

Male Genotype Influences Seed Set and Seed Size in Controlled Crosses of American Chestnut (*Castanea dentata* [Marsh] Borhk)

Lisa Worthen¹ and Keith Woeste²

¹Department of Forestry and Natural Resources, Purdue University, West Lafayette, Indiana, 47907, ²USDA Forest Service, Hardwood Tree Improvement and Regeneration Center, Northern Research Station, Purdue University, West Lafayette, Indiana, 47907

Five American chestnut trees (*Castanea dentata* [Marsh] Borhk) located in Indiana were used as mother trees in a full diallel breeding design in order to determine the influence of pollen donor genotype on seed set and seed mass. Pollen from ten American chestnut or American chestnut hybrids was applied to the five mother trees. The seeds were harvested, counted, and individually weighed. A random effects model fit to the data showed that both female ($F = 18.10$, $p < .001$) and female by male cross ($F = 1.54$, $p = 0.0445$) contributed significantly to the variance in seed mass. Similarly, both female and female by male cross accounted for significant variation in seed set ($F = 10.98$, $p < .001$ and $F = 1.67$, $p = 0.0205$, respectively). A general association test showed male genotype and seed set to be statistically associated ($\chi^2 = 26.97$, $p = 0.0014$). A variance components model fitted to the data showed that individual female by male crosses explained 28.3% and 15.8% of the variation in seed mass and seed set, respectively. Individual crosses differed significantly in the amount of variation they explained, from 0% to 61.5% of variation in seed mass and from 0% to 67.6% of variation in seed set. These results demonstrate the influence of male genotype on seed mass and seed set and are the first to show differential male and female by male performance on seed characters of American chestnut. The seed from this experiment are currently being germinated to assess seedling vigor. The results will be combined with the results of the study above to present a fuller picture of the influence pollen donor genotype on seed and seedling characters in American chestnut.