ABSTRACT

A uniform appearing 6 year old walnut orchard in which 'Chico', 'Hartley', and 'Franquette' are growing in a Yolo loam was selected in Winters, CA for experimentation in 1985. Only 'Chico' was cropping in 1985. Two orchard rows containing one hundred 'Chico' trees on J. hindsii seedling rootstocks were measured, harvested, and processed individually to obtain production data for each tree. Tree sizes were estimated on the basis of trunk cross-sectional area (TCA), and cropping efficiencies (yield/TCA) were calculated for each tree. Large differences among trees were evident in tree size, tree yield and cropping efficiency. These data are being analyzed statistically to determine a) the total level of variability which exists among the 100 trees and b) the relative significance of the rootstock (genetics) vs the environmental component - orchard site heterogeneity (due to soil, water, etc.) with respect to the total variability among trees within the test plot.

The same trees will be harvested in 1986 (and 1987) to determine whether the differences noted in 1985 persist or are overwhelmed by the level of variation which occurs between seasons. This study will be expanded in 1986 and over the next several years (see proposal).

OBJECTIVES

Assess the variability in growth and productivity among 100 'Chico' trees supported by J. hindsii seedling rootstocks. Harvest trees individually and use appropriate statistical procedures to distinguish the genetic component, i.e. rootstock-dependent variation, from the residual variation due presumably to orchard site heterogeneity (soil, water, etc.).

PROCEDURES

Identify a uniform orchard in which representative lateral - and terminal bearing cultivars are grown. The entire plot should be established in a single orchard to minimize the variability in tree growth and productivity associated with soil type, environment, and management practices. The experimental design involves the use of 10, 10-5433 blocks to enable us to distinguish statistically between environmental (orchard site) from genetic (rootstock-dependent) variation in tree size and productivity. Trees will be measured, harvested, and processed individually. These same trees will be monitored for 3-4 years depending upon level of year-to-year variation.
RESULTS AND CONCLUSIONS

The range in tree yields, tree size and cropping efficiencies among the 100 'Chico'/J. hindsii trees tested in 1985 are presented in the table. The data collected this year are being analyzed statistically to estimate how much of the variability measured is strictly due to the genetic component i.e., the variability imparted to the tree by the heterogeneity among seedling rootstocks and how much is due to environmental variable.
Range in Tree Size and Productivity Among 100 6 Year Old 'Chico'/ *J.* hindsii Seedling Trees in 1985

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield (lbs)/Tree</td>
<td>14 - 60</td>
<td>329%</td>
</tr>
<tr>
<td>1 Tree Size (cm²)</td>
<td>132.6 - 262.4</td>
<td>98%</td>
</tr>
<tr>
<td>2 Cropping Efficiency (lbs/cm²)</td>
<td>0.10 - 0.27</td>
<td>170%</td>
</tr>
</tbody>
</table>

1 As estimated by trunk cross-sectional area.

2 Calculated as yield (lbs)/trunk cross-sectional area (cm²).