What's Cropping Up?

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Lime-Treated Sludge Should Dairy Farmers be Concerned?

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Application of sewage sludges (also called biosolids) on agricultural lands is steadily increasing in NYS. Estimates from the Broome county area alone are that 15-20,000 acres have had recent applications of lime-treated sludge. Municipal sewage sludges are a byproduct of sewage treatment and are a potentially useful source of plant nutrients and soil organic matter. They also may contain undesirable levels of heavy metals, pathogens and other contaminants.

Soil, water and crop characteristics in the northeastern U.S.A. make this area more sensitive to potentially toxic metal accumulations in soils. There has been recent concern over the use of lime-treated sludge on dairy farms in both the Northeastern USA and Southern USA. Depending on the concentrations of elements in sludge and soil pH, there is the potential for ruminant animal health problems.

Lime-treated Sludge

Liming materials, developed by addition of strongly alkaline ash or dust to dewatered sewage sludge that meets state and federal standards, are approved for application in NYS. Sewage sludge is pasteurized by the addition of materials such as cement kiln dust and lime. These amendments raise the temperature and pH of the sludge, killing most of the potential pathogens in sludge. The treated sludge can then meet the criteria for a Class I compost, under NYS-DEC solid waste rules (Part 360), and can be applied to all crops except those for direct human consumption. The increase in soil pH generally limits the immediate plant availability of certain heavy metals of concern, particularly zinc, cadmium and lead. Unfortunately, there is often a simultaneous increase in availability of molybdenum (Mo) and sulfur (S), two elements present in sludges and lime-treated sludge products. This can, in some cases, result in the production of forage on treated lands that is potentially harmful to animal health.

Ruminants and Mineral Imbalances

Interactions between the Mo, S and copper (Cu) concentrations in forage can lead to severe health problems in ruminant animals. Molybdenosis, or Mo-induced Cu deficiency in ruminants, is caused by an imbalance in dietary Mo, Cu and S. Lime-treated sludge increases soil pH, increasing plant availability of soil Mo and S, without changing Cu availability appreciably. Some particular sludges also may be sufficiently contaminated with Mo to be a major additional source of plant available Mo. In ruminants, Mo and S interact with Cu and have the potential to greatly reduce Cu uptake by ruminants. Molybdenosis can result.

Recent research in Florida has shown that even a single application of sludge can change forage quality sufficiently to induce a Cu deficient status in grazing ruminants. Cornell research has shown that Mo availability to soybeans, canola and a number of other crops persisted in soil at a high level over 20 years after heavy application of a low-Mo sludge. Cornell also is cooperating with the University of Guelph to assess forage plots near Guelph that received sludge applications 20 years ago. Research at both of these sites indicates that some of the applied Mo persists in a plant-available form in soils for decades once it is applied.

Regulation of Molybdenum Content

Risk assessment by US EPA may have underestimated risks to livestock associated with high-Mo sludge and with lime-treated sludge application. The final EPA 503 rule that sets loading limits has no cumulative soil-loading limit for Mo and allows for the application of sludges and sludge products with up to 75 parts per million of Mo (vs. a typical NYS agricultural soil level of 1 ppm) . Preliminary sampling of NYS dairy farms in the fall of 1998, with a history of lime-treated sludge application, revealed some forage with high Mo content. The extent of this potential problem in NYS is unknown. More information is needed before reasonable recommendations can be generated.

What are We Doing?

We have initiated a project to sample forage and soil on sludge-amended fields across NYS during the 1999-2001 growing seasons. Samples from fields containing grass-legume mixtures are being separated, with grass and legume forage analyzed separately. Legumes appear to have the ability to accumulate Mo to a greater extent than grasses. Forage and soil samples will be analyzed for Mo, Cu and S. Commonly used soil extraction procedures give an estimate of total soil Mo concentration, but this value does not always correlate with actual plant uptake of Mo. We are developing a relatively simple modified hot-water extraction method for soil Mo that initial studies are showing to be a good predictor of forage crop uptake of Mo. We are accumulating forage and soil Mo, Cu and S databases to provide a basis for an assessment of the risk to ruminant animals from land application of sludge products in NYS.

