What's Cropping Up?

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How to Select an Alfalfa Variety

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Alfalfa varieties with a fall dormancy rating of 1, 2, 3, or 4 are suitable for NY growing conditions, and there are just over 200 such varieties listed on the "Fall Dormancy & Pest Resistance Ratings for Alfalfa Varieties 1999/00 Edition" from the Alfalfa Council (http://www.alfalfa.org/falldormancy.html). Currently, 97 varieties (not all of these are on the ratings list) are being tested in the Cornell Alfalfa Yield Trials.

Yield

The first thing to do in selecting a variety is to start with the varieties that have been tested in yield trials in NY for more than one growing season and more than one location, and have at least average yields. In other words, start with the 97 varieties that are in the Cornell Alfalfa Trial Report.

It is important to remember when looking at a table of yield trial data, that there is always a group of varieties that are high yielding. Just because there is a variety listed at the top of the table, it is probably not significantly higher in yield than the five or more varieties listed below it. The way to figure out how many varieties are in the top group is to take the yield of the top variety and subtract the LSD (least significant difference). This value marks the end of the top group. For example if Variety A yields 110% of the checks and the LSD is 5%, then the range of the top yielding group is 110-105%. If the LSD is small, than the trial data are acceptable. If the LSD is large (>10), then some environmental stress like drought, disease, deer damage, etc, affected the trial and likely affected the ranking of the varieties in the trial. For example, when a trial is damaged by winter-kill, the yield data are informative about variety winterhardiness, but not necessarily about yielding ability under normal conditions.

Trials in NY are generally harvested for 3 production years. For the first production year, yield differences among the varieties are often not statistically significant. However, by the third production year, the yield differences among the varieties often are large and statistically significant. Thus be aware of what production year the yield data are from.

If you are interested in looking at alfalfa variety yield data from other states, the following web site has links to other states: http://genes.alfalfa.ksu.edu/Resources/yields.html

Disease Resistance

Most of the varieties in the NY trials have adequate disease resistance for bacterial wilt, Verticillium wilt, anthracnose, and Phytophthora root rot. However, cross out the varieties that have less than a R (resistant), or HR (highly resistant) rating for bacterial wilt, Verticillium wilt, and Phytophthora root rot, and have less than a MR (moderate resistance) to anthracnose. We are not aware of any need for resistance to Fusarium wilt or Aphanomyces root rot in NY. If you plan to plant in late summer, it would be nice to have a variety with resistance to Sclerotinia, but there are very few varieties with this resistance. Also, it would be nice to have varieties resistant to Rhizoctonia, spring black stem, and leaf spot, but at this time such varieties are not commercially available.

Potato Leafhopper Resistance (PLH)

We have had PLH-resistant varieties in trials in NY since 1997. The PLH-resistant varieties planted that year at two locations have been lower in yield than conventional varieties when PLH are not present. However, when PLH are a problem, the resistant varieties have less PLH damage and yield more than the conventional unsprayed varieties. In 1998 and 1999 we planted the second-generation PLH-resistant varieties. In 1999, under severe drought conditions and within both insecticide treated plots and untreated plots, the resistant varieties were not significantly lower in yield than the susceptible varieties. Although further testing is needed, especially testing in a non-drought year, is appears that the newer PLH-resistant varieties are yielding better than the first PLH-resistant varieties marketed in NY.

Even though varieties are available that are resistant to PLH, you can still find a low number of PLH on a resistant variety. In a year with normal moisture, a low number of PLH would not reduce yields. However in 1999, just a few PLH on the resistant varieties reduced yields in contrast with resistant varieties that had been sprayed with insecticides.

See How to (p. 7)

Nutrient Management

Phosphorus and Agriculture IV: The National Phosphorus Project

Peter Kleinman, USDA-ARS; University Park, PA; Andrew Sharpley, USDA-ARS, University Park, PA; Ray Bryant, Dept. of Crop & Soil Sciences, Cornell; and Shaw Reid, Dept. of Crop & Soil Sciences, Cornell.

