PENNSYLVANIA CHAPTER OF THE AMERICAN CHESTNUT FOUNDATION (PA-TACF)

BREEDING UPDATES FOR 2005 PA-TACF SCIENCE COMMITTEE MEETING

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December 19, 2005

A. Status of Breeding Manual

The breeding manual will not be completed by the end of 2005 as hoped. Various portions have been complete for on-line reading (Pollination, Harvesting, Planting and Growing), but those documents have not been edited for proper print-publication. Work for that will resume in early 2006. The hope for publication will be February 2006 so that distribution to growers may occur at the 2006 Spring Growers' Meeting in Hershey, PA.

B. PA-TACF Planting Activities

The Chapter established orchards with several new cooperators in 2005. Table V shows a breakdown of the Chapter's plantings activities through the 2005 planting season. Almost 4000 chestnuts were planted as part of our breeding efforts. About half of the plantings were established as part of the TACF Regional Adaptability Program.

Of particular note is our new relationship with The Nature Conservancy on their West Branch Wilderness property in central Pennsylvania. At last update (mid-August), germination at the site was about 60% and growth of the trees averaged 2.5 feet. Further reports for this past year's planting efforts are still being compiled and are expected to be completed by February 2006 (growers routinely give final survival and height reports through the dormant season). Overall survival and growth for all PA-TACF orchards through the 2005 growing season will be reported in the spring, most likely at the Spring Growers' Meeting in Hershey, PA.

C. PA-TACF Inoculation Activities

					Number of Individuals per Rating Class								
Family	# Planted	# Inoculated	# Selected	% Selected	1	1.5	2	2.5	3	3.5	4	4.5	5
CH271	86	84	17	20%		2	2	1	13	22	28	14	2
CH283	16	13	2	13%				1	1	4	3	2	2
CH526	26	24	4	15%					2	3	11	2	6
CH726	131	111	18	14%			1	2	8	21	43	21	15
TOTALS	259	232	41	16%		2	3	4	24	50	85	39	25

Table I. Individuals per Resistance Rating Class at PSU Arboretum. Preliminary ratings, 11/18/2005

The Pennsylvania Chapter did not inoculate a large amount of trees in the summer of 2005. The most prominent development for the chapter was the opportunity to inoculate its first batch of BC3F2 material. That material

represented the first lines planted at the Penn State University Arboretum. Having been planted in 2002, these lines all were produced at the TACF Meadowview Research Facilities.. In early November, canker measurements and ratings were taken in order to determine resistance classes among the families inoculated; a summary of those ratings may be found in Table 1.

Percentages	MV_1	PA_1	MV_2	PA_2	MV_3	PA_3	MV_4	PA_4	MV_5	PA_5
CH271	7	2	10	4	31	42	31	50	22	2
CH283	7	0	7	8	29	38	34	38	22	15
CH526	0	0	3	0	33	21	39	54	25	25
CH726	0	0	4	3	18	26	43	58	34	14
TOTALS	3	1	6	3	25	32	39	53	28	11

Table II. Comparison of 2004 Meadowview ratings (MV_) and 2005 Arboretum ratings (PA_) *by Percentage of Individuals per Rating Class*

Table II shows a breakdown of comparison within rating classes between the same BC3F2 families selected at TACF's Meadowview Research Farms (2004 final ratings) and those rated at the PSU Arboretum (preliminary selections, November 2005). Canker measurement data are still being analyzed and may be useful for further selection. Those trees that did not pass preliminary selection at the PSU Arboretum were removed on November 18, 2005.

We also inoculated at a Clapper BC3 orchard that was established in the year 2000, one that is referred to as the Riegelsville orchard. The results of the preliminary canker ratings may be found below in Table III. From these initial ratings, it appears as the the Chapter will have some appropriately resistant BC3 material to breed new lines of BC3F2s in the summer of 2006. The production of that material depends, of course, upon the proper flowering of those individuals (See Section C).

