What's Cropping Up?

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When, What, and How Deep to Plant Soybeans in New York?

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Many growers in New York plant their corn crop first, followed by the soybean crop. These growers frequently finish soybean planting in June because of weather delays during the latter half of May. A frequently asked question if planting is delayed into June is “when to switch from a Group II to a Group I variety”. Other growers, however, will switch to a late Group II from a late Group I variety, if planting occurs past June 10. A frequently cited reason for the switch to a later variety is “to get higher pod set on the late-planted Group II variety”.

Some growers, however, have had success by planting soybeans before the corn crop in late April, which begs the question, “just how early can we begin to plant soybeans”. Almost all growers will plant soybeans at about a 1-inch depth, regardless of the planting date. We initiated small-plot research at the Aurora Research Farm in 2013 to answer three questions concerning soybean planting: 1) Can soybean be safely planted in mid to late April under NY growing conditions without a yield penalty, 2) should a Group II or Group I variety be selected if the planting date is delayed until mid-June, and 3) does the 1-inch seeding depth fit all planting dates?

We planted a mid-Group II (AG2431) and a late Group I (AG1832) variety on April 19, May 6, May 17, June 1 and June 15 at 1.0, 1.5, 2.0, and 2.5 inch seeding depths in 15-inch rows with a White row crop planter at a rate of 180,000 seeds/acre. We evaluated early plant establishment at the unifoliate (V1) or early 1st trifoliate stage (V2) about 10-35 days after planting, depending upon planting date. Each planting date x variety x seeding depth plot was harvested when moistures were less than 18% (September 27, October 3, and October 15).

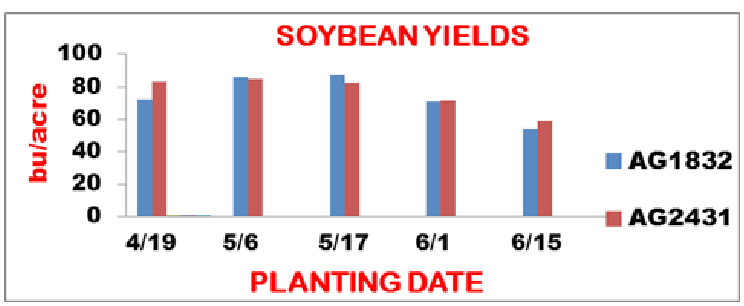

Fig. 1 Yield of a Group I (AG1832) and a Group II (AG2431) soybean variety, averaged across four seeding depths, at five planting dates.

Early plant populations had a significant planting date x seeding depth interaction. Despite the interaction, the 1-inch seeding depth consistently had the highest early plant populations with an average plant establishment of ~135,000 plants/acre (~75% establishment) for the April, early May, and mid-June planting dates and ~145,000 plants/acre (~80% establishment) for the mid-May and June 1 planting dates (Table 1). The interaction occurred because the deeper planting depths had lower plant populations than the 1-inch depth on most but not on all dates (the 2.0 inch planting depth had the same plant establishment on the May 6 and May 17 planting dates and the 2.5-inch depth had the same establishment on the May 17 planting date).

Seed yield had planting date x seeding depth interactions (Table 2). Seed yields were highest at the two May planting dates, May 6 and May 17, which was somewhat earlier than most NY growers plant soybeans. Despite differences in early plant establishment, soybeans yielded the same at all seeding depths on all planting dates, except for the June 15 planting date (Table 2). It is not clear why soybeans yielded so poorly at the deeper seeding depth on the June 15 planting date.

Seed yield had a planting date x variety interaction (Fig. 1). The Group II variety yielded the highest at the April 19 planting date and then again at the June 15 planting date. The Group I and Group II variety yielded the same on the other three planting dates. Interestingly, when averaged across variety and seeding

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depths, the yield for April 19th planted soybeans averaged 77.5 bushels/acre compared with 71.2 for the June 1 and 56.5 bushels/acre for the June 15 planting dates. Evidently, a planting date about 1-month earlier than normal results in ~25% higher yields than planting about 1-month later than normal, at least in a year when moisture stress was not prevalent.

Table 1. Early plant populations of soybean at the unifoliate stage (V1) or early 1st trifoliate leaf stage (V2) at five planting dates and four seeding depths when averaged across two varieties (AG1832 and AG2431).

DEPTH	PLANTING DATE				
	4/19	5/6	5/17	6/1	6/15
inches			plants/acre		
1.0	133,700	136,400	145,500	143,300	134,700
1.5	131,100	121,500	134,800	134,700	123,000
2.0	114,000	130,000	145,400	132,700	127,300
2.5	101,800	123,000	140,100	127,300	110,800
LSD 0.05			6,525†		

† LSD compares seeding depth means within a planting date.

