What's Cropping Up?

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When to Plant Soybeans in New York?

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The question regarding soybean planting date in many regions of the USA is "how early can we plant soybeans?" Unfortunately, in New York, because of cool and wet spring conditions and moderately drained soils, a more frequent question is "how late can we plant soybeans"? Another question that is recently being asked is "should soybean seed be treated with seed-applied insecticide"? In 2005 and 2006, we drilled the Group II variety 92B38 under conventional tillage treated with or without seed-applied insecticides at 200,000 seeds/acre in mid-May, late May, and mid-June to answer these questions.

When averaged across years and seed treatments, the late May planting date resulted in the best final stands at 158,698 plants or a 79% emergence rate. Final stands at the mid-May planting date were lower (144,966 plants/acre or 72% emergence rate) because of cooler soil conditions after planting, especially in the 2005 growing season. Final stands at the mid-June planting date were also lower (146,942 or 73% emergence rate) compared with the mid-May planting date because of soil crusting problems, especially in the 2005 growing season. Seed-applied insecticides did not improve final stands in this study with all treatments averaging 74 to 77% emergence.

Despite almost 14,000 more plants/acre in final stand, the mid-May and late-planting date had similar yields (Table 1). In fact, only the mid-May and mid-June planting date yielded differently in this study with the late May planting date yielding similarly to the other two planting dates. When averaged across years, the yield penalty for a delayed planting date beyond mid-May was only 1/6 bu/acre/day (1/3 bu/acre/day in 2006 but no yield penalty in 2005). In the dry and hot 2005 growing season, however, the mid-June planted soybeans benefited from a 3" rain from the remnants of Hurricane Katrina on 30 August. The earlier planting dates had begun to yellow on August 30 so their advanced maturity negated much of the yield benefit from the 3" precipitation event, resulting in similar yields across all three planting dates in 2005. Overall, the results from this 2-year study indicates that soybeans can be safely planted until mid-June in warm growing regions in central New York when early fall frosts do not occur.

When averaged across years and planting dates, seed-applied insecticides did not increase soybean yields (Table 1). Soil insects, such as seed corn maggot, however, are occasional pests and in some years can greatly reduce soybean stands. Again, we suggest that growers test these products on their farms to determine responses for their soil and planting conditions.

Table 1. Final stands and yields of 92B38 soybeans planted at 200,000 seeds/acre in 7.5 inch rows under conventional tillage at three planting dates with different seed-applied insecticides in 2005 and 2006 at the Aurora Research Farm.

	PLANTING DATE							
TREATMENT	FINAL STAND				YIELD			
	5/14	5/28	6/13	Avg.	5/14	5/28	6/13	Avg.
	plants/acre				bu/acre			
Check	142,981	156,186	142,671	147,613	59	54	51	55
Gaucho	148,506	165,123	147,981	153,870	58	57	54	56
Cruiser	143,411	154,785	150,778	148,726	58	57	55	57
Avg.	144,966	158,698	146,942		58	56	53	
LSD 0.05		9,575†	NS‡	4†	NS‡			

† LSD compares means among planting dates.

‡ LSD compares means among seed treatments.

Forage Management

Switchgrass Management in New York State

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There is a rapidly expanding global interest in developing economically-viable bioenergy production systems. For the past decade bioenergy research on perennial crops was focused primarily on tropical and subtropical zones, where yields of 10 to 16 dry tons per acre are possible with tropical grasses. This is approximately double the potential yields of perennial grasses in the northern USA. Recently the promise of economically-viable cellulosic ethanol has ignited a flurry of interest in switchgrass (*Panicum virgatum*) production across much of the country. Regardless of the bioenergy conversion system utilized, switchgrass is one of the top candidates for a perennial biomass crop in the northern USA. Switchgrass is a native, warm season, bunch grass typically sown for conservation purposes. Switchgrass is well-adapted to various environments with an efficient growth habit (C_4 plant). Warm-season grasses are typically high fiber, low quality crops unsuitable as ruminant forage in the Northeast, but these characteristics make switchgrass a promising biofuel crop.

