Cooperative Forest Genetics Research Program
Research Project Summary

Number: P-14  
Keys: QG  
Title: Optimal analytical methods for unbalanced half-diallel tests.  
Initiated: 1989

Contact: D. Huber  
Cooperators: CFGRP  
Locations: UF Computer Labs

Objectives:
The goal is to determine optimum statistical methods for analyzing half-diallel experiments that are unbalanced in any way. Specific objectives are: 1) to examine the methods, assumptions, and problems associated with estimating GCAs and SCAs as fixed effects, 2) to investigate the precision of variance component estimates from balanced diallels compared to other mating designs, 3) to determine which analytical methods are best for estimating variance components for unbalanced half-diallels, and 4) to develop a computer program to conduct the most appropriate analyses.

Applications:
Half-diallels are widely used throughout the world in tree improvement programs; the CFGRP has over 100 such tests. Precise variance component estimates are needed from these tests to plan strategies and predict parental breeding values through best linear prediction. When trees are missing (as always), optimal methods are unknown.

Materials and Methods:
This study employs computer-simulated data; no field data are used. For objective 2, balanced half-diallels are compared to circular and polymix mating designs to examine the precision of estimates of h², etc. for varying numbers of crosses. For objective 3, data representing a range of possible conditions in field tests are simulated. Different types of unbalance (variable survival and variable numbers of missing crosses) are simulated for a range of genetic conditions.

For each type of mating design or unbalance, variance components (and h², etc.) are estimated for 100 data sets representative of that type. The 100 estimates are then averaged and a variance calculated to assess accuracy and precision of each estimate. For unbalanced data sets the following methods are compared: SAS I and II, MIVQUE, MLE, & REML.

Schedule of Activities:

<table>
<thead>
<tr>
<th>Year</th>
<th>Activities</th>
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<tbody>
<tr>
<td>1989</td>
<td>Design project and write study plan.</td>
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<tr>
<td>1990</td>
<td>Complete objective 1: Analysis of for estimating GCAs and SCAs.</td>
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<tr>
<td>1992</td>
<td>Complete objective 4: Write computer program.</td>
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