Influence of Wounding and Chilling on Rooting of Pear Cuttings

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Abstract. Disbudded 'Old Home' × 'Farmingdale' (OH × F) pear (Pyrus communis L.) cuttings rooted 96% before sufficient chilling to break rest and 84% after chilling. Rooting mass (as rated on a scale of 0 to 3) for disbudded cuttings was also less for chilled (1.22) than for nonchilled (1.94) cuttings. Disbudding of chilled cuttings reduced rooting significantly. Internodal wounding failed to alter % rooting but reduced rooting masses for both nonchilled and chilled cuttings, relative to non-wounded controls. The rooting mass of nodally wounded chilled cuttings was suppressed even further.

Season of the year is an important consideration in rooting cuttings from fruit trees. Relative bud activity is thought to be one of the primary determining factors in the marked seasonal fluctuation in rooting ability of pear cuttings (1, 2, 3, 4). Active buds have been associated with both increased (2, 3, 5, 6) and decreased (1, 4, 7) ability of cuttings to callus and root. Removal of buds, a possible site of synthesis of promotive or inhibitory compounds to rooting, resulted in both increased plum and apple rooting (6) and decreased pear rooting (2, 3). Internodal wounding was shown to be as effective as disbudding in promoting rooting of plum and apple (6). Increasing the no. of buds per cutting stimulated (3) or had no effect on (6) rooting.

These several contradictory results indicate a need for further work on important horticultural species. In the present study effects of nodal (disbudding) or internodal wounding and relative bud rest were evaluated in order to learn more about rooting of special decline-resistant rootstock.

One-year-old dormant wood was collected on Nov. 19, 1973, from 4 easy-to-root OH × F clones 10 to 12 years old grown at the Lewis-Brown Horticultural Farm, Corvallis, Oregon. Half the shoots were placed in a 5°C chilling room for 10 weeks, after which they were cut-up, callused, and rooted at 20°C as detailed below. The other half was prepared immediately for callusing-rooting period. This indicated that the buds on the branches were not yet in sufficiently deep rest at the time they were removed from the trees to prevent some bud activity. A prolonged rainy period prior to this time possibly prevented the buds from entering deep rest as they normally would.

A brief review of previous pear rooting tests indicates that the present results are different from all previous tests. Fadl and Hartmann (2, 3) reported that 'Old Home' rooted well in Sept. and Oct. and that disbudding at that time greatly reduced rooting. However, from Dec. to March, rooting was enhanced somewhat by disbudding, 'Bartlett' on the other hand rooted poorly but still better in both fall and spring if cuttings were disbudded. Higdon and Westwood (4) and Ali and Westwood (1) had previously shown that 'Old Home' rooted very well in Nov. when buds were in deep rest but rooted poorly or not at all after rest was removed by chilling. OH × F cuttings in the present test rooted very well both before and after chilling and bud removal after chilling only slightly depressed rooting. Thus these pear differ from 'Old Home' in rooting well after chilling and they differ from 'Bartlett' in that disbudding of OH × F did not enhance rooting. Our results further differ from those of Howard (6) who found that both disbudding and internodal wounding greatly enhanced rooting of plum and apple, possibly by a wounding-induced stimulus. The conflicting data apparently arise from the fact that differences in rooting among genetic lines, as related to chilling status and bud removal, occur because of different amounts of inhibitoric or stimulatory substances produced by buds in different physiologic states. Until such substances are identified and established areas were wounded by removing all the buds in the former and equivalent amounts of tissue from 6 internodal areas in the latter. The bases of cuttings were immersed in 200 ppm indolebutyric acid (IBA) for 24 hr. Cuttings were covered with damp granulated peat moss during both the chilling and rooting phases. Eighteen replicates of 10 cuttings each were used for each treatment. Cuttings were evaluated for rooting after the 14 week chilling-rooting or rooting-chilling sequences.