A great deal of agricultural land in New York State (NYS) is suitable for growing switchgrass, and grass biomass can be produced in the state without a major impact on our food or forage production capacity. Although switchgrass shows great promise for NYS, it should be realized that this crop alone will not solve our current energy problems; as with all renewable energies it should be viewed as one component of a larger system that can help to reduce our dependence on fossil fuels. There has not been widespread sowing of switchgrass in NYS in the past, but we do have a reasonably good idea how to establish and manage the species.

Variety and Site Selection

Switchgrass varieties should be chosen based on their ability to grow in NYS. There are upland and lowland varieties. While lowland varieties tend to yield more they are also more susceptible to winter kill, thus only upland varieties are recommended for northern climates. Cave-in-Rock is an upland variety that is generally recommended as it has been shown to do well in northern climates. Other upland varieties shown to grow in NYS include Forestburg, Blackwell, Nebraska, Pathfinder, Sunburst, Trailblazer, and Shawnee. There are several new varieties scheduled for release that will need to be tested under our growing conditions. Switchgrass will grow on many different New York soil types but it performs best on well-drained loam and sandy loam soils. An additional advantage of light-textured soils is that the mineral content of the biomass will be significantly lower, compared to switchgrass grown on clay soils. A website that will provide potential switchgrass yields for all agricultural soil types in NYS will become available later this year.

Seeding Issues

A standard soil test should be used to assess soil pH and nutrient availability at establishment. Switchgrass can grow on soils with a relatively wide pH range; however, a pH of 6.5 is optimal. Follow state guidelines for phosphorous (P) and potassium (K) for grass establishment. To reduce competition by weeds it is not recommended to apply manure or nitrogen (N) fertilizer in the year of establishment. Switchgrass seed is relatively small, accentuating the need for good seed to soil contact for optimum germination. A seeding rate of 7-9 lbs of pure live seed (PLS) per acre is recommended in northern climates but switchgrass seed is often highly dormant, especially immediately after harvest and for this reason close attention should be given to information such as % dormancy located on the label on the bag. Seeding rates should be based on PLS. Seeding should occur after the soil temperature reaches 60°F or within 2 weeks of the recommended corn planting dates in your area.

Press wheels, rollers or cultipackers should be used before and after seeding to enhance seed to soil contact. Late summer seeding is not recommended because there is a high risk that the switchgrass will not survive the first winter. Seed should be sown at a depth of ¼ to ½ inch for conventional and no-till planting with the shallower seed depth for heavier soils. No-till and frost seeding can work well; however, ideal conditions are needed for a good establishment. A slightly higher seeding rate is recommended for these types of seedings. One to three seedlings per square foot at the end of the establishment year is considered a successful establishment.

Weed control in the seeding year can greatly increase the success of establishment. Many problematic weeds are able to germinate and emerge with switchgrass and can grow much more rapidly at comparable temperatures. Properly labeled herbicides and mowing are recommended weed control. Chemical weed control can be used in the fall prior to establishment, pre-plant and post-plant. Weeds should be mowed just above the height of the growing switchgrass. Hormone herbicides such as 2,4-D should be avoided as they are known to reduce development of switchgrass in the seeding year.

Management of Established Stands

When managing switchgrass for biomass it is important to balance the fertilizer required to maximize yield and sustain the stand, while minimizing plant uptake of elements such as N, K, chlorine (Cl), and sulfur (S). In a biomass system crop removal of many nutrients can be minimized by leaving the crop in the field to allow nutrients to leach back into the soil. While this is a positive event from the standpoint of biomass composition, it will significantly impact overall nutrient management and, in particular, manure application to the stand.

