
Influence of Crop Load on the Response of Cherry Fruit Growth and Size to Antitranspirant

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Abstract. Fruit growth and final size were greater on lightly cropped than on moderately and heavily cropped cherry (Prunus avium L. cv. Buriat) trees. A wax-based antitranspirant (AT), sprayed 1 week before harvest, increased fruit size on both lightly and moderately heavily cropped trees. Although the lightly cropped AT-treated trees had the largest fruit at harvest, the response to AT was greatest on the moderately heavily cropped trees. Thus, AT can improve fruit grade-size, and probably monetary returns, particularly on heavily cropped trees. High rates of AT application, however, can adversely affect fruit appearance.

It is well-known that fruit trees with heavy crop loads generally produce smaller fruit than those with light loads, and that the practice of thinning increases the size of the remaining fruit (6, 7). There is also ample evidence that a film-type antitranspirant (AT), sprayed on orchard trees 1-2 weeks before harvest, improves plant water potential (1, 5) and increases fruit size of cherry, Prunus avium L. (2, 10), peach, Prunus persica L. (4), and olive, Olea europaea L. (1, 3, 9).

Since both the crop load and improved plant water potential (via AT treatment) can affect fruit size, our purpose was to evaluate the influence of crop load on AT effectiveness.

We selected 6 'Burlat' cherry trees with moderately heavy (H), and 6 with decidedly lighter (L), crop loads. In each group, 3 trees were left unsprayed (control) and 3 were sprayed on May 7 with 4% (v/v) Mobile FG (a wax-based food grade AT from Mobil Chemical Co., Richmond, Va.) at 2580 liters/ha (275 gal/acre), using a commercial air-blast sprayer. On each tree, 10 fruits were tagged, and their diameters were measured with Vernier calipers on May 6, 10, and 13 (harvest). Fruit diameters were converted to volume, assuming each fruit to be spherical.


The influence of crop load was manifest as smaller fruit on H than on L trees (Fig. 1). The AT increased fruit growth in both cases. The amount of growth per fruit occurring between May 6 and 13 was least for the heavily laden unsprayed trees (1720 mm3) and greatest for the lightly laden AT-sprayed trees (2484 mm3), the main effects of both crop load and AT on fruit growth being statistically significant (Table 1A). The interaction between the effects of crop load and AT was statistically significant at P < 0.1%, and in Table 1 the increased fruit volume due to AT was clearly larger on heavily cropped trees (676 mm3) than on trees with lighter crops (316 mm3).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>H cm3/fruit</th>
<th>L cm3/fruit</th>
<th>Increase due to AT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>1720</td>
<td>2168</td>
<td>448**</td>
</tr>
<tr>
<td>AT</td>
<td>2396</td>
<td>2484</td>
<td>88*</td>
</tr>
<tr>
<td>Increase due to AT</td>
<td>676*</td>
<td>316*</td>
<td>(39.3) (14.6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment</th>
<th>H cm3/fruit</th>
<th>L cm3/fruit</th>
<th>Increase due to AT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>7981</td>
<td>9008</td>
<td>1027**</td>
</tr>
<tr>
<td>AT</td>
<td>8657</td>
<td>9324</td>
<td>667**</td>
</tr>
<tr>
<td>Increase due to AT</td>
<td>676**</td>
<td>316*</td>
<td>(8.5) (3.5)</td>
</tr>
</tbody>
</table>

Notes:
1. Received for publication Aug. 24, 1981.
2. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked advertisement solely to indicate this fact.
3. Associate Research Water Scientist and Professor of Water Science, respectively, Dept. of Land, Air and Water Resources.
The increase in final fruit volume due to AT was 3.5% on the L trees, but 8.5% on the H trees (Table 1B). Thus, although the lightly laden trees had the largest fruit at harvest, fruit growth and final fruit volume showed more response to AT on H than on L trees. Looked at another way, if the tree is sprayed with AT, the size-reducing effect of a heavy crop: 1) on fruit growth is only 1/2 (88/448) as severe (Table 1B); and 2) on final fruit size is only 1/2 (667/1027) as severe (Table 1B).

