"Alar" is the trade-mark for a new growth regulator registered for use on apples. In early reports this chemical was often referred to as B-9 or B-995.

Alar is a growth retardant. When sprayed on apple trees it causes a number of different effects. In addition to reducing the vegetative growth of trees, application of Alar can influence the amount of bloom, fruit size, finish, firmness and color as well as pre-harvest drop and the development of water-core.

These effects or the development of these responses is influenced by tree age and condition as well as the concentration of Alar and the time of the year it is applied.

The information in this publication is intended to serve as a guide to the use of Alar on apples. It is based primarily on research results with individual Red and Golden Delicious trees over the past six years and on field trials in a few commercial orchards in 1968 and 1969. Not all of the results reported here will necessarily be observed in all orchards or in all seasons or with all varieties.
General Considerations

The type and magnitude of the response to spray applications of Alar are related largely to three factors: (1) the condition of the tree, (2) the time of application, and (3) concentration of Alar.

Tree Condition

The age and condition of the tree influences the response to Alar. In general any factor including cultural practices which increases tree vigor, tree growth, fruit growth and decrease fruiting will tend to reduce the amount of response to applications of Alar. As a result trees which are younger, are heavily pruned or fertilized, or for other reasons are excessively vigorous are not likely to respond as much as trees which are older, less vigorous or fruiting heavily.

Caution: Application of Alar to weak trees can seriously reduce growth of the fruit and tree and therefore should not be made.

Time of Application

Best results in the use of Alar have occurred when it was applied either as an early application, 10 to 14 days after bloom, or as a late application, 60-45 days before harvest, or 80-90 days after bloom. The early application has had more of an effect on reducing fruit size, reducing tree growth and increasing return bloom than the late application. The late application has had less effect on reducing growth or size but has been equally effective in delaying water-core, preventing pre-harvest fruit drop and increasing fruit firmness.

Warning: Alar is registered for use up to 45 days before harvest but should not be applied later than 80 days after full bloom. Later applications may cause delayed bloom and the development of misshaped fruit the following spring.

Rate of Application

Alar can be applied at concentrations ranging from 750 to 2000 ppm depending upon the amount and type of response desired. A concentration of 500 ppm is sufficient to prevent pre-harvest drop, but 1000 ppm is necessary to increase fruit firmness and to delay water-core development. Higher rates have not appreciably enhanced the above effects.

In contrast, the amount of reduction in the growth of the fruit and tree and the amount of increase in return bloom is closely related to the concentration of Alar applied. Concentrations less than 1000 ppm produce little effect. Increasing the concentration up to 2000 ppm increases the effect. In general the more vigorous the trees the higher the concentration necessary to effect a reduction in growth of the fruit and tree as well as an increase in return bloom.

A concentration of 750 and 1000 ppm is equal to 0.75 lbs. and 1.0 lbs. of Alar-85 per 100 gallons of spray. A single application is sufficient.
Table 1. Effect of timing and concentration of Alar sprays on fruit from 15-year-old Starking Delicious with moderate vigor and crop load.

<table>
<thead>
<tr>
<th>Time* and Concentration of Alar (ppm)</th>
<th>Size of fruit samples (cm. cir.)</th>
<th>Pressure (lbs) at harvest</th>
<th>Degree of water-core</th>
<th>Percent extra water-core</th>
<th>Percent extra fancy</th>
<th>Percent fruit size reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>22.7</td>
<td>16.4</td>
<td>2.2</td>
<td>34</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Summer - 500</td>
<td>22.5</td>
<td>17.1</td>
<td>1.5</td>
<td>34</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Spring - 500</td>
<td>22.5</td>
<td>17.9</td>
<td>1.1</td>
<td>39</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Spring - 500x2</td>
<td>22.7</td>
<td>17.8</td>
<td>0.9</td>
<td>45</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Summer - 1000</td>
<td>22.4</td>
<td>18.3</td>
<td>0.9</td>
<td>43</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Spring - 1000</td>
<td>22.6</td>
<td>18.1</td>
<td>0.8</td>
<td>42</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

1All size, pressure, and water-core figures are average values of 25 fruits from each of 10 trees or 250 fruits per treatment. Fruits were selected from limbs on same side of trees with similar fruit loads at 151 days from full bloom near Methow, Washington.

2Water-core rating 0 = None; 1 = Trace (barely visible); 2 = Light (all vasculars affected); 3 = Moderate (up to 30% of tissue affected).

3Size reduction figures obtained from actual packout records of all treated fruits (10-15 bins) in each treatment.

4Two applications - one week apart.

* Time of application: Spring - 30 days after full bloom
  Summer - 70 days after full bloom
**Discussion of Responses**

Prevention of pre-harvest fruit drop has been obtained consistently when Alar is applied either as an early spray (10-14 days after bloom) or a late spray (70-80 days after full bloom). The one time has been just as effective as the other.

A concentration of 750-1000 ppm has been sufficient to produce this effect.