Following establishment, soil testing should be conducted every three years to re-assess the nutrient status. Lime, P and K should be applied based on soil test results according to state guidelines. Additions of N fertilizer can improve yields of established stands and stand longevity. When switchgrass is managed as a biomass crop under a single cut system, N fertilizer needs are lower than when it is managed under a multiple cut forage system. For a single cut biomass system 50–75 lbs N/acre/year is recommended. Manure can be used in place of commercial fertilizers. Perennial grasses are considered an environmentally sound location for manure spreading during much of the year and switchgrass grown for biomass could offer a farm additional land to distribute manure on. However, the amount of manure that can be applied will be limited if the crop is managed to minimize mineral content in biomass removed from the field. Additional research is needed to quantify manure P application versus soil test P increase over time in bioenergy systems that require mineral leaching prior to harvest.

Harvest and Stand Longevity

Switchgrass is a perennial that spreads by rhizomes. For stand longevity, it is not recommended to harvest switchgrass in the establishment year. Timing of harvest in subsequent years varies based on intended use of the biomass. In northern climates a single cut system and 6 inch stubble height are recommended to assist with plant recovery and stand longevity. A 6 inch stubble height would not be required for a spring mowing of overwintered forage. There is the possibility that late summer harvest of switchgrass in the Northeast will negatively impact stand longevity, but more research is needed.

Greenhouse gasses and carbon crediting will soon be assigned considerable value when evaluating the feasibility of bioenergy systems. When this occurs, perennial grasses such as switchgrass are likely to become very economically competitive as sources of biomass in the Northeast. Coupled with an economically-efficient energy conversion process, the future of grass biomass in the Northeast is very promising.

'Cave-in-Rock' switchgrass harvested for biomass on a high elevation NYS site.

Nutrient Management

New York Corn Producers Make a Difference!! Phosphorus Fertilizer Imports 2003-2005 Reduced by 26.7 million lbs of P_2O_5

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From 2001 through 2003, the Northeast Sustainable Agriculture Research and Extension (NESARE) program, with contributions from Agway, Carovail, Pioneer Hi-Bred International Inc., AgriCulver Seeds, the New York State Natural Resources Conservation Service (NRCS), and Northern New York Agricultural Development Program (NNYADP), funded a project that evaluated phosphorus (P) needs for corn production in New York. The project consisted of on-farm and research station trials and extensive extension activities.

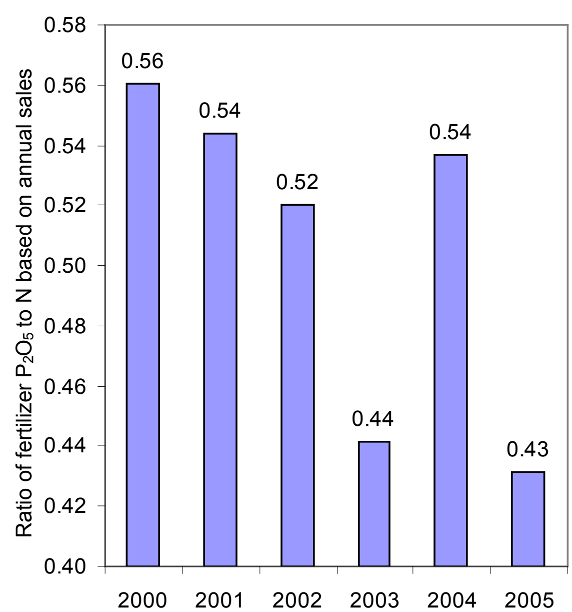
The results showed that on sites that test high in P and do not receive manure, P starter levels could be reduced to 25 lbs P2O5/acre or less. On sites that test very high in P or high P sites that receive manure, a P-free starter could be used without yield or silage quality penalty.

In 2005, New York counted about 990,000 acres of corn of which an estimated 47% test high or very high in soil test P. For these soils, a shift from standard applications of P containing fertilizers (i.e. 250 lbs/acre of 19-19-19) to a P-free starter could result in savings of 40-50 lbs P2O5/acre ($10-$15/acre).