The loss of phosphorus (P) from agricultural lands and its subsequent transfer to surface waters has focused attention on agricultural P management. This fourth article on P and agriculture describes the ongoing efforts of the National P Project. Previous articles in this series examined the underpinnings of environmental concerns over agricultural P, the principles of soil P chemistry, and factors affecting non-point source P pollution.

A Collaborative Effort

The USDA-Agricultural Research Service (ARS) is coordinating the National P Project, which is a nation-wide initiative aimed at providing a scientific basis for defensible P management strategies that protect water quality. The National P Project represents a consortium of Federal and State agencies, as well as land grant universities, with collaboration in over 20 states. In this article, we report on the collaboration between ARS and Cornell. The Project has two immediate objectives: (1) identify soil P thresholds for water quality; and, (2) construct a P indexing tool to define critical source areas of P exported from watersheds. These objectives are expected to culminate in the development of cost-effective, integrated nutrient management strategies that target remedial activities on areas specifically at risk of P loss.

Soil P thresholds for water quality

The first objective of the National P Project is to identify soil P thresholds for water quality protection. This objective builds upon the relationship between soil P and runoff P concentrations described in previous articles of this series and illustrated in Figure 1. Given an understanding of this relationship, it is possible to use water quality standards to identify thresholds in soil P, above which the potential for P loss in runoff increases. Because the relationship between soil P and runoff P is influenced by soil mineralogy, texture, pH, and organic matter content, it is decidedly soil specific. Consequently, the National P Project seeks to quantify soil P/runoff P relationships for a wide range of benchmark soils.

In New York State, the National P Project is collecting data to describe the relationship between soil P and runoff P for dominant agricultural soils. To do this, portable rainfall simulators (Figure 2) are being used to generate runoff from 2 m^2 runoff plots established on soils with a wide range of soil P concentrations. The project relies on runoff generated by rainfall simulators, rather than by natural rainfall, in order to control potentially confounding variables such as rainfall intensity and uniformity. Extensive research has been conducted to ensure that the simulated rainfall closely matches the intensity, drop size and energy of natural rainfall. Raining on soils in the field, rather than collecting the soils and conducting indoor runoff studies, ensures that results more closely represent actual field conditions. As part of this research, the project is also examining which soil testing methods provide the best estimate of runoff loss potential.