			RATING (preliminary 11/11/2005)												
Cross Type	**Tree Type**	**Cross**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**	**5**	**NI**	**Grand Total**	**Planted**	**Survival % (6/4/05)**
Am x opAm	American	RcSo-14 x opAm						1	1			3	5	6	50%
Ch x opCh	Chinese	CDMv x opCh				1						3	4	4	75%
Ch x opCh	Chinese	GM72-9 x opCh		1	2							2	5	5	60%
Ch x Am	F1	KWDa x GsSc-1										6	6	6	50%
Ch x Am	F1	LeNo x TeYo			1							2	3	5	20%
Ch x Am	F1	NWDa x GsSc-1					1	1				5	7	7	43%
Am x B2	BC3	CCCf x WV419				5	11	5	5	1	1	19	47	56	66%
Am x B2	BC3**	DrCn-2 x BE325					5	14	17	8	3	44	91	95	59%

** Potentially contaminated lot. Control seed were found in control bag.
Table III. Preliminary Ratings from inoculated trees at Riegelsville orchard. Inoculated June 4, 2005. Ratings November 11, 2005.

Also, the one remaining survivor from a 1994 planting of Douglas source BC1 trees at Tuscarora State Park in Barnesville, PA was inoculated in June of 2005. That tree has so far exhibited above average resistant for a backcross tree. PA-TACF volunteer Joe

Lankalis has taken over management of that orchard and for the past two years has been breeding BC2 progeny on that tree. His efforts will continue next year.

TABLE IV. PA-TACF Orchards to be inoculated in 2006

Year Planted	Age	Resistance	Orchard	Comments why waited past 5 years to Inoc
1997	9	Clapper	Longwood Gardens	Poor soil conditions; Moved
1997	9	Clapper	Longwood Gardens	Poor soil conditions; Moved
1999	7	Clapper	Beech Creek	Climate; soil conditions
1999	7	Clapper	Longwood Gardens	Soil conditions
2000	6	Clapper	Brogue	Deer browse
2000	6	Clapper	Codorus	Wanted more growth.
2000	6	Clapper	Kuhns	Herbicide damage, 5x5 spacing, no fertilization *** Ice storm damage??
2000	6	Clapper	Ober	Climate, little fertilization
2000	6	Clapper	Red Clay	Tubes, no fertilization
2000	6	Clapper	Thorpewood	Soil conditions (too basic)
1999	8	Graves	Moshannon	Climate, tubes
1995	11	Douglas	Allegheny Nat Forest	No previous working plan for orchard

Many of the more recently established orchards are about 2 years behind their scheduled time for inoculation. In most cases, this has to do with lack of fertilization or poor soil conditions. Deer control problems have hindered the growth at at least two locations planted previous to the year 2000. Table IV shows a listing of PA-TACF orchards that should be inoculated in 2006. Further analysis of these plans will take place in the spring to determine final scheduling of the inoculation events.

D. PA-TACF Pollination and Harvest Activities

In general, our pollination season went fine. Harvests were generally disappointing (Table VII). We've finally had major pollinations take place in the northern tier and western parts of the state. F1 production is on track, and we should have new F1 orchards in at least 5 formerly un-represented counties, including Berks, Mercer, Beaver, Perry, and Philadelphia. Having reached into these new areas, the hope for next year's pollinations is to further expand into other under-represented counties in, especially, the northern tier and western areas of the state.

From most reports during the 2005 TACF Annual Meeting in Lexington, KY, it appears as though many chapters' harvests were less than stellar. Many controlled pollinations seem to have failed due to poor rainfall in many areas of the eastern US.

Other points of interest are that are our best selections from the 2004 crop of inoculations did not flower this year. This is continuing the trend of our past inoculated orchards. Such a delay in flowering is setting back our timing for planting new BC3F2 lines in the Arboretum at Penn State. The new BC3F2 line pollination attempted failed (GR97 x AB185), most likely because pollen was held up due to a shipping error, and which caused pollen to sit in the Hummelstown post office for a couple of days.

TACF Staff Pathologist Dr. Fred Hebard at Meadowview recommends increasing amounts of phosphorous onto backcross orchards in order to induce earlier flowering. One of our 2000 Clapper B3 orchards that is to be inoculated in the summer of 2006, the Codorus State Park orchard, has heeded that advice and applied large amounts of phosphorous to the backcross trees this summer.