Proceed with Caution

We currently do not have a comprehensive assessment of the molybdenosis risk in NYS. It is clear, however, that some elements potentially harmful to the health and productivity of ruminants may accumulate in sludge-amended soil. Long-term experiments show that these will take a very long time to dissipate. Application of sludge on agricultural lands should be done with cumulative loading limits of Mo and S in mind. Moderate to high application rates, or multiple applications, will increase the potential for any negative impacts. Dairy farmers should seriously investigate the type of sludge product and its composition, prior to a management decision to use sludge for liming or fertilizing purposes.

More specific information on potential risks related to sludge application can be found in the publication "The Case for Caution" (www.cfe.cornell.edu/wmi/).

Weed Management

Conventional and Herbicide-Resistant Corn Weed Control Programs

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New York corn growers experienced vastly different growing seasons and herbicide performance in 1999 and 2000. The 1999 growing season was warm and characterized by the lack rainfall for activating preemergence (PRE) herbicides and for corn growth and development. This past season was characterized by cool temperatures and by average or above average rainfall for activating PRE herbicides. The failure of many PRE weed control programs in 1999 was at least in part, responsible for increased interest in total postemergence (POST) weed control programs with conventional and herbicide-resistant corn hybrids in 2000. While the lack of rainfall for herbicide activation is the major limitation of PRE programs, growers should be reminded that total POST programs also have limitations. Time-of-application can be very critical for POST programs in corn and some POST herbicides don't perform as well under drought conditions as when growing conditions are favorable and weeds actively growing.

Under "normal" conditions, the challenge for POST weed control programs is to produce yields comparable to those with PRE programs. With the widespread failure of PRE corn herbicides in 1999, EPO applications provided the best weed control and routinely produced higher yields than PRE applications. In one 1999 experiment, corn silage yields from the MPO and late postemergence (LPO) applications of Liberty ATZ were reduced 19 and 31% respectively compared with the EPO application. The PRE standard yielded 37% less than the EPO application. These results clearly demonstrated the importance of rainfall activation of PRE herbicides and of timely POST applications in corn. Field experiments in 2000 were designed to compare Liberty Link or Roundup Ready programs with PRE programs and with conventional POST programs. In addition to comparing the three programs, experiments provided additional data on the importance of application timing for POST programs and on how much residual herbicide should be used in Roundup Ready programs.

Liberty Link Experiments

Glufosinate resistant corn, DK493GR and Pioneer 38B22, was planted on May 30 and 27, 2000 at Aurora and at the Valatie Research Farm respectively. Each experiment compared EPO applications of 2.5 pt/A of Liberty ATZ and of 14 oz/A of Basis Gold plus 2 oz/A of Clarity with a PRE standard treatment of 1.5 qt/A of Bicep Lite II Magnum plus 3.6 pt/A of Prowl. At Aurora, the EPO treatments were applied when common ragweed and green foxtail were 2 and 3 inches tall respectively. The PRE treatments received 1.53 inches of rain during the first 2 weeks after treatment (WAT) and provided 85 and 99% late season control of ragweed and foxtail respectively (Table 1). The EPO Liberty ATZ and Basis Gold plus Clarity treatments provided 95% or better control of both species. Grain corn yields for these three treatments averaged 140 bu/A (Table 1) and there were no significant differences among them. The untreated check yielded only 75 bu/A.

At Valatie, the EPO treatments were applied when common lambsquarters and giant foxtail were 1 and 2 inches tall respectively. The PRE treatment received 3.45 inches of rain the first 2 WAT and controlled 100 and 99% of the lambsquarters and foxtail respectively (Table 2). The EPO Liberty ATZ treatment provided 95% lambsquarters control but only 77% foxtail control. Finally, the EPO Basis Gold plus Clarity treatment controlled 100 and 90% of the lambsquarters and foxtail respectively. Although some giant foxtail broke through the EPO programs late in the season, this foxtail did not affect grain corn yields. Yields for the PRE and EPO treatments averaged 142 bu/A (Table 2) and there were no significant differences among them. The untreated check yielded 101 bu/A. These two experiments reinforce the fact that

Table 1. Weed control ratings and grain corn yields with PRE and conventional and herbicide-resistant POST weed control programs in Liberty Link corn at Aurora in 2000.