Table 1. Effect of wounding and chilling on percent rooting and rooting mass of 'Old Home' × 'Farmingdale' pear cuttings.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% rooting</th>
<th>Rooting mass rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-chilled</td>
<td>Chilled</td>
</tr>
<tr>
<td>Control</td>
<td>93a</td>
<td>99a</td>
</tr>
<tr>
<td>Nodal wounding</td>
<td>96a</td>
<td>84b</td>
</tr>
<tr>
<td>Internodal wounding</td>
<td>98a</td>
<td>94a</td>
</tr>
<tr>
<td>Avg</td>
<td>96</td>
<td>93</td>
</tr>
</tbody>
</table>

2Mean separation in columns and rows within % rooting and within rooting mass by Duncan’s multiple range test, 5% level.


2Present address: Department of Fruit Crops, University of Florida, Gainesville.

2All buds removed.

2Equivalent amounts of tissue removed from internodal areas as were removed in nodally wounded cuttings.
Resistance to the Common Peach Tree Borer (Sanninoidea exitiosa Say) in Seedlings of 'Rutgers Red Leaf' Peach\(^1\)

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Abstract. Seedlings of 'Rutgers Red Leaf' peach (Prunus persica (L.) Batsch) exhibited more resistance to the common peach tree borer than seedlings of 'Siberian C', 'Harrow Blood' and 'New'.

Weaver and Boyce (2) reported a range of common peach tree borer infestation of 8.4% to 81.4% in a group of selfed and crossed progeny, with 'Goldray' selfed progeny the most resistant. This observation was made in conjunction with a study of wood cold hardiness, and the degree of infestation was inversely related to winter kill. They postulated that the less cold hardy trees did not have enough live tissue to support borers and, thus, the data was biased. However, they did find that several inbred progenies exhibited low infestation and also tolerance to cold injury. Other inbred progenies and crosses showed marked susceptibility to borers.

A nursery planting, at Lexington, Kentucky, consisting of 4 peach seedling rootstocks ('Rutgers Red Leaf' (RRL), 'Harrow Blood', 'New' (1) and 'Siberian C') was heavily infested with the peach tree borer in 1972. The trees were planted in 4 adjacent rows with 100 trees of each rootstock per row. Analysis of variance was performed using each tree as a replicate. We found (Fig. 1) that 'Rutgers Red Leaf' had 10% of trees infested compared to 39% for 'Harrow Blood', 49% for 'New' and 69% for 'Siberian C'. The degree of injury was rated on a scale of 0 to 3 (0 = no infestation, 1 = a minimum of injury, 2 = severe injury and often several borers) and an injury index (sum of ratings x no. of trees) was calculated.

\\(\text{injury index} = \sum (\text{ratings} \times \text{no. of trees})\)

\(^{-}\text{in August 1973 for use in another experiment. They were not sprayed for borers the following year, and a fairly heavy infestation of the common peach tree borer developed. The trees were dug in Oct., 1974, and rated for percentage and severity of infestation. Since the number of trees was different from the previous experiment, the injury index was arrived at by multiplying the percentage of infestation by the injury rating. The results were quite similar to those of the 1972 test although not quite as distinct (Fig. 1). 'Rutgers Red Leaf' again showed the least infestation and the most resistance as indicated by the injury index with 'Siberian C' the highest infestation and greatest amount of injury. We suggest these data indicate the feasibility of breeding peach rootstocks with resistance to the common peach borer.}

\footnotesize{\text{Literature Cited}}

\footnotesize{\text{1Received for publication Nov. 22, 1974. The investigation reported in this paper (No. 74-10-152) is in connection with a project of the Kentucky Agricultural Experiment Station and is published by permission of the Director.}}

\footnotesize{\text{2Assoc. Professor and Professor in the Department of Horticulture, respectively.}}

\footnotesize{\text{Fig. 1. Injury index and percent infested of peach rootstock by the common peach tree borer, Sanninoidea exitiosa Say. Mean separation by Duncan's multiple range test, 5\% level.}}