A similar experiment in another year was conducted on heavily and lightly cropped ‘Burlat’ cherry trees, but with a different wax-based AT (Folicote, 5% w/v) (Crystal Soap & Chemical Co., Lansdale, Pa.). Since crop load affects the rate of fruit maturation (8), we made allowance in this trial for delayed fruit ripening on H trees by both spraying and harvesting them 3 days later than for L trees. Thus, the effects of AT and crop load on fruit size were based on comparable physiological maturity of the fruit. Final fruit volume was increased by AT by 5% and 2% on H and L trees, respectively. Although the responses to AT were not as large in the first experiment, this trial also demonstrated that the percentage increase due to AT on fruit growth and final size was larger on trees with a heavy, rather than light, crop load.

Although a grower with a heavy crop load may obtain high yield, an AT spray can improve fruit size and thereby increase the possibility of obtaining a better price. If the crop load is light, the low competition amongst fruits on the same tree would provide good sizing, but an AT spray could nevertheless give some further increment to both yield and size-grade. Since most cherry orchards can, in any 1 year, contain trees with varying crop load, spraying the orchard with an effective AT 1-2 weeks before harvest (2, 10), regardless of crop load, should be beneficial. An excessive rate of AT application, however, increases costs as well as the risk of unsightly fruit due to heavy wax deposits. Net benefits need to be determined based on current cost of AT and its application and on that year's market price for cherries, which determines the value of the increased size and yield, due to AT, of marketable fruit. Increasing costs of irrigation (including water, pumping energy, and labor costs) suggest that further benefits could accrue if studies show that an AT can reduce irrigation requirements (4).

### Literature Cited


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**An Evaluation of Commercial Experience with the Tatura Trellis for Growing Peaches**

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Additional index words: Prunus persica, tree training

Abstract. Cumulative yields in commercial plantings of clingstone peach trees [Prunus persica (L.) Batsch] trained on the V-shaped Tatura Trellis system (average density 1800 trees/ha) were 145 MT/ha after 5 growing seasons as compared to 52 MT/ha in commercial orchards with low densities of conventional vased-shaped trees (average density 300 trees/ha). The best yield obtained with higher tree densities in commercial orchards (537 trees/ha) for the same period was 91 MT/ha.

The Tatura Trellis is a close-planting system, with rows of V-shaped trees running north–south. Each tree has only 2 limbs which grow east and west at an angle of 60° to the horizontal. Experiments with the Tatura Trellis system of fruit growing began at the Irrigation Research Institute, Tatura, Victoria, Australia in 1973. Results indicated that early and high yields were possible (1, 2), and a number of orchardists became sufficiently interested in the Tatura system to establish trial plantings under commercial conditions. These were established between 1976 and 1979 in different localities in Australia (7 plantings), South Africa (3 plantings), and New Zealand (1 planting). These developments provided an opportunity to study the Tatura Trellis that had been maintained without the detailed care often afforded to experiments. Because they were commercial developments, financed by the growers, it was not possible to replicate treatments or provide experimental controls. Nevertheless, the study included a considerable number of fruitgrowers in 3 countries, and their results were sufficiently promising to warrant comparison with the yields normally obtained by fruitgrowers in those countries. In addition to the yields of standard plantings, the production figures of 3 types of close-planting systems have been included: 1.) An intensive standard vase system planted by the New Zealand grower to compare with his Tatura Trellis planting (519 trees/ha); 2.) Palmette pyramid shape, commonly used in South Africa (568 trees/ha); 3.) Free-standing central leader (537 trees/ha), used successfully by 2 growers in Victoria, Australia. A total of 7 cultivars of clingstone peach were used. Trees were planted 0.75 or 1.00 m apart and rows spaced at 4.50, 5.50, or 6.00 m centers. Trees were budded or propagated from hardwood cuttings (3). The latter were planted directly into the orchard as rooted cuttings or kept in a nursery for one year. The size of plantings ranged from 0.14 to 2.14 ha. All trees were irrigated with trickle irrigation using a surface mulch to maintain soil structure. Contact herbicides containing parquat and diquat were applied 2 to 4 times per season to control weeds along the tree-row. Weeds and grass were mown between the tree-rows.

Yield data were supplied by the individual fruitgrowers from cannery records. Unseasonal frost in the Goulburn Valley (Victoria, Australia) during the 1977 blossom period...