Table 2. Seed yield of soybean at five planting dates and four seeding depths, when averaged across two varieties (AG1832 and AG2431).

DEPTH	PLANTING DATE				
	4/19	5/6	5/17	6/1	6/15
inches			bushels/acre		
1.0	78.7	86.5	83.6	71.9	66.9
1.5	79.3	85.8	86.7	72.9	57.5
2.0	75.3	87.2	82.6	69.0	57.5
2.5	76.8	83.2	82.7	71.1	43.8
LSD 0.05			6.4		

† LSD compares seeding depth means within a planting date.

Conclusion

Both the Group I and Group II variety yielded their highest (and similarly) at the May 6 and May 17 planting dates. The Group II variety incurred no yield reduction when planting on April 19; whereas the Group I variety incurred a ~9% yield reduction. The Group I variety incurred ~18% yield reduction when planting on June 1 and ~38% yield reduction on the June 15 planting date. The Group II variety incurred slightly lower yield reductions on these dates (~14 and 29%, respectively). Consequently, the Group II compared to Group I variety had somewhat more stable yields across the 8-week planting period.

Seeding depth had a major influence on early plant populations with the 1.0 inch depth having a ~75% establishment on April 19 and June 15 and ~80% establishment on the other planting dates. In contrast, the 2.0 depth had ~70% establishment on May 6, June 1, and June 15 planting dates and only 63% on the April 19 planting date. The 2.5 inch depth had ~70% plant establishment on the May 6 and June 1 planting dates but only ~55 to 60% establishment on April 19 and June 15. Evidently, the 1- inch planting depth is the optimum planting depth for stand establishment for mid-April to mid-June planting dates, at least under moist soil conditions as in 2013. Nevertheless, seed yield did not vary among seeding depths at the first four planting dates, despite plant population differences. Final plant establishment exceeded 100,000 plants/acre on all planting dates at all seeding depths, which once again reinforces the concept that soybeans can compensate and maintain close to optimum yield, if early plant establishment exceeds 100,000 plants/acre. Weather conditions greatly influence the response of soybeans to planting dates and seeding depths so we will continue this study another year.

Spring Carbon and Nitrogen Pools of Wheat and Cereal Rye Following Corn Silage

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Introduction

The practice of seeding an overwintering cover crop such as cereal rye or winter wheat after corn silage harvest is becoming increasingly popular in New York State. Based on cover crop biomass sampling of New York farm fields in the fall of 2010 and 2011, fall accumulation of nitrogen (N) is typically 20 to 30 lbs of N/acre independent of species (Ketterings et al., 2011; Ort et al. 2013). However, the contribution of cover crops to N dynamics is not determined by fall growth only. In spring 2012, 13 cereal rye and 15 wheat fields seeded after corn silage harvest in the fall of 2011 were sampled to determine total biomass, carbon (C) and N. The biomass was determined by using a sampling frame of 8 by 38.5 inches at a total of four locations per field. Within the sampling area, plants were uprooted to assess both the above and below ground biomass. Samples were washed to remove soil, and roots and shoots were separated prior to drying in an oven. Dried samples were weighed, ground, and analyzed for C and N content.

Results

Total biomass accumulation averaged 0.64 tons DM/acre for wheat and 0.75 tons of DM/acre for cereal rye (Table 1). The total C accumulation averaged 529 lbs C/acre for wheat and 632 lbs C/acre for cereal rye (Table 1), while N accumulation averaged 37 lbs N/acre for wheat and 45 lbs/acre for cereal rye. However, as Table 1 shows, there was a wide range in total biomass, C, and N accumulation across fields within each species. All fields in the study were planted between 9/12/2011 and 10/12/2011, and stands were terminated and sampled between 3/13/2012 and 4/9/2012. Among wheat fields, those fields that were planted the earliest and received an application of manure in the fall tended to have the highest C and N accumulation. Cereal rye fields that accumulated the most biomass, C, and N also tended to be the ones planted the earliest in the fall. Thus, planting date plays a major role in determining total C and N pools accumulated by these overwintering cover crops.