	Rate	When	Control (%)		Yield
Herbicides	Amt/A	Appl.	Ragweed	Foxtail	(Bu/A)
Bicep Lite II Mag + Prowl	1.5 qt 3.6 pt	PRE PRE	85	99	141
Liberty ATZ + AMS	2.5 pt 3.0 lb	EPO EPO	97	97	140
Basis Gold + Clarity*	14 oz 2.0 oz	EPO EPO	96	99	139
Untreated	-	-	0	0	75
LSD (0.05)			3	1	17

* Applied with 1% (v/v) COC and 2% (v/v) 28% UAN.

Table 2. Weed control ratings and grain corn yields with PRE and conventional and herbicide-resistant POST weed control programs in Liberty Link corn at Valatie in 2000.					
	Rate	When	Control (%)		Yield
Herbicides	Amt/A	Appl.	Lambs	Foxtail	(Bu/A)
Bicep Lite II Mag + Prowl	1.5 qt 3.6 pt	PRE PRE	100	99	140
Liberty ATZ + AMS	2.5 pt 3.0 lb	EPO EPO	95	77	142
Basis Gold + Clarity*	14 oz 2.0 oz	EPO EPO	100	90	143
Untreated	-	-	0	0	101
LSD (0.05)			5	8	13

* Applied with 1% (v/v) COC and 2% (v/v) 28% UAN.

Gold plus Clarity and the MPO and LPO Roundup Ultra only treatments provided excellent weed control. There were no significant differences in grain corn yields among the PRE, EPO, and MPO treatments. Table 3 shows there was a difference between the yield with the MPO (149 bu/A) and LPO (134 bu/A) Roundup Ultra only treatments. The untreated check yielded only 34 bu/A. These results again demonstrate that each of these weed control programs can perform well. With the PRE program this means having adequate rainfall for herbicide activation. For the POST program this means timely application. If Roundup Ultra was applied in a timely fashion, (EPO or MPO), there was no yield advantage to tank mixing a residual herbicide (Bullet) with it. These results are similar to those obtained during the past 3 years.

PRE and EPO weed control programs can provide good to excellent weed control and similar yields.

Roundup Ready Experiments

Roundup Ready corn, DK520RR, was planted May 5, 2000 at Aurora. The experiment included a PRE application of 4 qt/A of Bullet, EPO applications of 2.7 qt/A of Bullet plus 2 pt/A of Roundup Ultra, 14 oz/A of Basis Gold plus 2 oz/A of Clarity, and EPO, MPO, and LPO applications of 2 pt/A of Roundup Ultra alone. The EPO treatments were applied when corn was in the V2 stage and common ragweed and green foxtail were 1 and 2 inches tall respectively. MPO and LPO applications were made when corn was in the V4 and V7 stages of development respectively. Ragweed had 10 leaves and foxtail was 5 inches tall at the LPO timing. The PRE treatment received 3.06 inches of rain the first 2 WAT and provided 70 and 77% late-season ragweed and foxtail control respectively (Table 3). Similar weed control ratings were obtained with the EPO Bullet plus Roundup Ultra and Roundup Ultra only treatments. The EPO Basis

Table 3. Weed control ratings and grain corn yields with PRE and conventional and herbicide-resistant POST weed control programs in Roundup Ready corn at Aurora in 2000.					
	Rate	When	Control (%)		Yield
Herbicides	Amt/A	Appl.	Ragweed	Foxtail	(Bu/A)
Bullet	4.0 qt	PRE	70	77	140
Bullet + Roundup Ultra*	2.7 qt 2.0 pt	EPO EPO	70	73	141
Basis Gold + Clarity**	14 oz 2.0 oz	EPO EPO	97	99	145
Roundup Ultra*	2.0 pt	EPO	75	70	147
Roundup Ultra*	2.0 pt	MPO	94	95	149
Roundup Ultra*	2.0 pt	LPO	99	99	134
Untreated	-	-	0	0	34
LSD (0.05)			7	6	14

* Applied with 2 lb/A AMS or **1% (v/v) COC and 2 lb/A AMS.