In the final year of the project, a survey of over 350 corn producers showed project convinced 17% of those that replied to reduce starter P application rates. We monitored the fertilizer sales data (Department of Agriculture and Markets) for the period 2000-2005 to assess the true impact of the project.

Statewide P fertilizer use dropped from an average of 33,494 tons of P2O5/year in 2000-2002 to 29,052 tons of P2O5/year in 2003-2005, a reduction of 4,442 tons or 8.9 million lbs of P2O5/year. In this time period nitrogen (N) sales did not go down (61,877 tons or 123.8 million lbs of N/year over the 6 year period), showing that producers did not reduce fertilizer use, but strategically selected lower P fertilizer blends!

The team work (Cornell University faculty, staff and students, Cooperative Extension field crops educators, PRODAIRY staff, corn growers, and agricultural agencies and industry), and the integrated research and extension approach helped reduce P imports into the state by a total of 13,325 tons or 26.7 million lbs of P2O5 over the 2003-2005 period!



The New York Starter Phosphorus Project was initiated to evaluate and demonstrate the value of P starter application on soils testing high or very high in P. Cornell University's Nutrient Management Spear Program (NMSP) faculty and staff, PRO-DAIRY staff and Cornell Cooperative Extension educators worked together to conduct 65 on-farm and 13 research station trials between 2001 and 2003. The project was funded by a NESARE research and education grant (LNE02-173) and contributions from New York State Natural Resources Conservation Service, Agway, Carovail, Pioneer Hi-Bred International Inc., AgriCulver Seeds and the Northern New York Agricultural Development Program. For more information on the project and its impact on New York, visit: http://nmsp.css.cornell.edu/projects/starterp.asp or contact Quirine Ketterings at qmk2@cornell.edu or (607) 255-3061.

Impact Herbicide Registered for Corn in NY State

Weed Management

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INY State Department of Environmental Conservation recently approved the registration of Impact Herbicide for use on field and sweet corn. Although topramezone, the active ingredient in Impact, is new, many NY corn growers are familiar with another herbicide, mesotrione, with the same site of action. Mesotrione is the active ingredient in Callisto and a component in Lumax and Lexar. Impact and Callisto inhibit 4-HPPD, an enzyme critical to synthesis of plant pigments. Susceptible weeds turn white and this bleaching is followed by tissue necrosis and death.

New Site of Action

The 4-HPPD site of action (Group 27 Herbicides) is only one of two new target sites for herbicides introduced since 1991. During this period, about two-thirds of herbicide introductions have been either PPO inhibitors (Group 14 Herbicides like Reflex, Resource, etc.) or ALS inhibitors (Group 2 Herbicides like Steadfast, Permit, Python, etc.). While only three weeds have developed resistance to PPO inhibitors, 93 weeds have developed ALS-resistant populations. To date, there are no confirmed cases of resistance to the new 4-HPPD inhibitors and lab studies indicate that the likelihood of developing 4-HPPD resistance is low.

Labeled Uses of Impact

While Callisto can be used both preemergence (PRE) and postemergence (POST) in corn, Impact is registered for POST use only. Impact is a 2.8 lb/gal suspension concentration (SC) with a normal use rate of 0.75 fluid oz/A. For best performance, Impact should be tank-mixed with atrazine at 0.25 to 1.0 lb ai/A. It can be applied from the spike stage of corn up to 45 days prior to harvest. Applications should be made in a minimum of 10 gallons per acre of water and must include a methylated seed oil (MSO) *or* crop oil concentrate (COC) *and* a nitrogen fertilizer source such as urea ammonium nitrate (UAN) or ammonium sulfate (AMS).