Table 1: Spring biomass on a dry matter (DM) basis, percent carbon (C) and nitrogen (N) content, C:N ratio, and total C and N pools for various cover crop species following corn silage in the rotation.*

Species (fields)		DM	C	N	C: N	Total C	Total N
		tons/acre	%	%		lbs/acre	
---Total (above and below ground)---							
Cereal rye (13)	Mean	0.75	.	.	.	632	45
	Min	0.08	.	.	.	71	7
	Max	1.61	.	.	.	1295	94
Wheat (15)	Mean	0.64	.	.	.	529	37
	Min	0.07	.	.	.	62	6
	Max	1.32	.	.	.	1088	83
---Shoots---							
Cereal rye (13)	Mean	0.62	42.88	3.69	13:1	526	41
	Min	0.07	40.00	1.62	9:1	60	7
	Max	1.32	44.87	4.98	26:1	1067	86
Wheat (15)	Mean	0.55	41.86	3.47	13:1	452	34
	Min	0.06	39.60	2.29	9:1	51	5
	Max	1.15	43.30	4.88	18:1	956	77
---Roots---							
Cereal rye (13)	Mean	0.13	40.36	1.75	25:1	106	4
	Min	0.01	37.95	0.88	19:1	11	0
	Max	0.29	42.27	2.26	46:1	228	9
Wheat (15)	Mean	0.10	40.60	1.73	26:1	77	3
	Min	0.01	38.69	1.06	17:1	9	0
	Max	0.21	41.96	2.39	39:1	166	7

*Cover crop planting dates ranged from 9/12/2011 to 10/12/2011 and spring sampling dates ranged from 3/13/2012 to 4/9/2012.

The shoot portion of the cover crop represented 86% and 83% of the total biomass, 85% and 83% of the total C pool, and 92% and 91% of the total N pool for wheat and cereal rye, respectively. These results were very similar to the 82 to 84% C and 92 to 93% N pools seen for the same species in the fall (Ort et al., 2013).

Average C:N ratios were 13:1 for the shoots of both species in the spring (Table 1), similar to what was measured in the fall 2011 sampling round of these fields (Ort et al., 2013). Root C:N ratios in the spring averaged 25:1 and 26:1, also consistent with the fall sampling (Ort et al., 2013). When spring C:N ratios fall below 25:1, N mineralization of the

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cover crop biomass can occur rapidly assuming good mineralization conditions following termination of the stand.

Summary, conclusions, and implications

Spring total biomass accumulation of cover crops planted after corn silage and terminated early to allow for timely corn planting averaged 0.64 and 0.75 tons DM/acre for wheat and cereal rye, respectively. Total C accumulation averaged 529 lbs C/acre for wheat and 632 lbs C/acre for cereal rye. Spring N accumulation for cereal rye fields averaged 45 lbs N/acre, while for wheat this accumulation was 37 lbs N/acre. The C:N ratio of the shoots and roots in the spring (typically around 13:1 for shoots and 25:1 for roots) suggested that the total N pool in the cover crop could become available to the corn crop planted after cover crop termination and somewhat reduce the amount of N fertilizer needed. Assuming an uptake efficiency of 60–75%, the estimated N credit from winter cereals seeded after corn silage harvest and terminated between mid-March and mid-April, amounts to 20–30 lbs N/acre. However, fall planting date, fall manure application, and spring harvest date may impact the spring accumulation and expected N credits of a field.

> Research in New York supports use of a 20-30 lbs N/acre N credit from overwintering cereals seeded as a cover crop after corn silage.

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Recommended Roundup Ready Soybean Varieties for Central/Western and Northern New York

Crop Management

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Soybean acreage in New York has averaged close to 300,000 over the last 5 years. If the present corn to soybean price ratio is maintained, NY acreage is projected to increase to 350,000 in 2014, Variety selection is the key management decision that affects soybean yield because soybeans require a limited number of other inputs. Growers should gather as much information as possible on variety selection because of its importance in optimizing profit for the 2014 growing season.

The varieties in Table 1 are recommended varieties for Central/Western New York, based on tests in Cayuga (Aurora Research Farm) and Livingston Co. (Neenan Brothers Farm in Lima). The varieties in Table 2 are recommended varieties for Northern New York, based on tests in Jefferson (Ron Robbins Farm in Sackets Harbor) and Clinton Co. (Miner Institute in Chazy). We recommend varieties that have relative yields, averaged across the two sites in each respective region, of more than 100% (100% relative yield equals the mean yield across the two sites). **Recommended varieties, which have been tested more than one year, have performed well over different growing seasons in NY so more consideration should be given to those varieties. When looking at relative yields in Tables 1 and 2, only compare relative yields of varieties within a Maturity Group within a region. Varieties that we refer to as "exceptional" or "varieties that performed exceptionally well" in the text had relative yields of 105 or above.** Varieties that we refer to as "very good" or "varieties that performed well" in the text have relative yields of 101 to 104.