Nutrient Management

Phosphorus and Agriculture VI: Identifying a Soil P "Source Factor" for the New York P Index

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New York is currently developing a P Index to assist in nutrient management decisions on agricultural fields. This sixth article on P and agriculture describes the use of soil P data to quantify a soil P source factor for the P Index. Previous articles in this series examined the underpinnings of environmental concerns over agricultural P, the principles of soil P chemistry, factors affecting non-point source P pollution, the National P Project and the New York P Index.

As discussed in the fifth installment of this series (What's Cropping Up? 10, 3: 4-5), the P Index employs a variety of site-specific factors to rank fields by their potential for P loss to a water body. These factors include source factors that affect the availability of P at the field; and transport factors that control the movement of available P from the field to the water body. Because soil P plays a large role in determining the availability of P to runoff, it is one of the most frequently mentioned and heavily scrutinized source factors.

Soil P – how much is too much?

The focus on developing a soil P factor for the P Index has been "how much soil P is too much?" Specifically, can we identify soil P concentrations above which P loss from soil to runoff increases substantially? Two approaches, one based on crop response and one on water quality criteria, have been used to address this question.

The Agronomic Approach

The first approach establishes agronomic soil P recommendations as environmental standards. In New York, for instance, Cornell University has assigned an agronomic threshold of 40 pounds Morgan's P per acre to distinguish between soils that are "High" and "Very High" with respect to crop requirements. Using the agronomic approach, 40 pounds per acre Morgan's P would become the P threshold for all soils in New York State. The crop response approach is based on the rationale that soil P in excess of crop requirements is vulnerable to removal by surface runoff or leaching. Since agronomic guidelines already exist for soil P, this approach requires little investment in research and can be readily implemented. However, there is little science to support this. A major problem with unilaterally equating agronomic and environmental standards is that processes controlling plant uptake of soil P are quite different from those determining soil P release to runoff.

The Water Quality Approach

The second approach to determining how much soil P is too much, the water quality approach, requires correlation of soil P with direct measurement of P in runoff or ground water so that water quality standards can be related to soil P. In the Netherlands, soil P serves to guide agricultural P management and is based upon research linking soil P with groundwater P concentrations. The National P Project takes a similar approach, developing relationships between soil P and P in surface runoff for benchmark U.S. soils.

The Soil Chemical Behavior Approach

As an offshoot of the water quality approach, New York is adopting a third approach to quantifying the potential for soil P to enrich runoff, a soil chemical behavior approach. This approach relates P sorption in soils (soil chemical behavior) to indicators of runoff available P. By relating the amount of P that is sorbed by a soil to the amount of soluble P in that soil, it is possible to quantify the potential of soils with a certain P content to release P to water. The advantage of this approach is that it relies upon laboratory analysis of soils and does not demand the additional resources and effort required of runoff studies. As a result, large numbers of soils can be analyzed quickly to quantify soil-specific trends in runoff available soil P. Ultimately, research from the National P Project is needed to validate conclusions derived this approach.

Delaware County P project

To develop the soil chemical behavior approach, we conducted a study in Delaware County, New York on soils that are typical of the glaciated Appalachian Plateau soils of the Southern Tier (Kleinman et al., 2000). Fifty-nine samples, collected from agricultural soils across the county were analyzed for Morgan's P, Mehlich-3 P and calcium chloride ($CaCl_2$) extractable P. Morgan's and Mehlich-3 P may be considered agronomic indicators of "sorbed P." Calcium chloride extractable P is considered a surrogate for runoff P (water extractable P has also been used toward this end). By plotting Morgan's P against calcium chloride extractable P (Figure 1), we were able to quantify the relationship between Morgan's P and a soil's potential to enrich runoff with P. In the process, we found that the relationship was non-linear and that a threshold could be identified at a Morgan's P concentration of 32 lbs per acre, above which the potential for soil P to enrich runoff increased in a statistically significant fashion. A similar threshold was identified when Mehlich-3 P was plotted against calcium chloride extractable P (Figure 2). This threshold occurred at a

