



Northern NY Agricultural Development Program 2004 Project Report

Forage Soybean Breeding Nursery and Advanced Line Evaluations

Project Leader(s):

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Background:

A Pennsylvania study indicated that soybean production and feeding on farms that feature high corn silage rations would show an economic benefit up to \$100/cow (Roltz et al., 2001). Across NYS growers are annually harvesting in excess of 100,000 acres of soybeans. Soybean production continues to expand in northern New York, especially in Jefferson and St. Lawrence counties. There is a significant acreage of land in northern NY potentially suited to growing soybeans, and with the increasing interest in biodiesel the actual soybean acreage could expand greatly. As northern NY producers become more comfortable with soybean management, the potential for production of soybeans for alternative uses also will increase. There is increased interest in growing soybeans for forage on Northern NY dairy farms. With the banning of meat and bone meal as a source of protein in ruminant diets in the European Union, the demand for high protein crops for ruminants has increased there. The demand for high protein forage crops is likely to increase in the USA as well. Soybeans historically functioned as a forage crop, and on farms that have difficulty maintaining alfalfa stands, soybeans grown for forage may provide a viable alternative. Forage soybeans are spring-seeded annuals that are not subject to winter killing, as with other forage legumes.

Objective:

To support efforts to develop forage-type soybean varieties that are well adapted to Northern New York growing conditions by evaluating advanced breeding lines in a replicated field trial.

Methods:

Seventeen advanced breeding lines and two named varieties were obtained from Dr. Devine's forage soybean breeding program, and trialed in the Cornell research plots at the W.H. Miner Institute in Chazy, NY. A randomized complete block experimental design with three replications was employed. Plots were located on a Roundabout silt loam soil with tile drainage. 200 lbs/acre 6-24-24 was broadcast applied and incorporated with a spring-tooth harrow prior to planting. Broadstrike+Dual herbicide was also pre-plant applied.

Four-row plots were planted with 30" row spacing on June 3, 2003. Plots were scored for leaf type, coloration, lodging, disease occurrence, and stage of development prior to harvest on September 22, 2003. A single 16.5' long row was hand harvested from each plot, weighed, and then dried for yield and dry matter determinations. An additional three plants per plot were sampled for quality analysis.

Results and Discussion:

Dry matter yields ranged from 3.23 tons/acre to 4.64 tons/acre with a trial mean of 4.02 tons/acre. Several of the entries, including the named variety Donegal, had significant lodging problems (Table 1). Late maturing soybean lines often exhibit a vine-like growth habit that can result in a thick, tangled crop canopy at harvest (Figure 1). While tangled, lodged plots look like a mess and are difficult to hand harvest, they frequently yield well. The four top lines in the 2003 yield ranking all had relatively high lodging scores (Table 1) suggesting that a vine-like growth habit and the resulting tangled crop canopy may maximize the use of available light resources over the course of the growing season. Thick tangled crop canopies could potentially experience increased incidence of white mold, but no significant mold problems were observed in the 2003 trial.

R6 (full seed) is generally considered to be the ideal stage of development for harvesting soybeans for forage because it optimizes both yield and quality parameters. Crude protein levels increase as the pods fill, so harvesting prior to R6 may forfeit some crude protein as well as some dry matter accumulation. None of the lines in the 2003 trial reached R6 prior to harvest. Plots were harvested on 9/22/03 ahead of a forecast killing frost. Twelve of the lines were R5 at harvest while the remaining seven lines were much less mature at R2. Lines that were R5 at harvest had higher dry matter percentages (mean=24.2%DM) than lines at the R2 stage (mean=22.3%DM). Maturity stage at harvest did not noticeably influence crude protein levels or fiber content (Table 1). Trial mean percent crude protein was 17.0, and mean percent NDF was 46.4. The fact that none of the 2003 entries reached the ideal harvest stage before frost suggests that earlier

maturing forage type soybean lines may be more suitable for northern NY growing conditions.

Table 1. Results of 2003 Forage Soybean Advanced Line Evaluations.

Line	R stage at harvest	DM (T/A)	Height (cm)	Lodging Score (1-10)	% DM	% CP	%NDF
XB-32	5	4.64	155	5	23.3	15.7	46.5
97PA34-4	2	4.48	176	4.5	22.3	16	47.3
Donegal	5	4.44	188	5.5	25.3	15	42.7
97NYCZ-13	5	4.37	192	3.5	24.7	18.3	48.4
7P116	2	4.29	155	1	22.3	17.7	47.9
97NY-21	5	4.23	156	4	22.7	17.3	46.5
7-0PA-7-1	5	4.22	152	2	26	17.5	45.3
97NYCZ-29-1	5	4.2	149	4	25	16.9	47.2
97NY-14	5	4.04	188	3	24	17.7	45.5
Tara (97VA20)	5	3.98	174	3.5	24.7	16.4	49.1
98PA29-1	2	3.98	152	4.5	20.7	14.3	45.8
97NYCZ-12	5	3.95	192	4	23	17.3	47
8GH85-2	2	3.95	174	2.5	22.7	17.9	43.9
8GH-81-1-1PL	2	3.81	182	3	23.3	16.3	47.6
97NY-10	5	3.75	145	1.5	25.7	18.4	44.7
8GH-110-1-1PL	2	3.62	148	2.5	22.7	18.8	42.4
97NY-5	5	3.6	148	3.5	23.3	18	48.7
97PA34-5	2	3.53	174	4	22.3	17.4	47.5
97VA80	5	3.23	180	4.5	23	16.2	48.3

Figure 1. Donegal exhibited a vine-like growth habit in the 2003 forage soybean trial in Chazy, NY. (Photo by Delvin Meseck)



Outreach:

Updates on any new variety releases and the performance of forage soybeans as a forage crop will be included in regional extension publications and meetings, and during educational tours of the Cornell research plots and Miner Institute.

Acknowledgments:

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Literature cited:

Rotz, C.A., G.W. Roth, K.J. Soder, and R.R. Schnabel. 2001 Economic and environmental implications of soybean production and use on Pennsylvania dairy farms. *Agron. J.* 93:418-428.

Northern New York Agricultural Development Program:

The Northern New York Agricultural Development Program provided funding for this crop production research project. The Northern New York Agricultural Development Program is a farmer-driven research and education program specific to New York state's six northernmost counties: Jefferson, Lewis, St. Lawrence, Franklin, Clinton and Essex.

Thirty-three farmers serve on the Program board led by Co-Chairs Jon Greenwood of Canton (315-386-3231) and Joe Giroux of Plattsburgh (518) 563-7523. For more information, contact Jon, Joe or R. David Smith at 607-255-7286 or visit www.nnyagdev.org # # #