an angle so that, as the blade crossed the vertical cut, it tended to peel open one of the corners of the bark where the two incisions crossed (fig. 2). The high point of the knife blade (quill) was then used to peel open both corners (fig. 3). The trunk was now ready for the bud to be inserted (fig. 4).

With a bud stick about 1 cm (1/2 inch) in diameter, the budder made a cut angled downward into the stick, from about 2 cm (4 inch) above the bud to about 2 cm below the bud (fig. 5). A second angled cut made downward about 1 to 2 cm (1/2 to 3/4 inch) below the bud met the first cut and severed the bud from the stick (fig. 6). The second angled cut below the bud exposes more cambium surface (fig. 7) for better callusing, which first occurs at this point.

The bud was inserted under the open corners of bark, and the base of the bud shield was pushed well below the bottom of the vertical cut with the point of the knife blade (fig. 8). The bud was then covered with tightly pulled, overlapping wraps of white, 4-mil, plastic flagging tape. Since the understocks were about 5 cm (2 inches) in diameter, a 2.5-cm (1 inch) tape was used, starting below the bud (fig. 9) and wrapping up to about 2 to 3 cm (1 inch) above the horizontal cut (fig. 10).

The final few wraps were brought down to just above the bud and tied by tucking the end of the tape under the last wrap and pulling tightly to stretch the tape.

Tape wrapped in this way can be partially removed later if there is evidence of constriction or girdling of the shoot. Cutting across the tape up to the bud on the side of the vine relieves pressure below the bud. The tape will unravel below but not above the bud because of the overlapping last tie just above the bud. The tape should not be cut or removed above the bud until fall, unless there is evidence of girdling above the bud.

The tape held the buds tightly in place and prevented the shoots from breaking away. When the shoots were about 45 cm (18 inches) long, they were fastened to the bottom wire for support. To provide the more flexible established cordon needed for mechanical harvesting, each shoot was crossed over the top of the stock so that it was established on the side opposite the bud insertion.

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cost of a second complete harvest operation would not normally be justified. In the San Joaquin Valley, on Marchetti walnuts, the use of ethephon increased the pounds of nuts removed in the first harvest by nearly 30 percent. This increase could improve quality significantly on this difficult-to-harvest variety.

In all trial locations, a significant difference (p < 0.05) in percentage of nut removal was found between ethephon-treated plots and the untreated check. In the San Joaquin and Sacramento Valleys, there was no significant difference among any of the rates of ethephon or gallonage used per acre. In the coastal region, the 3-pint rate at 100 gallons per acre resulted in significantly fewer nuts being harvested in the first harvest than with any of the other ethephon rates or gallonages. However, even this 3-pint rate was significantly better than the untreated check.

In all locations, the ethephon-treated nuts were more huggable than the untreated check (fig. 2). In the San Joaquin Valley, the combined average hullability for all ethephon-treated plots was significantly greater (p < 0.05) than the untreated check. In the Sacramento Valley, there was no significant difference in hullability among the ethephon-treated plots, but they were all significantly more huggable than the untreated check. In the coastal region, the ethephon-treated nuts were only slightly more huggable than the untreated check. This is probably because the cool coastal climate provides for more rapid hull dehiscence than does the warm interior valley.

No adverse effects, such as excessive leaf drop or poorer kernel quality, could be seen from the use of lower or more concentrated rates of ethephon.

**Conclusions**

The results of these trials have demonstrated that lower rates of ethephon may be used with results comparable to those at the 5-pint rate. The 3-pint rate, which worked well in the San Joaquin and Sacramento valleys at 100 and 300 gallons per acre and in the coastal region at 300 gallons per acre, could result in a 40 percent savings over the cost of the 5-pint rate. These trials also demonstrated that 100 gallons per acre worked as well as 300 gallons per acre. This can result in further savings, because the more acres that can be treated per tank load, the more efficient the operation.

Although a complete harvest (meaning 100 percent in one shake) may not be feasible, a far greater first harvest, and in some cases a near-complete harvest, is possible earlier than normal with the use of ethephon.

Even with the improved quality benefits obtained at a reasonable price, ethephon should not be used by all growers. The use of this material on orchards under stress has resulted in excessive defoliation, complicating harvest with an overabundance of leaves.

Growers who do not have their own harvest equipment or who, for some other reason, cannot harvest the crop promptly should not use this material. Once ethephon is applied, harvest must commence as soon as feasible to avoid accelerated loss in kernel quality.

Growers who have interplanted orchards of two or more varieties may find this material too difficult to use if only one variety is to be harvested at a time.

Finally, coverage is of utmost importance. If the trees are too large or the spray equipment inadequate to provide complete coverage, it would be unwise to use ethephon.

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**Fig. 1. Influence of ethephon rate and gallonage per acre on initial walnut harvest.**

**Fig. 2. Influence of ethephon rate and gallonage per acre on walnut hullability.**

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**Table:**

<table>
<thead>
<tr>
<th>Region</th>
<th>Pints Ethephon Used/Acre</th>
<th>Harvest Date</th>
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<tr>
<td>San Joaquin</td>
<td>100 Gal/A</td>
<td>Marchetti</td>
</tr>
<tr>
<td>Sacramento</td>
<td>300 Gal/A</td>
<td>Harvest 9/15/75</td>
</tr>
<tr>
<td>Coastal Region</td>
<td>Control</td>
<td>Harvest 9/19/75</td>
</tr>
</tbody>
</table>

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**Diagram:**

- **San Joaquin Valley Marchetti Harvest 9/15/75**
- **Sacramento Valley Ashley Harvest 9/19/75**
- **Coastal Region Payne Harvest 10/6/75**