Impact has excellent activity against many summer annual broadleaf weeds such as velvetleaf, pigweed, common ragweed, common lambsquarters, and wild mustard. It also provides significant burndown activity against giant foxtail and crabgrass and should provide partial control of other summer annual grasses like green and yellow foxtail and fall panicum.

Research Experience

Experiments conducted the past two growing seasons suggest that Impact should improve the annual grass activity of residual premix or tank-mix combinations (i.e. Bicep Lite II Magnum, Prowl H20 + AAtrex, etc.) that are applied early POST rather than PRE. Impact might also prove beneficial in total POST weed control programs when Steadfast products are used with conventional hybrids or in Roundup Ready or Liberty Link corn weed control programs. An experiment at Aurora, NY in 2005 demonstrated the effectiveness of Impact against giant foxtail. Limited rainfall (~0.66 inch) during the 2 weeks following PRE application of 1.5 pt/A of Dual II Magnum resulted in poor (60%) giant foxtail control. When a mid-POST application of Impact with 1% (v/v) MSO and 2.5% (v/v) 28% UAN followed a PRE Dual II Magnum application, giant foxtail control increased to 99% and grain corn yield increased from 100 to 137 Bu/A.

During the 2006 growing season, early POST application of 0.73 fl oz/A of Impact or 0.75 oz/A of Steadfast, each with 1 pt/A of AAtrex and appropriate adjuvants, controlled greater than 95% of giant foxtail at Aurora while 3 fl oz/A of Callisto plus 1 pt/A of AAtrex and adjuvants controlled only about 20% of the giant foxtail. An early POST application of Prowl H20 plus 1 qt/A of AAtrex with 1% (v/v) MSO and 2.5% (v/v) 28% UAN provided only 19% giant foxtail control 60 days after treatment (DAT). When 0.73 fl oz/A of Impact was added to this residual tank mix, giant foxtail control was 100% 60 DAT.

At the Valatie Research Farm, early POST applications of Impact, Callisto, or Steadfast, each with 1 pt/A of AAtrex and required adjuvants, provided 90% or greater large crabgrass control 22 DAT. While crabgrass control with Callisto or Steadfast was still 60 and 65% respectively 64 DAT, control with Impact had declined to 45%. An early POST application of Impact with 3 pt/A of Prowl H20 plus 1 qt/A of AAtrex provided 95% crabgrass control 64 DAT.

While these results demonstrate how Impact might provide benefit to corn weed control programs, additional research will further refine how we use this new herbicide.

Crop Management

Soybean Prices Are Higher! Should Seeding Rates Be Higher?

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Soybean prices are almost $2.00/bu more than the average selling price of the last 3 years. Even with the strong negative basis in New York, soybean growers are receiving in the vicinity of $6.50/bu for the 2006 crop. Soybean prices are expected to remain strong for the 2007 crop, especially if oil prices remain above $60/barrel and corn acres in the USA approximate 90 million. Last year, we revised our recommended seeding rates downward to 180,000 seeds/acre for drilled soybeans. Should soybean growers plant at this rate given the expected strong selling price for the 2007 crop?

We revised our soybean seeding rates downward based on studies at the Aurora Research Farm with the Group II variety, 92B38, planted with a drill under conventional tillage (Table 1). Despite doubling seeding rates from 160,000 to 320,000 seeds/acre, average soybean yields remained almost constant at 52-53 bu/acre. Furthermore, in field-scale studies under no-till conditions with the late Group I variety, AG1903, soybean yields remained almost constant at 47-48 bu/acre, despite a doubling of the seeding rate from 137,500 to 262,500 seeds/acre (Table 2). With no response to seeding rates whatsoever in the last 4 years, an obvious question is why not revise recommended soybean seeding rates downward to 150,000 seeds/acre or less?

