Northern NY Agricultural Development Program
2015 Project Report

Assessment of Plant Tissue Nutrient Levels in Soybean in Northern New York

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Cooperating Producers:
Jefferson County: CobbCrest Farm, Deer Run Dairy, Dodge Farms, Fairlawn Farms, Dennis Forrester, Nathan Gerber, Gracey Stoney Acres, Stuart Haggerty, Hayes Farm, Ives Farm, Lucki 7 Ranch, Morning Star Farm, Dale Morse, Murrock Farm, Plessis Farm, Reedhaven Farm, Robbins Family Grain, Jeff Rudd, Windsong Farm, H. Wood and Sons
Lewis County: Ernie Beyer, Rob Domagala, Markham Farms, Mike Nemeth, Jeff Sullivan, Nathan Yousey
St. Lawrence County: Steve Carr, Dave Lowery, Dave Stout

Background: In the past, soybeans have often times been overlooked as a significant crop of importance in NNY but they shows great economic promise and the acreage in the region is more recently expanding rapidly. Glyphosate tolerant soybeans represent the vast majority of soybeans grown in the region and glyphosate is by far the most common post emergent herbicide applied to soybeans in New York State. It has been reported that glyphosate applications to glyphosate tolerant soybeans can decrease manganese availability to the plant. As a result, many soybean growers include foliar manganese with glyphosate herbicide applications to reduce the risk of micronutrient deficiencies. The addition of the manganese is, however, made without knowing if manganese and other nutrient deficiencies are really an issue. In addition, soil test results suggest that manganese deficiencies are unlikely in the northern NY region. No systematic assessment of the micronutrient status of soybeans has been done in NNY.

Methods: Soybean leaf samples were collected from 39 soybean fields in Jefferson, Lewis and St. Lawrence Counties. The top fully developed trifoliate at the time of first flowering was the timing of the sample collections. This represents the time of the maximum rate of growth of the soybean plant, as well as the greatest extent of the root system, but is prior to the movement of nutrients from the leaves into developing seeds. Samples for plant analysis were taken from at least 20 plants, distributed throughout the area chosen for sampling. The samples were shipped to the Analytical Laboratory and Maine Soil Testing Service, Orono, Maine. The plant tissue samples were analyzed for manganese, phosphorus, potassium, calcium, magnesium, boron, iron and zinc.

Results: The main purpose of this project was to determine if soybean leaf tissue concentrations of manganese were commonly found to be below the critical concentration levels suggested by other land grant universities. Our current set of 39 plant tissue sample results show that the manganese levels were between 20.9 and 91.7 ppm; all within the accepted manganese sufficiency range of 17-100 ppm. Primary, secondary or micronutrient leaf tissue levels were all within the accepted critical concentration ranges. See Table 1.

Table 1. Nutrient Levels in 29 Field Samples Collected in NNY, 2015.

ID	Ca	K	Mg	P	B	Fe	Mn	Zn
1	1.15	2.44	0.289	**0.348**	41.5	208	43.1	**26.7**
2	0.885	2.53	0.267	0.448	43	102	59.4	32.3
3	1.49	2.62	0.44	0.416	36.3	126	54.2	45.6
4	0.971	2.76	0.452	0.506	35.9	83.8	43.1	45.9
5	1.04	2.69	0.385	0.525	33.4	78.1	46.5	41.9
6	1.06	2.86	0.353	0.552	36.5	81.8	51.1	42.3
7	0.894	2.93	0.367	0.581	31.8	92.9	40.7	41.7
8	1.08	2.71	0.401	0.353	**21.8**	**71.1**	35.9	35.4
9	1.33	2.68	0.356	0.409	36.2	78.5	66.3	48.9
10	1.31	2.53	0.351	0.574	40.4	90.8	61	52.7
11	1.24	2.97	0.401	0.467	39.7	149	**91.7**	**61.9**
12	1.18	2.31	0.472	0.421	39.4	80.9	51.9	52.4
13	0.93	3	0.306	0.486	29.2	108	56.2	32.8
14	1.03	2.82	0.37	0.42	38.2	89.5	59.5	48.4
15	1.26	2.69	0.379	0.511	41.2	90.5	47.7	48.2
16	0.773	2.73	0.347	0.504	31.2	83.5	25.6	33.3
17	0.864	2.54	0.378	0.494	29.5	86.4	41.6	38.7
18	0.996	2.18	0.383	0.467	36.4	86.2	45.8	45.4
19	0.969	**3.00**	0.441	0.535	28.9	92.3	28.8	45.3
20	0.805	2.66	0.342	0.511	36.1	78.7	22.2	45.4
21	0.918	2.45	0.361	0.429	34.4	108	45.2	41.4
22	1.28	2.41	0.383	0.454	32.5	86.7	40.1	43.1
23	0.807	2.74	0.353	0.533	32	75.3	34.5	35.9