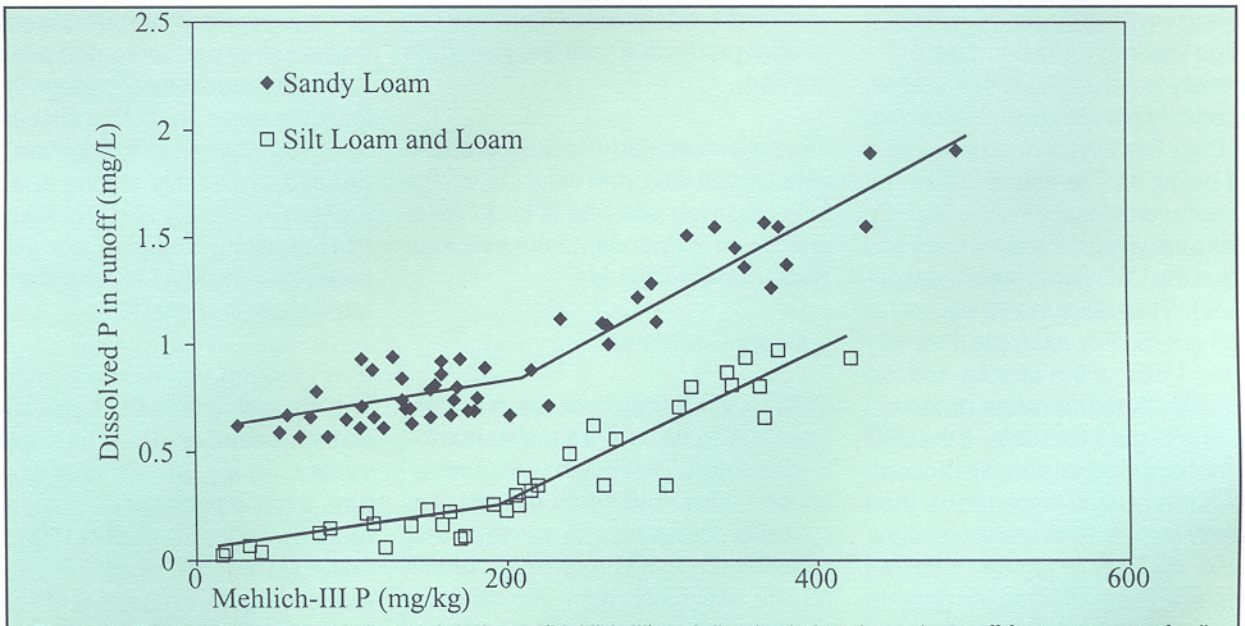

Figure 1. Relationship between soil test phosphorus (Mehlich III) and dissolved phosphorus in runoff for two groups of soils with similar mineralogy but differing textures. The National P Project is collecting data to quantify these relationships for a variety of dominant agricultural soils.

The P Index

The second objective of the National P Project is to develop an indexing tool that assesses and ranks the risk of P loss from specific sites. This tool builds upon a P Index already developed by ARS and USDA-Natural Resources Conservation Service (NRCS) for nutrient management and planning strategies. Information on soil P thresholds will be an integral part of the index. The refined index will provide a more reliable user-oriented tool to identify critical sources of P loss to P-sensitive waters, and thereby facilitate targeting of remedial strategies. The P Index will be described in detail in the next article of this series.

Integrated Nutrient Management

The National P Project will incorporate the results of the threshold initiative and the P index initiative to develop an integrated nutrient management decision-making process that can be applied at a watershed scale. The process will be tested on a variety of farms to assess its practical merit. For example, Penn State Cooperative Extension, ARS, NRCS, and nutrient management consultants are applying a refined P index to ten farms across Pennsylvania. A nutrient management plan, which includes P, has been developed for each farm, and feedback from planners and farmers will be used to refine the index where appropriate. A similar project is currently being developed for Delaware County as part of the New York City Watershed Agriculture Program. Results from these projects will provide more reliable user-oriented tools to identify critical sources of P loss, facilitate targeting of remedial strategies, and meet nutrient management goals. It is envisioned that integrated nutrient management will result in areas of the watershed or farm being managed for P and other areas for N, based on site-specific risks for P and N loss in runoff.

Project Outcomes

This research will provide defensible recommendations for nutrient management based on threshold soil P holding levels and source areas of P transport. Use of the modified P index will also allow greater flexibility in managing P to protect water quality in a way that is more economically viable and predictable than using a threshold soil P approach alone. Project outcomes will meet critical needs of NRCS and EPA as they develop guidelines for nutrient management planning to utilize manure and protect water quality.

Acknowledgements

The authors wish to thank the following individuals for their contributions to the National P Project in New York State: Barbara Bellows (Cornell); Shawn Bossard (Cornell); Karl Czymmek (Cornell); Fred Gaffney (NRCS); Larry Geohring (Cornell); Tammo Steenhuis (Cornell).