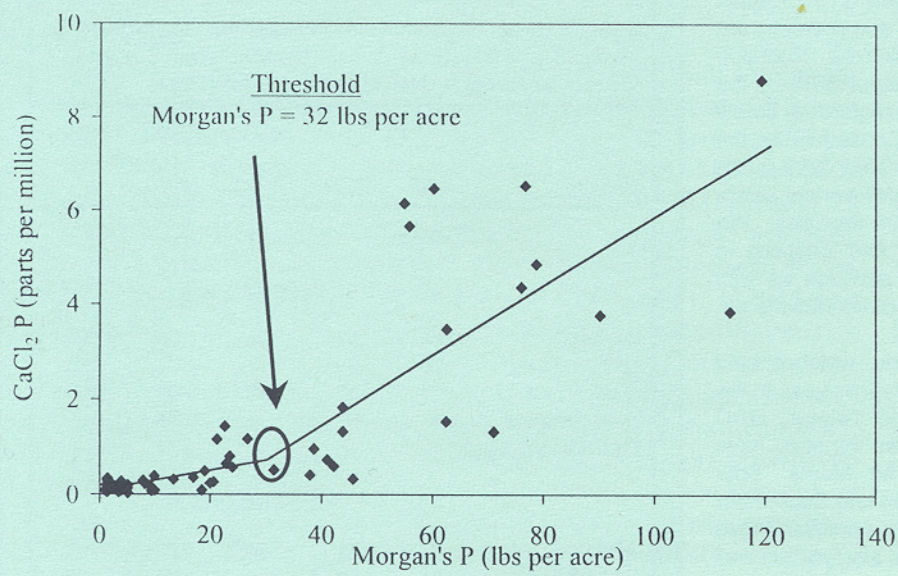

Figure 1. Relationship between Morgan's P and CaCl$_2$P obtained from Delaware County soils.

Mehlich-3 P value of 282 lbs per acre. These results confirm the preliminary findings of the National P Project, shown in the fourth installment of this series (What's Cropping Up? 10, 2: 2-3), that the relationship between soil P and runoff P is not only soil-specific but also tends to be non-linear. It is the non-linear nature of these relationships that allows soil P thresholds to be identified.

Relating the Delaware County results to the P Index

The methods employed in the Delaware County study will serve as the basis for quantifying the soil P source factor in the New York P Index. To make this factor soil-specific, a large sampling study has been conducted in cooperation with crop consultants across New York State.

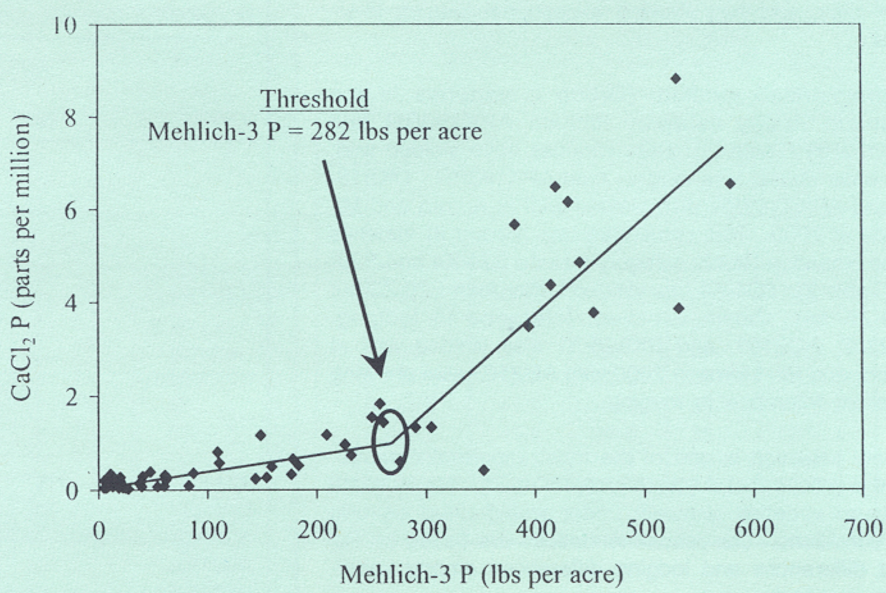

Figure 2. Relationship between Mehlich-3P and CaCl$_2$P obtained from Delaware County soils.