24	0.833	2.85	**0.267**	0.538	33.2	89.4	45.5	33.4
25	1.49	**1.46**	0.308	0.427	37.7	85.5	53.6	36.1
26	0.973	2.68	0.306	0.385	27.1	87.3	89.2	43.5
27	1.04	2.43	0.38	0.48	34.7	104	56.9	32.7
28	1.27	2.35	0.418	0.392	**51.4**	72.7	41.3	58.2
29	**0.765**	2.78	0.388	**0.626**	32.3	137	32.7	38.1
30	0.974	2.3	0.5	0.5	35.3	151	23.4	35.8
31	0.976	2.89	0.4	0.567	34.1	171	28.4	52.9
32	1.2	2.69	0.314	0.516	42.3	139	37.3	42.3
33	1.2	2.57	0.371	0.528	42.4	123	45	57.1
34	1.48	2.7	0.371	0.49	44.5	**224**	43.1	50.7
35	1.02	2.77	0.34	0.485	35.6	126	33.9	48.9
36	0.79	2.91	0.321	0.567	33.4	110	**20.9**	41.2
37	0.951	2.54	0.34	0.518	37.1	109	48.2	38.1
38	1.07	2.63	0.365	0.5	40.5	100	49	39.5
39	**1.63**	1.91	**0.517**	0.543	42.3	111	21	60.5
Min.	**0.765**	**1.46**	**0.267**	**0.348**	**21.80**	**71.10**	**20.90**	**26.70**
Max.	**1.630**	**3.00**	**0.517**	**0.626**	**51.40**	**224.00**	**91.70**	**61.90**
Suff. Range	**.8-1.4**	**1.5-2.25**	**.25-.7**	**.3-.6**	**20-60**	**25-300**	**17-100**	**21-80**

Conclusions/Outcomes/Impacts:

The most common use for plant analysis is to diagnose nutrient related problems with crop growth, either a deficiency or toxicity. The only requirement for this project was that the soybean plants were at the R1 stage (beginning flowering) at the time of leaf sample collection. Considering the fact that soil type, planting date, variety, soil pH, soil test levels, manure and fertilizer applications were not taken into consideration, it was interesting that we found no plant tissue nutrient deficiencies.

This widespread soybean plant tissue testing survey program has begun to help us gain a better understanding of the nutrient status of soybeans grown in NNY with specific focus on manganese and other micronutrients.

Outreach:

Results of the survey are being shared with growers that participated in the project. Results also will be shared with soybean growers and agribusinesses and crop consultants this spring through extension agricultural newsletters.

Next Steps:

Our first year results found that all of the plant tissue samples fell within the accepted nutrient sufficiency ranges for soybeans at early flowering stage. Weather conditions can have an influence on these nutrient values in any given year and warrants additional plant tissue assessments to further build upon our initial sample database.

Acknowledgments: We sincerely appreciate the support from the Northern New York Agricultural Development Program that enabled this project.