Testing Leaf Inoculation as a Blight Resistance Screening Method for Advanced Backcross Chestnuts

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**Introduction**

- A detached leaf assay (Newhouse et al. 2014) could allow earlier screening of blight resistance than the standard stem inoculation technique
  - Would allow very susceptible trees to be discarded in the first year
- Due to segregation of blight resistance alleles, B3F2 trees should vary widely in blight resistance
  - The technique was originally tested on pure species (C. mollissima, C. dentata, C. pumila)
- Indiana’s state chapter recently began stem inoculations on two large plantings of B3F2 chestnuts
- Leaf inoculations were performed on a subsample of these trees

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**Methods**

- 100 B3F2 from the SIPAC site (southern IN), 100 B3F2 from the Potawatomi (POW) site (northern IN) 6 B3F1, 7 C. mollissima, and 5 C. dentata were screened using the detached leaf assay using Cryphonectria parasitica strain Sg88 as inoculant
- Inoculations began in early July 2014 and ended in early August
  - 4-8 leaves inoculated per individual (10-15 for pure species controls)
- Leaf lesion length and width measured after 5-7 days
  - 61 individuals at SIPAC received stem inoculations in June 2013
  - 78 individuals at SIPAC received stem inoculations in June 2014
- Variation in resistance according to stem inoculation too low at POW to be useful for assessing correspondence with leaf assay results

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**Results**

- The leaf inoculation measurements were able to discriminate between pure species, as expected (Figure 4)
- Strong differences in resistance and leaf lesion size between northern and southern Indiana plantings (Figure 3)
- Significant (95% CI) differences in leaf lesion size among B3F2 individuals
- Leaf lesion size was poorly associated with current-year stem canker size and 1-year canker resistance rating in the SIPAC population of B3F2 trees (Figure 5, 6)

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**Ongoing Work**

- Using leaf lesion area for greater discriminatory power
- Genetic mapping of stem and leaf lesion traits in Indiana breeding population

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**Figure 1.** Map of American chestnut native range showing location of two B3F2 trials used in this study. SIPAC = Southern Indiana Purdue Agriculture Center; POW = Potawatomi Wildlife Park. Image source USFS.

**Figure 2.** Clockwise from top left: leaf lesions on Castanea mollissima, C. dentata, a third-backcross tree, and a BC3F2 individual. Photos by N. LaBonte.

**Figure 3.** Histogram of individual leaf lesion lengths at POW and SIPAC with means of pure species and B3 chestnut for comparison.

**Figure 4.** Mean leaf lesion length and width for different experimental groups of chestnuts, with 95% confidence interval for the estimate of the mean. CD= Castanea dentata, CM= Castanea mollissima.

**Figure 5.** Estimates of the mean and 95% CI for leaf lesion lengths and widths in SIPAC B3F2 chestnuts grouped by canker severity class (1=least severe, 5=most severe) scored 1 year after inoculation.

**Figure 6.** Current year stem canker length and width (scored in August after June inoculation) for B3F2 chestnuts at SIPAC plotted against leaf lesion length (left) and width (right).

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**Works Cited**