Soil chemical behavior relationships will be quantified for all soils and used to develop soil-specific, soil P source factors in the New York P Index. Notably, because there are many factors affecting P transport (seeWhat's Cropping Up 10, 1: 2-3), it is important to keep in mind that the specific soil P threshold values identified in the Delaware County study do not necessarily correspond to critical limits in the P Index. In the next article, the revised P Index source factor will be presented.

Relevant Literature

Kleinman, P.J.A., Bryant, R.B., Reid, W.S., Sharpley, A.N. and Pimentel, D. 2000. Using soil phosphorus behavior to identify environmental thresholds. Soil Science 165:943–950.

Crop Management

Recommended Soybean Varieties for Central and Western New York

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New York farmers planted 170,000 acres of soybeans in 2000, a record acreage. Soybeans typically do not require starter fertilizer (provided that soil test P and K values are high), N fertilizer, or insect control in New York. Roundup Ready soybeans, which represented about 80% of the acreage in New York in 2000, only require a timely Roundup application for weed control. Consequently, the most important management practice in New York is the soybean planting operation, which includes variety selection, planting date, row spacing, and plant densities. We evaluate soybean varieties annually at two locations in central and western New York, which provides us with New York data to base our variety recommendations on.

Recommended early (Group 0) varieties, which should represent about 20% of the acreage in a typical year, in the non-Roundup Ready category include Telstar, OAC Bayfield, and Sentry (Table 1). All three varieties have consistently yielded well at Aurora and Mt. Morris. Soybean growers, who wish to plant wheat in late September after soybean harvest, should seriously consider these varieties. OAC Stratford and OAC Oxford also yielded well at Aurora and Mt. Morris in 2000.

Recommended medium (Group I) varieties, which should represent about 60% of the acreage in a typical year, in the non-Roundup Ready category include APK184 and S19-90 (Table 1). APK184 usually has a slight edge in yield over S19-90, but S19-90 shows less lodging. S19-79 is a new Group I variety, which also yielded well and showed good tolerance to lodging. The recommended late (Group II) variety, which should represent about 20% of the acreage in a typical year, in the non-Roundup Ready category is S25-35 (Table 1). S25-35 has yielded well at both sites, and has showed exceptional lodging tolerance.

Recommended medium (Group I) varieties in the Roundup Ready category include APK190RR and APK183RR (Table 2). Both varieties have yielded well, and have shown less lodging than APK198RR. DKB19-51 and APKX186RR also yielded well at Aurora and Mt. Morris in 2000. Recommended late (Group II) varieties in the Roundup Ready category include S24-K4 and S20-Z5 (Table 2). S24-K4 has yielded better than S20-Z5 but S20-Z5 has shown excellent tolerance to lodging. AG2302, AG2103, and DKB26-51 also yielded well at Aurora and Mt. Morris in 2000 with AG2103 also showing excellent tolerance to lodging.

Variety selection is one of the most important management practices that soybean growers make. We evaluate soybean varieties annually under well-drained uniform soil conditions. Our recommendations are based on the yield differences and lodging differences among varieties in our tests.

Table 1. Yields of recommended early (Group 0), medium (Group I), and late (Group II) non-Roundup Ready soybean varieties at Aurora and Mt. Morris in 1999 and 2000.

	AURORA		MT. MORRIS		MEAN
Variety	1999	2000	1999	2000	
	------------	------bu/acre	------	------------	
		Early (Group 0)			
Telstar	28	57	78	65	57
OAC Bayfield	28	55	71	71	56
Sentry	29	55	76	64	56
OAC Stratford	-	57	-	70	-
OAC Oxford	-	55	-	71	-
		Medium (Group I)			
APK184	35	54	84	72	61
S19-90	31	52	82	74	60
S19-79	-	54	-	65	0
		Late (Group II)			
S25-35	41	54	82	64	60

Table 2. Yields of recommended medium (Group I), and late (Group II) Roundup Ready soybean varieties at Aurora and Mt. Morris in 1999 and 2000.

