For small wounds such as occur in topping or shaping young trees it is sufficient to paint the cut surface with an asphalt emulsion dressing such as "Tree-Seal" or "De Ka Go." This type of material seems ideal for the purpose because when fresh it can be thinned with water to any desired consistency but after setting it is completely impervious to moisture. Also, it remains slightly plastic and thus allows for expansion of callous tissues.

When diseased wood has been removed in the recutting of diseased pruning wounds or in the surgical treatment of foot-rot lesions it is important to apply to the new surface a good penetrating disinfectant such as Avenarius or Red Arrow carbolineum. Penetration of the disinfectant will be better if the wound is allowed to dry through exposure to the air for several days. A carbolineum-treated wound will remain water repellent for several months but in time moisture will penetrate it. Therefore, a final coating of asphalt emulsion should be applied before that time.

**Summary**

Other than the surgical treatment of foot-rot lesions and the eradication of Sphaeropsis knot, but little pruning of citrus trees is done for the purpose of eradicating disease in Florida. Eradicant pruning has not been found to give adequate control of melanose.

Pruning wounds are important avenues of entrance for organisms that cause such serious citrus diseases as young-tree die-back, Florida gummosis, Diplodia disease, and wood rot or concentric canker.

To promote rapid healing, pruning wounds should be made smooth and flush with the surrounding bark surface.

Pruning cuts into healthy wood should be protected with a good water-impervious dressing.

Cuts made to remove diseased wood should be treated first with a disinfectant of good penetrating qualities, before the water-impervious coating is applied.

**Literature Cited**

the greatest amount of condemnation because they particularly shed heavily during periods of warm, dry weather in the fall and winter. Although pre-harvest drop of Valencia oranges is just as great as that of Pineapple and seedling sweet oranges, the Valencia variety escapes the reputation of being a bad dropper because the drop extends over a long period. Rapid decay of fallen fruit and also the covering up of such fruit from time to time by disk ing hide the magnitude of the loss from the grower.

In recent years this problem has been attacked by a number of workers. Gardner (*) reported in 1941 that naphthaleneacetic acid and naphthalene acetamide could be used to lessen materially the drop of Pineapple oranges in Florida, but the high concentration and the necessity of early application discouraged use of the method. In 1947 Stewart and Klotz (*) showed that by spraying California Valencia orange trees in May with a 2,4-D derivative (diethanolammonium 2,4-dichlorophenoxyacetate) at a concentration of 25 p.p.m., as much as 78 per cent of the normal pre-harvest drop could be prevented.

Study of the problem under Florida conditions was resumed in 1948 by Gardner, Reece, and Horanic (*), using the sodium salt of 2,4-D and four other growth-regulating compounds. They reported that the response of Pineapple oranges to 2,4-D closely paralleled the results reported for California Va lencia. However, they found that the compound seemed to be without effect upon Florida Valencia oranges when it was applied on Oct. 15, 1948 and on Dec. 19, 1949. The marked contradiction by these results of those reported from California for this variety led to further experiments.

Effect of Growth Regulators on Drop of Valencia and Pineapple Oranges

The experiments in 1950 were designed to test the effect of the time of application of 2,4-D upon pre-harvest drop of Valencia oranges. All sprayed trees were drenched with the sodium salt of 2,4-D applied at a concentration of 25 p.p.m. of 2,4-D acid equivalent. Trees were chosen in blocks for their comparable size and crop. Blocks were replicated twenty-five times. Within each block treatments were applied to single-tree plots as follows: (1) Unsprayed trees - control; (2) tree sprayed September 12 and again April 16; and (3) tree sprayed September 12 and again on January 29. All litter beneath the trees was removed at the time the sprays were applied. Weekly drop records were kept thereafter until the crop was harvested.

The data in Table 1 show that trees in the control plots lost 21.8% of their total crop by pre-harvest drop. However, trees that received applications of 2,4-D in September and January lost 30% of their total crop, a loss of 37.6% more than that of the controls instead of the expected decrease. The loss of fruit from plots sprayed in September and April was also greater than that from unsprayed plots.

No apparent difference could be detected in the drop records from these plots before the second 2,4-D spray was applied. Therefore, in an analysis of the effect of the January 29 application, prior drop records were disregarded and the total crop was recalculated on the basis of subsequent drop records plus the picking yield. Each experimental block then consisted of paired trees, one sprayed and one unsprayed, and blocks were replicated 25 times.

TABLE 1. Effect of time of application of 25 p.p.m. 2,4-D on pre-harvest drop of Valencia oranges picked May 14, 1951.

<table>
<thead>
<tr>
<th>Date spray applied</th>
<th>Ave. no. boxes per tree</th>
<th>Percent of total crop dropped</th>
<th>Percent increase in drop of sprayed fruit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control — no spray</td>
<td>8.0</td>
<td>21.8</td>
<td>+ 15.6</td>
</tr>
<tr>
<td>Sept. 12 and April 16</td>
<td>7.6</td>
<td>25.2**</td>
<td>+ 37.6</td>
</tr>
<tr>
<td>Sept. 12 and Jan. 29</td>
<td>6.9</td>
<td>30.0**</td>
<td></td>
</tr>
</tbody>
</table>

*Statistically significant — Required difference between means, 3.2 percentage units
**Statistically highly significant — Required difference between means, 4.2 percentage units.
Data in Table 2 show that between the date of spraying, January 29, and picking date, May 14, the trees that had been sprayed with 25 p.p.m. of 2,4-D lost 16.4% of their total crop. Comparable unsprayed trees lost 9.7%. Thus the use of 2,4-D on Valencia oranges proved decidedly disadvantageous as it increased the normal loss by 59.1%.