Table 1: Relative yields of recommended Group I and Group II Roundup Ready soybean varieties for central/western New York based on tests in Cayuga and Livingston Co. over the last few years

Variety	Brand/Source	Relative Yield (%)[2]	Yrs. in Test
		GROUP I VARIETIES	
S17-B3	Syngenta	109	3
5N180R2	Mycogen	107	2
HS 15A11	GROWMARK FS	106	2
1805R2	Channel	104	3
HS 19A11	GROWMARK FS	104	1
RPMDB1212	Doebler's	103	3
HS 13A11	GROWMARK FS	103	3
SG1311	Seedway	102	2
S14-J7	Syngenta	101	1
		GROUP II VARIETIES	
HS 20A12	GROWMARK FS	108	2
2105R2	Channel	106	1
RPMDB2812	Doebler's	106	1
SG2013	Seedway	105	2
S24RY73	Dyna-Gro	104	1
S22-S1	Syngenta	104	1
H20-12R2	Hubner	104	1
S22-Y2	Syngenta	104	1
5N234R2	Mycogen	103	1
5N210R2	Mycogen	103	2
2306R2	Channel	103	1
2903R2	Channel	103	1
H26-12R2	Hubner	103	1
S25RY44	Dyna-Gro	103	1
HS 24A12	GROWMARK FS	102	2
HS 28A12	GROWMARK FS	102	2
RPMDB2612	Doebler's	102	2
S24-K2	Syngenta	101	2

Central/Western NY

Group I

When averaged across the Group I tests at Cayuga and Livingston Co. over the last few years, exceptional varieties include S17-B3 from Syngenta, 5N180R2 from Mycogen, and HS 15A11 from GROWMARK FS. Also, newly-entered varieties, HS 19A11 from GROWMARK FS and S14-J7 from Syngenta, performed well in 2013. Other varieties that have performed well over the last few years include 1805R2 from Channel, RPMDB1212 from Doebler's, SG1311 from Seedway, and HS 13A11 from GROWMARK FS. The 15 Group I varieties that were entered in the central/western NY tests in 2013 averaged 73 bushels/acre at Aurora and 66 bushels/acre at Lima.

Group II

When averaged across the Group II tests at Aurora and Lima over the last 2 years, exceptional varieties include HS 20A12 from GROWMARK FS and SG2013 from Seedway. Newly-entered varieties that yielded exceptionally well in 2013 include 2105R2 from Channel and RPMDB2812 from Doebler's. Varieties that have performed well over the last couple of years include 5N210R2 from Mycogen, HS 24A12 and HS 28A12 from GROWMARK FS, RPMDB2612 from Doebler's and S24-K2 from Syngenta. Newly-entered varieties that performed well in 2013 include H20-12R2 and H 26-12R2 from Hubner, S22-S1 and S22-Y2 from

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Syngenta, 5N234R2 from Mycogen, 2306R2 and 2903R2 from Channel, and S25RY44 from Dyna-Gro. The 25 Group II varieties that were entered in the central/western NY tests in 2013 averaged 70 bushels/acre at Aurora and 71 bushels/acre at Lima.

Northern NY

Group I

When averaged across the Group I tests at Jefferson and Clinton Co. over the last few years, exceptional varieties include S17-B3 from Syngenta, 1805R2 from Channel, and HS 15A11 and HS 17A12 from GROWMARK FS. In addition, the newly-entered variety, S19RY84 from Dyna-Gro, performed exceptionally well in 2013. Other varieties that have performed well over the last few years include SG1311 and SG1911 from Seedway, 5N180R2 from Mycogen, and HS 13A11 from GROWMARK FS. The 15 Group I varieties that were entered in the test in 2013 averaged 56 bushels/acre at Sackets Harbor and 64 bushels/acre at Chazy.

Group II

When averaged across the Group II tests at Jefferson and Clinton Co. over the last 2 years, exceptional varieties include SG-2013 from Seedway, HS 20A12 from GROWMARK FS, S24-K2 and S22-Y2 from Syngenta, and 2105R2 from Channel. Newly entered varieties that performed well in 2013 include S22-S1 from Syngenta, HS 24A12 from GROWMARK FS, and RPMDB2812 from Doebler's. The 20 Group II varieties that were entered in the test in 2013 averaged 54 bushels/acre at Sackets Harbor and 66 bushels/acre at Chazy.