E. PA-TACF Schedule 2006 Plantings

Resistance	Seed Type	Farm Name	County
Clapper	BC3/BC4	Blooming Grove Hunt Club	Pike
Clapper/Graves	BC3F2	Rutgers Hort	Middlesex (NJ)
CMS	F1	Hartlieb	Berks
CMS	F1	Schuylkill Center	Philadelphia
CMS	F1	Sewickley Heights	Allegheny
CMS	F1	Longacre	Perry
CMS	F1	Beagle Club	Mercer

Table V. New orchards to be established in 2006 as part of PA-TACF's breeding efforts.

Several new plantings will be established as part of PA-TACF's breeding efforts in 2006. Those orchards of particular not e may be found in Table V.

Other seed will be used either as replacement seed in orchards established in 2005 or will be used toward various experimental orchards. Of particular note will be up to two Chinese chestnut orchards that will be established as part of Dr. John Carlson's efforts to quantify resistance of Chinese chestnuts at the molecular level. Trees will be grown for approximately 3 years, inoculated, measured/rated, and then rogued.

PA-TACF also has a new cooperator, Derek Pritts of Lancaster Co., keenly interested in the propagation of Large-Surviving Americans (LSA's) and "timber-type hybrids". Having procured stock of the latter type from Greg Miller in Ohio, the grower has expressed an interest to participate in TACF's F^3 Timber Type Program.

F. Update Regarding TACF's National Science Foundation Grant Proposal

TACF is seeking substantial funding for many programs both within the organization and with cooperating members such as SUNY-ESF (bioengineering). As part of the more than $2 million proposal to NSF, PA-TACF may procure approximately $6500 over the next 4 years to collect and/or grow germplasm toward efforts to 1) isolate resistance genes in the Graves source of resistance (whose Chinese parent is the none variety Mahogany) and 2) map resistance genes in bulked populations of various sources of Chinese resistance using large numbers of BC1 progeny from the Chapter's CMS program.

Originally, the Chapter was called upon to deliver 10,000 trees as part of objective 2 above. During discussions prior to application for the grant, that number was decreased to 1,000. PA-TACF's participation in these objectives will not detract from its long-term breeding goals.

Final notification for grant approval should be received by April 2006.

Table VI. Seed/Seedlings planted in 2005 as part of PA-TACFs breeding efforts.

Orchard Type	Resistance	County	Name	Amount	Comments
BC3F2	Clapper	Center	Arboretum	576	Great germination and growth.
BC3F2	Clapper	Northumberland	Carbaugh	431	Great germination and growth.
BC3F2	Clapper	Somerset	Reels Corner	293	interplanted amongst B3s
BC3F2	Clapper	Center	Greenhouse	450	microinoculation experiments; had significant spider mite problems. Will retry next year.
BC3	Graves	Clinton	TNC/West Branch	236	Planting with The Nature Conservancy
BC3	Graves	Schuylkill	Pine Grove	206	
BC3	Graves		still in greenhouse	40	use as replants in TNC/Pine Grove; lost 75% to mites.
BC3	Clapper	Jefferson	Smith	364	
BC3	Clapper/Graves	Snyder	Middleburg		Chandis' experiments; forest plantings
BC2	Douglas	Schuylkill	Tuscarora State Park	12	Stock from Douglas B1; resurrected planting.
BC2	Douglas	Mercer	Hissom	35	
BC2	Douglas	Bucks	Heritage Conservancy		
F1	Various	Perry	Longacre	40	old American planting; new to F1 plantings
F1	Various	McKean	Kane	24	replants
F1	Various	Cumberland	Tumblin	141	Some transplantation problems; will replant in 2006.
F1	Various	Morris, NJ	Schooley's Mountain	80	water problems? Seedlings for Carlson
F1	Various	Morris, NJ	Camp Mack	58	
F1	Various	Lancaster	Reed Run	117	replanting
F1	Various	Schuylkill	Air Products	54	no survival report; to visit on way to CT in November.
F1	Various	Bucks	Pennsbury HS	96	seedlings; to plant next year; Bucks/Somerset material
F1	Various	Forest	Campbell	35	Replants
F1	Various	Lancaster	Camp Mack	58	Replants
F1	Various	Adams	Yohe	46	Replants
BC1	Leffel North	Centre	Penn Nursery	205	????
American		Tioga	Montague	63	Replanting
American		Mercer, NJ	Mercer	35	Don't think this one got off the ground :(
American		Centre	Stone Valley/XSP	80	LSA cross for Carlson. 50% germination. Some in greenhouse; most destroyed by spider mites.
American		Chester	WestTown	40	Replants --- some good LSA crosses. Great care!
			Totals	3815	