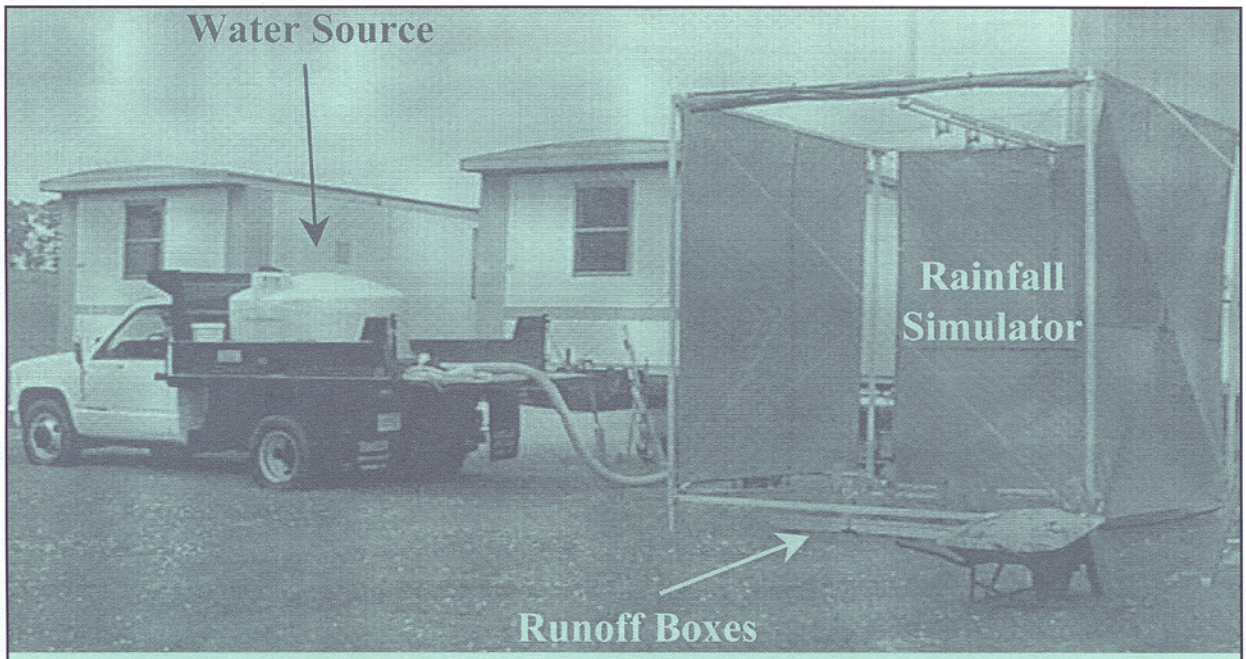

Figure 2. The National P Project rainfall simulator is used to rain on two adjacent 1 x 2 meter runoff plots. Because the simulator is portable, it can be used to rain on a wide range of soils, with variable soil P content. Data collected from this approach are used to develop relationships such as those shown in Figure 1.

Weed Management

Effect of Residual Herbicides and Timing of Roundup Ultra on Weed Control and Soybean Yields

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Roundup Ready® soybeans, which were commercialized in 1996, met or exceeded the expectations of 90% of the U.S. growers surveyed following that inaugural season. The popularity of this new technology has increased steadily in the 3 years since and will likely remain high. One thing that might cause the acreage of Roundup Ready® soybeans to stabilize or decline is the public debate about genetically modified organisms. This issue is of perhaps greater concern in the Midwest, where many of the soybeans enter national and international trade channels, than here in the Northeast where most of the beans are used locally in livestock feed.

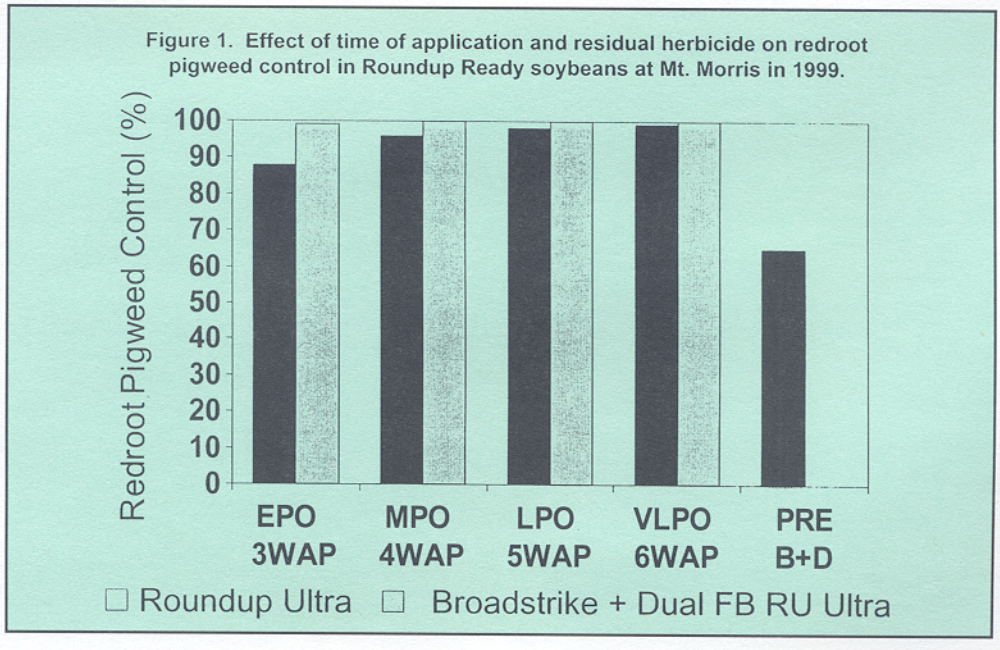
Although Roundup Ultra is most often used alone in this region, manufacturers of other soybean herbicides have been, and will continue to suggest that residual herbicides are needed in Roundup Ready programs. They recommend the application of a preemergence (PRE) herbicide followed by a postemergence (POST) application of Roundup Ultra or Touchdown or recommend tank mixing other herbicides with Roundup Ultra or Touchdown to provide residual weed control.

