Reviving a threatened species: Screening for *P. cinnamomi* resistance in Chestnut crosses

University of Missouri Center of Agroforestry

Elias Bunting



Background Information



Mcconnell, M. & Balci, Y.. (2014). Plant Disease / March 2014 319 Phytophthora cinnamomi as a Contributor to White Oak Decline in Mid-Atlantic United States Forests. Plant Disease. 98. 319-327. 10.1094/PDIS-06-13-0649-RE.



- *Phytophthora cinnamomi* is a serious and wideranging fungal pathogen that causes
 Phytophthora root rot (PRR).
- At the turn of the century, chestnuts were the most common tree in eastern American forests.
 Fungal diseases like PRR almost wiped them out.
- European chestnut (*C. mollissima*) has been
 observed to have PRR resistance whereas
 American chestnut (*C. Dentata*) does not.
- Gains in the accessibility of genotyping plant tissue lends itself to investigating quantitative trait loci for resistance.

Research Objectives

- This study will screen for heritable traits to incorporate into interspecific crosses, adding high quality data to restoration efforts.
- Expand the genetic base of *P. cinnamomi* resistant chestnut germplasm.
- Aid in the recovery effort of American chestnut in eastern forests.
- The data will help to guide breeding improvement.



Methodology

- Screening the *C. mollissima* germplasm will broaden the genetic resources for horticulturalists and identify the trait loci of the resistance.
- Families were cross pollinated by hand, yielding 595 germinated plants.
- The populations will be genotyped as biparental mapping populations.
- Inoculated using a V8 broth medium with *P. cinnamomi* isolates and observed for 100 days for symptoms of decline and mortality.

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Mother	<u>Father</u>	Seed count	Healthy trees	Stunted trees
Miller	ss44	52	32	5
Au Super	ss44	148	22	13
Luvell's Monster	ss44	126	88	3
Szego	ss44	220	140	7
Eaton	ss44	106	39	35
Sleeping giant	ss44	64	31	10
Jersey Jim	ss44	< 50	6	2
Dunston	ss44	< 50	2	4
Jenny	ss44	< 50	0	2
Khor	ss44	< 50	1	0
Hong Kong	ss44	< 50	1	4
Plot 316-150	ss44	< 50	0	8
Quing	ss44	< 50	1	0
American	ss44	< 50	84	57

Fall Objectives

- The roots of dead plantlets will be washed and rated for infection Ο severity.
- The lesions on roots will be measured using a caliper, visual length Ο along the root, and evaluated against a 1 to 6 scale of severity.
- Surviving plants analyzed non-destructively and transplanted to new pots for evaluation of vegetative growth during the Ο subsequent growing season.

Disease severity rating (DSR)	Description		X	
0	Healthy roots with no visible lesions		A MERICA	MAX-
1	Minor lateral root rot with less than 10% of lateral root tips necrotic	1	The second	/ MAR
2	Moderate lateral root rot with 10-50% of lateral root tips necrotic or tip of tap root slightly rotted or both			
3	Severe lateral root rot with greater than 50% of lateral root tips necrotic or 5-30% of the tap root rotten from tip or both	1. 1	4	
4	Severe tap root rot with greater than 30% of the tap root necrotic but with some healthy lateral roots above lesions	Lesions on tap roots	Lesions on feeder roots	
5	Tap and lateral roots completely rotted or plant dead	Dead plants (class 2)	(class1)	No lesions, healthy plants
een, B "Microbial Ecolo iological Suppression of f	gy of Phytophthora cinnamomi Suppressive Soils: A Study of P. cinnamomi in Sub-Tropical Avocado Orchards on the East Coast	(class3) C. dentata	6 7	(class 0) C. mollissima

of Australia." (2006).

Discussion

- This project adds to a growing body of fascinating research that can improve our valuable trees.
- For further questions contact Dr. Ronald
 Revord (PI) at r.revord@missouri.edu or I at
 ejbqzc@umsystem.edu