Table 2. Relative yields of recommended Group I and Group II Roundup Ready soybean varieties for Northern New York based on tests in Jefferson and Clinton Co. over the last few years.

Variety	Brand/Source	Relative Yield (%)[2]	Yrs. in Test
		GROUP I VARIETIES	
S17-B3	Syngenta	109	2
1805R2	Channel	108	3
S19RY84	Dyna-Gro	107	1
HS 15A11	GROWMARK FS	106	2
HS 17A12	GROWMARK FS	106	3
SG1311	Seedway	103	3
SG1911	Seedway	103	3
5N180R2	Mycogen	102	2
HS 13A11	GROWMARK FS	102	3
		GROUP II VARIETIES	
SG2013	Seedway	117	2
HS 20A12	GROWMARK FS	109	2
S24-K2	Syngenta	109	1
S20-Y2	Syngenta	109	2
2105R2	Channel	107	2
S22-S1	Syngenta	103	1
HS 24A12	GROWMARK FS	102	1
RPMDB2812	Doebler's	102	1

Conclusion

Variety selection strongly influences yield and subsequent profit. Commercial varieties in the same maturity group have significant yield differences, lodging tolerance, and harvest moistures, if harvesting during the initial dry-down phase. Consequently, soybean variety selection greatly impacts yield, harvesting efficiency, potential drying costs, and ultimately profit so growers should consider all sources of information when selecting varieties. We provide yield, moisture, and lodging data in our 2013 New York State Soybean Variety Test Report (as well as reports from previous years), posted on our Web site, http://www.fieldcrops.org.

Field-Scale Studies Evaluating Soybean Seed Treatments and Inoculants

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The New York soybean market price increased from an average of ~$6.00/bushel from 2003-2005 to ~13.00/bushel from 2011-2013 so soybean is now a high-value crop. Growers now manage soybean more intensively, including using the myriad seed treatment options commercialized during the last 10 years. Many soybean growers in New York routinely order pre-treated seed with rhizobium inoculant, as well as fungicide, insecticide, and biological compounds. We evaluated the following five seed treatments at four sites (Livingston, Seneca, Tompkins, and Yates Co.) in 2012 and 2013 field-scale studies: **1) untreated seed, 2) untreated seed + Cell-Tech (a liquid rhizobium) applied at planting, 3) PPST 120 (pre-treated seed with rhizobium inoculum) +PPST 2030 (a biological seed treatment) +FST (fungicide seed treatment), 4) PPST 120 + PPST 2030 +IST/FST (insecticide and fungicide seed treatments), and 5) PPST 2030 +IST/FST + Cell-Tech at planting.** The objective of the study was to determine if the use of seed treatment products increase yield and profit under New York grower conditions.

Growers at all sites planted (grain drills at Livingston and Seneca Co. and Kinze planters at Tompkins and Yates Co. sites; all sites in 15-inch row spacing) in May of 2012. Growers at Livingston and Tompkins Co. planted in May of 2013 but planting was delayed until early June at Seneca and Yates Co. because of the wet spring. Seeding rates, when averaged across the 2 years, were 200,000 seeds/acre at Livingston Co., 175,000 seeds/acre at Seneca Co.; 170,000 seeds/acre at Yates Co., and 155,000 seeds/acre at Tompkins Co. The growers harvested all studies with their respective combines in October (all sites in 2013) or November (Tompkins and Seneca Co. in 2012). We or the growers provided Weigh Wagons or grain carts with scales to determine yield. Two samples from each load were taken to a field lab to estimate moisture and then grind the seed before sending the sample to Dairy One for protein analysis.

Partial budget analysis was used to determine partial costs and returns, based on 2 years of data, for all treatments. Soybean seed price, averaged across the 2012 and 2013 growing seasons, was estimated at $54.50/bag for a 140,000 seed bag. Cell-Tech cost was estimated at $3.75 to treat a bag of seed. When averaged across the 2 years, seed-applied rhizobium with the biological and fungicide seed treatment was estimated at $11/bag and seed-applied rhizobium with the biological and fungicide/insecticide seed treatment was estimated at $14.50/bag of seed. Hauling costs were estimated at $0.21/bushel. The average soybean marketing price in New York was reported at $13.60 in 2012, but we estimated it at $13.00/bushel in 2013.

Table 1. Yield and plant populations (mid to late June) of P92Y12 soybean variety with different seed treatments in field-scale studies on farms in Livingston, Seneca, Yates, and Tompkins Counties averaged across the 2012 and 2013 growing seasons.