The effect of the 2,4-D spray applied at the rate of 25 p.p.m. on April 16 was similarly analyzed. The data in Table 3 show that between that time and the picking date unsprayed trees lost only 4.9% of their crop, while sprayed trees lost 6.6%. Thus this spray treatment increased the normal loss over a four-week period by 34.7%. In this experiment the time of spraying, April 16, corresponded closely with the effective period indicated in the California experiments for Valencias but it is quite clear that the results were the opposite of those reported by the California investigators.

All evidence seemed to indicate that the differences in response to applications of 2,4-D between California and Florida Valencia oranges was not due to differences in timing the applications. In previous Florida experiments to control pre-harvest drop the sodium salt of 2,4-D was used, whereas California investigators used diethanolamine 2,4-D. Therefore the 1951 experiments on Pineapple and Valencia oranges were designed to compare the relative effectiveness of these compounds under Florida conditions. Another compound, triethanolamine salt of 2,4,5-trichlorophenoxypropionic acid, that is reported by Edgerton and Hoffman (1) to give good control in pre-harvest drop of McIntosh apples where 2,4-D had failed, was also included in this experiment.

In the experiment on Pineapple oranges four trees of comparable size and crop were chosen to constitute a block. Within each block were the following single-tree treatments: (1) Control - no spray, (2) sodium salt of 2,4-D, which had given a high degree of drop control on this variety in previous years, (3) Triethanolamine 2,4,5-T-P, and (4) diethanolamine 2,4-D. The blocks were replicated 20 times. Each of these compounds was applied at the rate of 25 p.p.m. on December 21, 1951, a calm day when the temperature ranged between 78 and 85 degrees. All litter beneath the trees was removed and weekly drop records were kept until the crop was harvested on February 21.

The data presented in Table 4 show that all three compounds decreased drop, but the difference between them was not significant. The sprays were applied late in December and the crop was harvested early. Therefore the pre-harvest drop record constitutes a relatively small percentage of the total crop and the savings effected by the growth-regulator sprays were correspondingly small, ranging from 12.9% in the case of Na 2,4-D to 19.4% in the case of diethanolamine 2,4-D.

A similar study was made upon Valencia oranges. Twenty-five blocks of three trees each were chosen for comparable size and crop. Within each block were three single-tree treatments: (1) Control, (2) diethanolamine 2,4-D, and (3) triethanolamine 2,4,5-T-P, both at the rate of 25 p.p.m. The sprays were applied on December 11, 1951,
and weekly drop records were kept until the fruit was harvested on June 2, 1952, approximately six months later.

The sodium salt of 2,4-D was not tried again because data from experiments in three previous years seemed to prove conclusively that it is not effective upon Florida Valencia oranges.

Final results showed that control plots lost 15.6% of their crop. Plots sprayed with diethanolamine 2,4-D and 2,4,5 T-P each lost 16% of their crop. This difference is not significant.

**Effect of 2,4-D on Drop of Temple Oranges**

During the 1949-50 season the effect of 2,4-D on Temple oranges was tested. Blocks of three trees of comparable size and crop were chosen and replicated ten times. Within each block the following treatments were applied to single-tree plots: (1) Control - no spray, (2) Na salt of 2,4-D at a concentration of 25 p.p.m., and (3) Na salt of 2,4-D at a concentration of 50 p.p.m. of 2,4-D free acid equivalent. Both were applied as a spray on December 14.

Data presented in table 5 show that sprays containing 2,4-D at rates of 25 and 50 p.p.m. prevented 27% to 35% of the normal pre-harvest drop during a period of about two months while the fruit was ripening. The difference between each 2,4-D treatment and the control is highly significant but that between the two concentrations of 2,4-D is not significant.

**Table 5. Effect of applying 2,4-D (sodium salt) Dec. 14, 1951, on pre-harvest drop of Temple oranges picked Feb. 9, 1952**

<table>
<thead>
<tr>
<th>Spray treatments</th>
<th>Percent of total crop dropped</th>
<th>Percent of normal drop prevented</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>10.6</td>
<td>0%</td>
</tr>
<tr>
<td>25 p.p.m. 2,4-D</td>
<td>7.7**</td>
<td>27%</td>
</tr>
<tr>
<td>50 p.p.m. 2,4-D</td>
<td>6.9**</td>
<td>35%</td>
</tr>
</tbody>
</table>

**Statistically highly significant. Required difference between means, 1.6 percentage units**

**Conclusions**

Sodium salt of 2,4-D, diethanolamine 2,4-D, and the triethanolamine salt of 2,4-5 trichlorophenoxypropionic acid at a concentration of 25 p.p.m. significantly reduced pre-harvest drop of Pineapple oranges. There was no significant difference in the effectiveness of these compounds.

These compounds were not effective in reducing fruit drop of Valencia oranges under Florida conditions. This is in marked contrast to the reported high degree of drop control secured by the use of 2,4-D on California Valencia oranges.

This failure to secure drop control in Florida Valencia oranges was not due to improper timing of the spray applications. Fall applications of 2,4-D between September 12 and December 19 had neither a beneficial nor a detrimental effect on Valencias. During the 1950-51 season the use of the sodium salt of 2,4-D significantly increased the amount of pre-harvest drop of Florida Valencias when the spray was applied in late January just before new growth appeared or in April after new growth had matured.

The pre-harvest drop of Florida Valencia oranges remains an important but unsolved problem.

Sprays containing 25 p.p.m. of the sodium salt of 2,4-D were effective in preventing about ½ of the normal pre-harvest drop of Temple oranges over a period of two months while the crop was maturing.

**Literature Cited**


**Acknowledgments**

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