Over-tree Irrigation in Pear Orchards Influences Persistence of Foliar Residues of Four Pesticides

David Sugar and P.H. Westigard
Oregon State University, Southern Oregon Experiment Station, 569 Hanley Road, Medford, OR 97502

Abstract. Residues of two fungicides (dodine and fenarimol) and two insecticide/acaricides (amitraz and formetanate) on pear (Pyrus communis L.) leaves were reduced by over-tree sprinkler irrigation applied 24 or 72 hours after pesticide treatment. The difference in residue persistence following over-tree irrigation applied at 24 vs. 72 hours after pesticide treatment was significant only for fenarimol. Residues on leaves from nonirrigated trees at 96 hours post-treatment had declined 24% to 57% from initial levels. Over-tree irrigation further reduced residues by 14% to 47%. For all compounds except dodine, foliar residues measured at 96 hours post-treatment were reduced from initial levels to a greater extent by factors other than over-tree irrigation. Chemical names used: dodecylguanidine monoacetate (dodine); \( \alpha \)- (2-chlorophenyl) \( \alpha \)- (4-chlorophenyl)-5-pyrimidinemethanol (fenarimol); N\(^-\) (2,4-dimethylphenyl) N\(^-\) (2,4-dimethylphenyl) iminomethyl\(\)-N\(^-\) methylmethanimidamide (amitraz); N\(^-\) dimethyl-N\(^-\) [3(1-methylamino) carbonyloxy]phenyl]methanimidamide (formetanate).

Over-tree irrigation has become an integral management component in many pear orchards in the Pacific Northwest of the United States. In addition to providing summer irrigation for trees, over-tree systems may be used for frost protection, summer cooling, pesticide and fertilizer delivery, and reducing pest density and damage (Lombard et al., 1966; Westigard et al., 1979). However, over-tree irrigation may provide conditions for increased incidence of pear scab (Sugar and Lombard, 1981) and may advance fruit maturity in some cultivars (Lombard et al., 1966).

Irrigation follows summer pesticide applications in many orchards in southern Oregon, because moving spray application equipment through orchards with wet soil is difficult and may be disruptive to soil structure. Westigard et al. (1974) reported that over-tree sprinkler irrigation reduced residues of several pesticides on pear leaves by 30% to 90%. In that study, trees were irrigated immediately after pesticide residues dried, and samples for residue analysis were collected 24 h after pesticide application.

The present study measured the persistence of two fungicides (dodine and fenarimol) and two insecticide/acaricides (amitraz and formetanate) following over-tree irrigation. Only formetanate had been included in the previous study of residue persistence on pear (Westigard et al., 1974). Irrigation water was applied at two post-treatment timings.

Each pesticide was applied until runoff by handgun sprayer to 24 ‘Bartlett’ pear trees as single-tree replicates selected randomly within a block of 25-year-old trees planted in a 3.7 × 7.3-m spacing. Products and rates applied were as follows: Rubigan 1EC (fenarimol), 0.23 ml-liter\(^-1\); Dodine 65WP (dodine), 0.9 g-liter\(^-1\); Mitac 50WP (amitraz), 0.9 g-liter\(^-1\); and Carzol 92SP (formetanate), 0.37 g-liter\(^-1\). Eight trees treated with each pesticide were not irrigated during the study’s course, eight trees were irrigated by over-tree sprinklers 24 h after pesticide application, and eight trees were irrigated 72 h after pesticide application.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mean leaf residue (ppm)(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amitraz</td>
</tr>
<tr>
<td>Initial deposit(^b)</td>
<td>184 a</td>
</tr>
<tr>
<td>No irrigation(^b)</td>
<td>140 b</td>
</tr>
<tr>
<td>Irrigation at 24 h(^b)</td>
<td>96 c</td>
</tr>
<tr>
<td>Irrigation at 72 h(^b)</td>
<td>90 c</td>
</tr>
</tbody>
</table>

\(^a\)Mean separation in columns by Fisher’s protected LSD (P ≤ 0.05).
\(^b\)Initial deposit samples collected 24 h after pesticide application.

\(^b\)Samples collected 96 h after pesticide application.
Literature Cited


Sugar, D. and P.B. Lombard. 1981. Pear scab influenced by sprinkler irrigation above the tree or at ground level. Plant Dis. 65:980.