	AURORA		MT. MORRIS		MEAN
Variety	1999	2000	1999	2000	
	------------	------bu/acre	------	------------	
		Medium (Group I)			
APK190RR	32	55	83	62	58
APK143RR	33	54	80	58	56
APK198RR	33	52	81	-	-
DKB19-51	-	47	-	62	-
APKX186RR	-	48	-	61	-
		Late (Group II)			
S24-K4	35	50	92	72	62
S20-Z5	30	49	87	66	58
AG2302	-	49	-	70	-
AG2103	-	47	-	71	-
DKB26-51	-	53	-	64	-

Food Grade Soybean Varieties

Crop Management

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The Food and Drug Administration (FDA) in October, 1999 proclaimed that products that contain 6.25 g of soybean can carry labels claiming the health benefits of the product. Consequently, we anticipate increased acreage of food grade soybeans in the coming years. We initiated food grade variety trials at Aurora and Mt. Morris in 1999 because we anticipate that the demand for food grade soybeans will increase greatly.

Vinton 81, a late Group I/early Group II variety developed in Iowa, has been the standard food grade variety, especially for the organic tofu market, because of its high protein content, large seed, and other favorable food grade characteristics. Vinton 81, however, yields significantly less and lodges more than most other soybean varieties with similar maturity. Table 1 compares the yield and protein content of several food grade varieties, developed in Iowa, with Vinton 81. IA2041, a variety that matured 2 days later than Vinton 81, averaged 5 bu/acre more in yield in 1999 and 2000 compared with Vinton 81 (Table 1). Of equal importance, IA2041 averaged 41.5% protein compared with 40.1% for Vinton 81 (Table 1). IA2041 also showed less lodging than Vinton 81 in both years of testing (data not shown). IA2034 and HP204, varieties that also matured 2 days later than Vinton 81, averaged 3 bu/acre more in yield with about the same protein content as Vinton 81. IA2034 also showed slightly less lodging but HP204 showed slightly more lodging when compared with Vinton 81 (data not shown). IA2041 had slightly smaller seed size, whereas IA2034 and HP204 had similar seed size as Vinton 81 (data not shown). Unfortunately, we were unable to compare other food grade characteristics, such as tofu making ability, of these varieties with Vinton 81.

In conclusion, some newly developed food grade varieties yield more than Vinton 81 and have similar or somewhat higher protein percentages. Unfortunately, all of the food grade varieties yielded about 5 bu/acre less than standard check varieties (data not shown). Also, the food grade varieties mostly had less emergence and more lodging when compared with standard check varieties (data not shown). Consequently, we recommend that soybean growers contract for a significant premium if they decide to grow food grade varieties.

Table 1. Yield and protein content of food grade soybean varieties at Aurora and Mt. Morris in 1999 and 2000.

	YIELD					PROTEIN				
	AURORA		MT. MORRIS		AVG.	AURORA		MT. MORRIS		AVG.
Variety	1999	2000	1999	2000		1999	2000	1999	2000	
	bu/acre					%				
IA2041	35	47	84	61	57	41.5	42.2	41.6	40.5	41.5
IA2012	32	51	80	61	56	38.1	39.0	38.6	38.6	38.6
IA2040	35	49	73	68	56	38.4	38.5	38.5	37.7	38.3
HP204	35	49	73	64	55	41.2	40.7	39.5	39.0	40.1
IA2034	37	48	74	60	55	40.8	41.2	40.3	39.1	40.4
IA2042	37	48	73	60	55	40.8	39.5	39.6	38.7	39.7
Vinton 81	33	44	75	56	52	41.2	40.4	40.1	38.8	40.1

Calendar of Events

March 13	Field Crop Industry Meeting, Holiday Inn, Waterloo, NY
June 7	Small Grain Management Field Day, Musgrave Research Farm, Aurora, NY
June 24-27	Northeastern Branch ASA-SSSA Annual Meeting, University of Rhode Island, Kingston, RI
July 6	Weed Science Field Day, Valatie Research Farm, Valatie, NY
July 13	Aurora Field Day, Musgrave Research Farm, Aurora, NY
July 17	Weed Science Field Day, Musgrave Research Farm, Aurora, NY
July 18	Weed Science Field Day, Thompson Research Farm, Freeville, NY
Oct. 21-25	ASA-CSSA-SSSA Annual Meetings, Charlotte, NC

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, 144 Emerson Hall, Cornell University, Ithaca, NY 14853.**

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