**Caution:** Higher concentrations on Golden Delicious may make the fruit more difficult to pick and may result in an increase in the number of finger bruises and stems pulled.

**Increased fruit firmness** has been obtained from either an early or a late application of Alar. This increased fruit firmness has been measured with Red and Golden Delicious at harvest and with Red Delicious after a period of six to nine months in storage. A concentration of 1000 ppm has resulted in an increased fruit firmness at harvest of 1 to 2 pounds with Red Delicious and 0.5 to 1 pound with Golden Delicious apples.

**Delayed water-core** development has resulted from either an early or a late application of Alar. A concentration of 1000 ppm on Red Delicious and Winesap has delayed the development of water-core from 4 to 7 days.

**Caution:** Applications of Alar do not prevent water-core from developing. The benefits in delaying the development of water-core can be lost if the harvesting of Alar treated trees is delayed too long.

**Increased red color** has been observed following an application of Alar. In commercial plantings of Starking Delicious, red color was increased in the 1968 season by 8 to 10 percent. It is not known whether Alar will consistently cause such an effect.

**Increased bloom** on apples has been observed the year following an early application (10-14 days after bloom) of Alar at 2000 ppm. This effect has been observed when Alar was applied to young nonbearing trees as well as to older trees when the bloom and crop was heavy the previous year. Low rates and late applications of Alar have had little effect on increased bloom the following year.

**Caution:** See effects of early sprays on fruit size below.

**Reduced fruit size** will result from applications of Alar to bearing trees when applied at high rates shortly after bloom. Applications 10 to 14 days after bloom at 2000 ppm in 1969 showed a reduction of 10 percent, one box size, with Golden Delicious, and 15 to 20 percent, 1½ to 2 box sizes with Red Delicious.

This amount of size reduction should not be anticipated in all orchards, in all seasons or with all varieties. It is most pronounced on Red Delicious. It is less on young trees in a high state of vigor.
Reduced shoot growth has been observed after Alar applications. The amount of reduced growth depends upon the time of application, the concentration of Alar and tree vigor. Late applications and low rates, under 1000 ppm, have had little effect. Early applications (10-14 days after bloom) at 1000 ppm reduced growth about 10%, and at 2000 ppm about 20%. Moderate to low vigor trees were affected more than high vigor trees.

Caution: Annual applications, early in the season, are necessary for any degree of growth control. If the trees remain untreated the year following a heavy Alar application, growth will be equal to or may even exceed that of untreated trees.

Improved fruit finish has been observed when Alar has been applied to some varieties. This same effect may be observed where excess tree vigor has been reduced.

Less storage scald has been reported from some areas with the varieties Red Delicious and Cortland. However, such an effect is not always observed nor is the amount of reduction sufficient to replace other scald prevention treatments.

Suggested Uses of Alar

Fruit growers interested in using Alar should study the above responses carefully. Limited trails are suggested first to determine the concentrations and conditions under which Alar is effective. The magnitude of the response is influenced by variety, tree age, tree vigor, cultural practices and environmental conditions. To adequately appraise Alar treatments, some portion of the test orchards should remain untreated. These trees and fruit serve as a comparison with those treated with Alar to determine whether concentrations and timing should be changed.

Young vigorous nonbearing trees: To help bring them into production, an early application (10-14 days after bloom) of Alar at 2000 ppm should increase the number of blossoms produced the following year. Application should provide some slight reduction in terminal or vegetative growth.

Caution: Treating low vigor trees can seriously reduce tree performance.

Young bearing trees: Young trees tend to produce light or sporadic crops of large, poorly finished, soft fruit with a short storage life. An early application of Alar (10-14 days after bloom) at 2000 ppm should reduce fruit size about 15%, improve fruit finish and firmness, delay water-core, prevent pre-harvest drop, tend to give some reduction in shoot growth and improve bloom the following year. Reducing the concentration of Alar in this early application to 1000 ppm should result in the same responses. However, this lower rate will have little effect on return bloom and reduced shoot growth and not as much effect on fruit size.
Late applications of Alar (70-80 days after bloom) at 750 to 1000 ppm will reduce pre-harvest crop of fruit, increase fruit firmness and delay the development of water core.

Mature bearing trees: With Red Delicious trees that have a light fruit crop or in situations where large fruit size has been a problem an early application of Alar (10-14 days after bloom) at 1000 ppm may be desirable. With Golden Delicious trees which have a heavy bloom or set a heavy crop, an early application of Alar (10-14 days after bloom) at 2000 ppm should help develop more return bloom the following year. Applying Alar this early and at this high a concentration should also reduce fruit size 7% to 10% and result in an increase in fruit firmness. Late applications, 70-80 days after bloom, are of very little value on Golden Delicious.

With most trees and especially with Red Delicious the later application (70-80 days) at 1000 ppm will be preferred. Application at this time will provide control over pre-harvest fruit drop, will result in increased fruit firmness, and will delay the development of water core.

To simplify the presentation of information, it is sometimes necessary to use trade names. No endorsement of products is intended nor is criticism of unnamed products implied.


2/69
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