	LIVING	SENECA	TOMPKINS	YATES
SEED TREATMENT	**Yield (bushels/acre)**			
Untreated	68	64	63	54
Cell-Tech-planting	68	64	63	55
PPST 120 PPST 2030+FST	68	63	64	55
PPST 120 +PPST 2030+FST/IST	68	**69**	63	**57**
PPST 2030+FST/IST +Cell-Tech-planting	67	67	64	56
LSD 0.05	**NS**	**3**	**NS**	**2**
	Plant populations (plants/acre)			
Untreated	159,960	125,715	133,955	129,710
Cell-Tech-planting	152,260	124,730	131,480	130,090
PPST 120 PPST 2030+FST	**194,562**	135,490	**142,220**	130,822
PPST 120 +PPST 2030+FST/IST	**185,665**	**151,360**	**145,000**	**143,510**
PPST 2030+FST/IST +Cell-Tech-planting	161,790	**155,155**	130,734	**141,510**
LSD 0.05	**9,918**	**4,899**	**8,649**	**6370**

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Table 2. Partial costs and partial return of P92Y12 soybean variety with different seed treatments in field-scale studies on farms in Livingston, Seneca, Yates, and Tompkins Counties averaged across the 2012 and 2013 gorwing seasons.

	LIVING	SENECA	TOMPKINS	YATES
SEED TREATMENT	Yield (bushels/acre)			
Untreated	68	64	63	54
Cell-Tech-planting	68	64	63	55
PPST 120+PPST 2030+FST	68	63	64	55
PPST 120+PPST 2030+FST/IST	68	**69**	63	**57**
PPST 2030+FST/IST +Cell-Tech-planting	67	67	64	56
LSD 0.05	**NS**	**3**	**NS**	**2**
	Plant populations (plants/acre)			
Untreated	159,960	125,715	133,955	129,710
Cell-Tech-planting	152,260	124,730	131,480	130,090
PPST 120+PPST 2030+FST	**194,562**	135,490	**142,220**	130,822
PPST 120 +PPST 2030+FST/IST	**185,665**	**151,360**	**145,000**	**143,510**
PPST 2030+FST/IST +Cell-Tech-planting	161,790	**155,155**	130,734	**141,510**
LSD 0.05	**9,918**	**4,899**	**8,649**	**6370**

When averaged across the 2012 and 2013 growing seasons, the biological and fungicide seed treatment compared to untreated seed increased early plant populations (~10,000 to 25,000 plants/acre) at the Livingston and Tompkins Co. sites with no further increase in plant populations when the insecticide seed treatment was added (Table 1). Nevertheless, yields were not significantly higher for the biological and fungicide seed treatment at these two sites (Table 1). In contrast, the biological and fungicide/insecticide seed treatment increased early plant populations (~25,000 plants/acre) as well as yield (2.6 to 4.8 bushels/acre) at the Yates and Seneca Co. sites, respectively (Table 1). Partial budget analyses indicated a significant partial return advantage for the biological and fungicide/insecticide seed treatment at the Seneca Co. site (~$45/acre) but not at the Yates Co. site (Table 2). Evidently, the 2.6 bushel/acre increase at Yates Co. (at an average selling price of $13.30 across the 2 years) did not generate adequate increased revenue to offset the increase in planting costs for the biological and fungicide/insecticide seed treatment. The grower at the Yates Co. site planted at about 170,000 seeds/acre so the increased partial seeding costs of ~$18/acre offset the increased revenue of~$34.50/acre to render the increased partial return ($17.20) insignificant in the statistical analysis (Table 2). The February USDA-NASS Crop Value Summary estimated that the soybean market price in New York will average $12.50/bushel in 2013, which would reduce the difference in partial return between the biological fungicide/insecticide seed treatment and untreated seed at this site even further. If the grower at this site, however, sold the crop at $13.50/bushel in 2013 ($13.55/bushel, 2-year average), the biological fungicide/insecticide seed treatment would have had greater partial returns than untreated seed. The use of Cell-Tech rhizobium inoculant at planting never increased yield or partial return at any of the sites when compared to the untreated seed (Tables 1 and 2).

