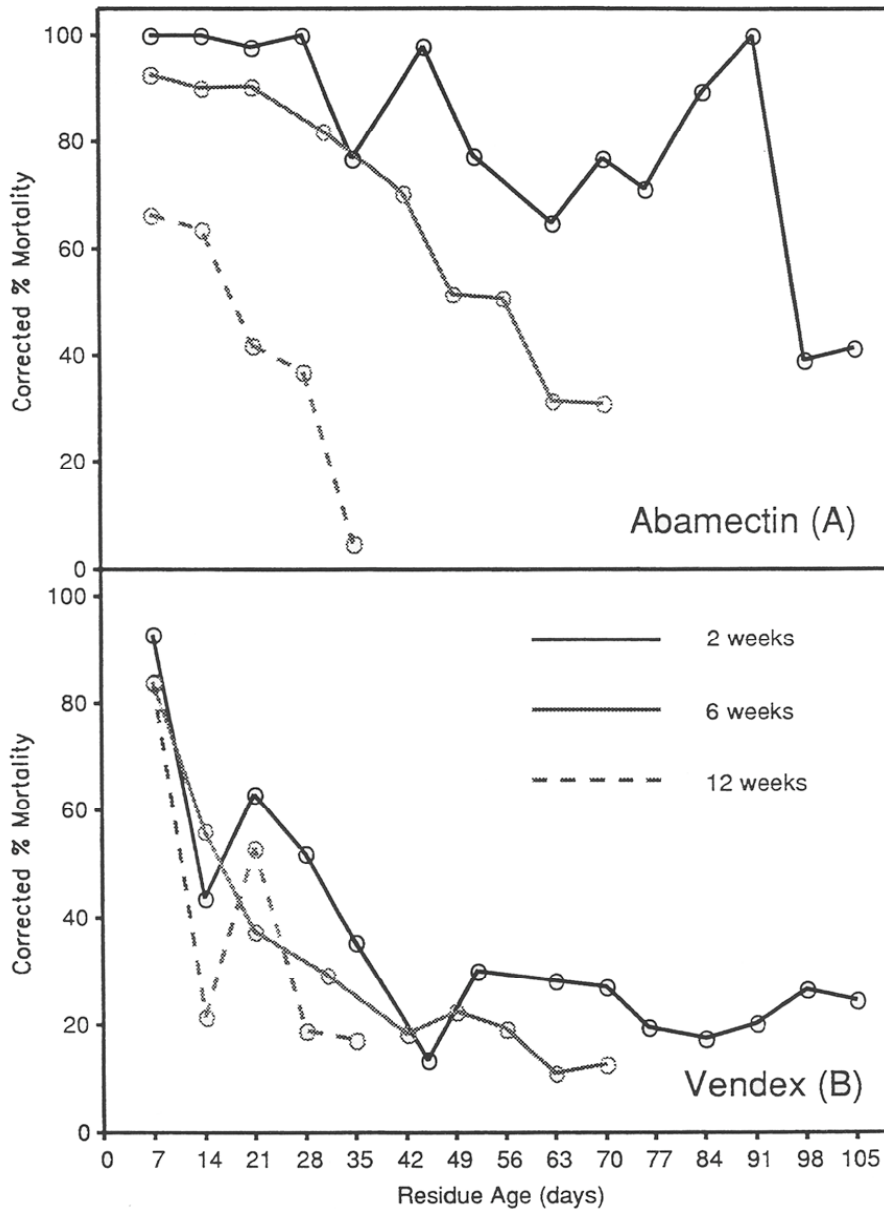


Figure 1. Corrected percent mortality of twospotted spider mite after treatment with (A) Agri-Mek or (B) Vendex applied at three leaf ages.