Soybeans planted in New York with a drill typically have emergence rates of 80% or even less. For example, 92B38 under conventional tillage planted in mid-May during the 2003-2005 seasons averaged 68 to 78% emergence, depending upon seeding rate (Table 1). Soybeans have a remarkable ability to compensate or fill in the gaps in the stand so the relatively low emergence rates do not result in yield reductions even at seeding rates of 160,000 seeds/acre. But what happens if soybean stands are further reduced because of crusting or soil insect problems such as seed corn maggot? How does this affect soybean yields, especially at lower seeding rates?

In 2006, we conducted a study where we simulated further damage to soybean stands of 92B38 by removing every 10^{th}, 4^{th}, or 2^{nd} plant in each drilled row, which resulted in stand reductions of 10, 25, or 50% (Table 3). Once again, soybean yields were essentially the same at 64 to 66

Table 1. Seeding rate, final stand, and yield of 92B38 under conventional tillage at 7.5” row spacing, averaged across the 2003-2005 growing seasons at the Aurora Research Farm.

SEEDING RATE	FINAL STAND	YIELD
--------seeds/acre-----------	-----------plants/acre----------	-------bu/acre-----------
160,000	124,833	52
200,000	146,972	52
240,000	174,857	53
280,000	197,232	53
320,000	219,884	53
LSD 0.05		NS

Table 2. Seeding rate, final stand, and yield of AG1903 under no-till at 7.5" row spacing, in field-scale studies, averaged across the 2005 and 2006 growing seasons at the Aurora Research Farm.

SEEDING RATE	FINAL STAND	YIELD
--------seeds/acre-----------	-----------plants/acre----------	-------bu/acre-----------
137,500	119,338	47
170,000	150,113	46
200,000	171,338	47
230,000	192,350	47
262,500	230,238	48
LSD 0.05		NS

bu/acre at seeding rates of 150,000, 200,000, and 250,000 seeds/acre with no further stand reductions. Table 3, however, clearly indicates that the 150,000 seeding rate had a significant yield reduction with a further 10% stand loss. In contrast, the 200,000 seeding rate didn't take a yield hit until a further 25% stand loss and the 250,000 seeding rate at a further 50% stand loss. Quite often May conditions in New York are cool, which results in extended emergence time and increased seed corn maggot damage. Likewise, heavy thunderstorms after planting followed by dry conditions and crusted soils are not uncommon. For these reasons, we will keep our recommended seeding rates at 180,000 seeded acre while continuing studies on seeding rates and stand losses. We urge New York soybean growers to also conduct seeding rate studies on their farms to fine-tune seeding rates for soil and planting conditions in their fields.

Table 3. Seeding rate, final stand, and yield of 92B38 under chisel tillage at 7.5" row spacing after 0, 10, 25, and 50% of the final stands were hand-removed at the V2 stage in the 2006 growing season at the Aurora Research Farm.

	SEEDING RATE (seeds/acre)					
	150,000	200,000	250,000	150,000	200,000	250,000
STAND LOSS		FINAL STAND			YIELD	
%	- - - - - -	- plants/acre -	- - - - - -	- - - - - -	- bu/acre -	- - - - - -
0	128,555	154,585	176,265	64	66	66
10	124,793	158,303	182,739	59	65	68
25	112,619	122,711	152,460	62	59	68
50	72,223	87,165	105,294	57	55	57

Calendar of Events

June 7, 2007	Small Grains Management Field Day, Musgrave Research Farm, Aurora, NY
June 24-26, 2007	Northeastern Branch American Society of Agronomy, State College, PA
July 5, 2007	Seed Growers Field Day, Ithaca, NY

What's Cropping Up? is a bimonthly newsletter distributed by the Crop and Soil Sciences Department at Cornell University. The purpose of the newsletter is to provide timely information on field crop production and environmental issues as it relates to New York agriculture. Articles are regularly contributed by the following Departments at Cornell University: Crop and Soil Sciences, Plant Breeding, Plant Pathology, and Entomology. **To get on the mailing list, send your name and address to Pam Kline, 234 Emerson Hall, Cornell University, Ithaca, NY 14853.**

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