Conclusion

When averaged across both years, the biological and fungicide/insecticide seed treatment increased plant populations and yield at two sites; whereas, the biological and fungicide seed treatment increased plant populations at two sites but not yield. Furthermore, the biological and fungicide/insecticide seed treatment increased partial return at one site. Given the uncertainty of the response of plant populations to soybean seed treatments (a fungicide response at some sites and an insecticide response at other sites), the "fully loaded" biological and fungicide/insecticide seed treatment would provide the greatest insurance of stand protection. Because of the ~15,000-25,000 plant/acre increase in early plant populations with the biological and fungicide/insecticide seed treatment at all sites, growers could consider a reduction in seeding rates by ~ 10,000-15,000 seeds/acre to increase partial returns. Soybean growers should also consider running test strips on their farms with or without rhizobium inoculum, be it planter box or seed-applied, to see if inoculation is still necessary on their fields. We are grateful for the partial support of the project by the New York Corn and Soybean Growers Association and Pioneer-Hi-Bred for donating the seed.

When, What, and How Deep to Plant Corn on Well-Drained Soils in New York?

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Crop Management

The average corn planting date is considerably earlier now compared to 25 years ago, especially in the Midwest USA. Here, in NY, planting is earlier than ever but still lags behind most upper Midwest states. For example, only 53% of the corn was planted by May 20th in NY from 2008-2012 compared with 84% in Minnesota, 68% in Wisconsin, and 71% in Michigan. Certainly, the soils in the upper Midwest States are as cold as New York in late April or early May. Consequently, the slower planting pace in New York must be attributed to either wetter soils; lack of readiness, especially for dairy producers that must include manure application into their corn management strategy; previous negative experiences by growers with April planting dates; or lack of belief that the newer hybrids with seed treatments can be planted into somewhat cold soils.

Some growers, however, are planting earlier and planting at the "one size fits all" depth of 2-inches. Early planted corn (~mid-April), however, can take 3 to 4 weeks to get out of the ground and a shallower planting depth may be beneficial for April planting dates. Other growers will not plant until May and if soils conditions are wet, their planting extends into late May or early June. When planting is delayed after May 20th, growers in NY wonder if they should switch to an earlier hybrid. We initiated small-plot research at the Aurora Research Farm in 2013 to answer three questions concerning corn planting: 1) Can corn be safely planted in early and mid-April on well-drained soils in NY without risk of poor stands and subsequent yield loss, 2) when should grain growers switch from a full-season to a shorter season hybrid, if planting is delayed, and 3) is the 2-inch seeding depth optimum from early April through early June planting dates?

We planted a 103-day (203-44STXRIB from Channel) relative maturity (RM) and a 96-day (DKC46-20VT3P RIB from DeKalb) RM hybrid on April 5, April 19, May 6, May 17, and June 1 at 1.0, 1.5, 2.0, 2.5, and 3.0 inch seeding depths at a rate of 32,000 seeds/acre. We determined stand establishment at ~ the 4th leaf stage (V4), about 3-6 weeks after planting, depending upon planting date. We harvested all plots on October 27th, once the grain moisture of the 103-day hybrid planted on June 1 was below 35%.

Plant populations had a significant planting date x seeding depth interaction (Table 1). When averaged across hybrids, the 1.5-inch depth consistently was among seeding depths with the highest stand establishment on all planting dates. The 1.5 inch seeding depth averaged ~85% plant establishment on the April 5 and May 6 planting dates and ~90% on the other planting dates. The 1.0 inch seeding depth also had 85-90% emergence on the first four planting dates but only ~75% emergence on the June 1 planting date (probably because of dry conditions for the first 8 days after planting). In contrast, the 2.0 and 2.5 inch seeding depths had mostly ~90% stand establishment on the last four planting dates but only ~75% for the April 5 planting date. The 3.0 inch seeding depth had above 80% stand establishment on the last four planting dates but only ~65% establishment on the April 5 planting date. Planting on the shallow side (<2.0 inches) for early-planted corn and deeper (>1.5 inches) for later-planted corn proved to be the correct strategy for stand establishment in 2013.

Table 1. Early plant populations of corn at the 4th leaf stage (V4) at five planting dates and five seeding depths, in 2013 when averaged across two hybrids (DKC46-20 VT3P-RIB and 203-44STXRIB).

DEPTH	PLANTING DATE				
	4/5	4/19	5/6	5/17	6/1
inches	plants/acre				
1.0	27,000	29,000	28,000	29,000	24,500
1.5	27,000	28,000	27,500	28,000	29,000
2.0	24,500	28,500	28,500	28,000	29,000
2.5	24,500	28,500	28,500	27,500	28,000
3.0	21,500	27,500	28,500	26,500	27,000
LSD 0.05	2,025†				

† LSD compares seeding depth means within a planting date.