Table VII. PA-TACF Pollinations and Harvest counts during the 2005 Season

County	Type	Meadowview Line	Bags Pollinated	Final Harvest	Comments
Dauphin	Clapper B3F2	GR97, AB185	52	0	Pollen bad??? AB185 from RC; PO prob's
Northumberland	Clapper B3F2	CL287, GR210	117	35	Always have had poor seed sets here
Somerset	Clapper B3F2	CL287, GR210	78	226	
York	Clapper B3F2	CL287, GR210	100	N/A	Much contamination of seed lots
Dauphin	Clapper/Graves B3F2	CL287,GR210||GR137	100	100	
Pike	Clapper BC	GL104	55	126	To be planted at Blooming Grove/ new B3
Pike	Clapper BC	CH34	63	56	To be planted at Blooming Grove/ new B3
Tioga	Clapper BC	GL367	100	Bagging too late	Will use for distribution as American seed
Warren	Clapper BC	CH271	63	17	Pollen bad?? Had reports of poor set in South with same pollen.
	Clapper BC totals			**199**	
Beaver	Graves BC	BG125	45	75	
Somerset	Graves BC	TM616	46	265	Will use for replacements in 2005 orchards
	GRAVES BC total			**75**	
Mercer	Douglas B2	Douglas1A	36	10	Will start a Douglas B2 orchard, potentially with new TNC cooperator.
Perry	Douglas B2	Douglas1A	84	184	
Schuylkill	Douglas B2	Douglas1A	N/A	N/A	Planted at Tuscarora State Park orchard
	Douglas B2 totals			**194**	
NEW JERSEY	F1	N/A	18	10	Will probably go to Mount Paul orchard.
Beaver	F1	N/A	45	93	1. Some to Sewickley Heights (resurrected American planting in Allegheny Co.) 2. Will find home for rest, hopefully in Beaver or Armstrong Co's.
Bucks	F1	N/A	26	9	To Hartlieb orchard (Berks)
Center	F1	N/A	34	10	Checks
Dauphin	F1	N/A	38	100	Great Chinese line; will be used at various CMS F1 orchards
Lycoming	F1	N/A	9	10	Checks
Mercer	F1	N/A	10	20	Should go to Beagle Club orchard (Mercer)
Montgomery	F1	N/A	42	60	1. Should all go to Schuylkill Center orchard (Philadelphia). 2. Some may go to Hartlieb orchard (Berks)
Delaware	F1	N/A	0	100	1. Some to Schuylkill Center orchard. 2. Some to Hartlieb orchard
Perry	F1	N/A	45	17	To Longacre American orchard, Perry Co.
Snyder	F1	N/A	8	17	Great Chinese line; Chandis decides

County	Type	Meadowview Line	Bags Pollinated	Final Harvest	Comments
Tioga	F1	N/A	50	Bagging too late	Will try again next year; did get Am. Seed
Warren	F1	N/A	6	5	May go to Campbell in Forest Co.
	F1 totals			**442**	
York	B1	N/A	N/A	N/A	
Perry	Nanking B2	KY89-110	32	0	Nankings at Reineman about dead
Various	op American	N/A	0	10,500	
Various	Chinese	N/A	1500	1500	Checks and Carlson plantings
		TOTALS	**1302**	**14,455**	