Despite the plant population x seeding depth interaction for plant populations, grain yield only had a seeding depth response (Table 2). When averaged across hybrids and planting dates, the 1.5 and 2.0 inch seeding depths yielded greater than the 2.5 and 3.0 inch seeding depth by about 4%. The 1-inch seeding depth yielded the same as the other four seeding depths. It is not clear why the 2.0 and 2.5 inch seeding depths did not have greater yield reductions on the April 5 planting date with plant populations of only 24,500 plants/acre.

A planting date x hybrid interaction did exist for grain yield, however (Fig.1). The 103 day hybrid yielded ~11% higher (235 bushels/acre) than the 96-day hybrid (212 bushels/acre) when averaged across both April planting dates and five seeding depths. The 103-day hybrid planted on April 5 and 19 did have higher average grain moisture (20.1 and 19.6%, respectively) than the 96-day hybrid (17.5

and 17.7%, respectively) at harvest on October 27. Nevertheless, the 11% yield increase would offset the additional drying costs if both hybrids were harvested on the same dates. Grain yields did not vary between hybrids on subsequent planting dates. The 96-day hybrid averaged 19.4 and 20.8% grain moisture compared with 22.1 and 26.3% for the 103 day hybrid, when planted on May 6th and May 17, respectively (data not shown). The similar yield but lower grain moisture of the 96-day hybrid on these two planting dates indicates that the switch from a 103 to a 96-day hybrid should have occurred as early as May 6 in 2013.

Table 2. Yield of corn at five planting dates and five seeding depths, in 2013 when averaged across two hybrids (DKC46-20 VT3P-RIB and 203-44STXRIB).

DEPTH	PLANTING DATE					
	4/5	4/19	5/6	5/17	6/1	Mean
inches	bushels/acre					
1.0	225	233	223	225	213	224
1.5	230	225	226	232	227	228
2.0	225	231	232	235	223	229
2.5	218	226	217	217	211	218
3.0	195	224	236	235	207	218
LSD 0.05						10†

† LSD compares seeding depth means.

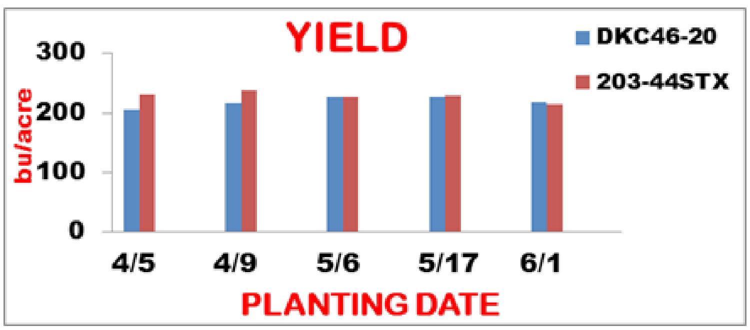

Fig. 1 Yield of a 96-day (DKC46-20VT3PRIB)) and a 103-day (203-44STXRIB) corn hybrid, averaged across five seeding depths, at five planting dates in 2013.

Conclusion

Planting at the 1.5 inch depth consistently resulted in the highest plant populations and grain yields among seeding depths across all planting dates. Despite the lower plant populations for the 2.0 vs.1.5 inch seeding depth on the April 5 planting date, grain yields did not vary between these two seeding depths. The 2.5 and 3.0 inch seeding depth yielded about 4% lower than the 1.5 and 2.0 inch seeding depths, although plant populations between the 2.0 and 2.5 inch seeding depth were similar across all planting dates.

The 103 day hybrid yielded ~11% more than the 96-day hybrid for the April planting dates but both hybrids yielded similarly for the May and June 1 planting dates. Because of lower grain moisture and similar yield for the 96-day vs. 103-day hybrid on the later three planting dates, the switch from 103 to 96-day hybrids on May 6 would have resulted in the most profit, if both hybrids were harvested in late October. The 2013 growing season was warm and wet from early April through mid-July and cool and wet for the remainder of the growing season. Climatic conditions vary each year and climatic conditions strongly influence planting date, hybrid RM, and seeding depth effects on yield. We will conduct this study another year to see if there is consistency in plant population and grain yield data across growing seasons. Keep in mind that this study was conducted on a well-drained soil and does not apply to poorly drained soils.

Calendar of Events

April 3, 2014	Adapt-N Training Webinar, Sites throughout NE and Midwest or online *More info and registration @ http://adapt-n.cals.cornell.edu/index.html*
May 8, 2014	Invasive Weed Seedling Identification, Ithaca, NY *More info and registration @ https://reg.cce.cornell.edu/weed_seedling_workshop_104*
Jun 5, 2014	Small Grains Management Field Day, Musgrave Farm, Aurora, NY

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