Timing and Residual Effects

Field experiments were conducted near Aurora, NY in 1998 and near Mt. Morris, NY in 1999 to investigate the effect or timing on a total POST program with Roundup Ultra alone and to provide additional information on the contribution, if any, residual herbicides might provide in Roundup Ready control programs. In each case, Roundup Ultra at 1 qt/A was applied alone and following a PRE application of 2.25 pt/A of Broadstrike + Dual, 3, 4, 5, and 6 weeks after planting (WAP). There was also a PRE Broadstrike + Dual only treatment and an untreated check in each experiment. In addition to different weed populations and soils (Mt. Morris has much higher yield potential) at the two locations, there was also a major difference in rainfall for activation of the PRE herbicides. In 1998 the PRE applications received about 1.5 inches of rain during the first week after application. On the other hand, rainfall was less than 0.25 inch during the first week after application in 1999. As a result, the PRE treatments did not provide adequate weed control in 1999.

Of greatest interest in these two different growing seasons were the influence of application timing and the presence of a PRE herbicide on soybean yields. In 1998 at Aurora, the four PRE Broadstrike + Dual treatments followed by sequential Roundup Ultra applications 3,4, or 5 WAP averaged 36 bu/A which was not significantly greater than the 34 bu/A from the PRE Broadstrike + Dual only treatment. The Roundup Ultra only treatments applied 3,4, or 5 WAP averaged 37 bu/A. It was only when application was delayed until 6 WAP, when the soybeans were 18 inches tall and velvetleaf was 12 inches tall that a slight yield reduction (6 bu/A) resulted with the Roundup Ultra only treatment.

Figure 1. Effect of time of application and residual herbicide on redroot pigweed control in Roundup Ready soybeans at Mt. Morris in 1999.



1999 Results

At Mt. Morris in 1999, velvetleaf and redroot pigweed were the dominant weeds. Although there was only 0.42 inch of rain during the 3 WAP, the PRE application of Broadstrike + Dual controlled about 65% of the redroot pigweed

(Figure 1). When PRE applications of Broadstrike + Dual were followed by sequential POST Roundup Ultra applications 3, 4, 5, or 6 WAP, redroot pigweed control was 99 or 100%. Redroot pigweed control was 88, 96, 98 and 99% respectively when Roundup Ultra was applied alone 3,4,5, or 6 WAP. Velvetleaf control with the PRE application of Broadstrike + Dual alone was only 17% and averaged 96% when PRE applications of Broadstrike + Dual were followed by sequential POST applications of Roundup Ultra 3,4,5 or 6 WAP (Figure 2). Finally, when Roundup Ultra was applied alone 3,4,5 or 6 WAP velvetleaf control averaged 94%.

Soybean yield from the PRE Broadstrike + Dual only treatment was 20 bu/A (Figure 3). Yields from the four PRE Broadstrike + Dual treatments followed by sequential POST Roundup Ultra applications 3,4, or 5 WAP averaged 75 bu/A while those with Roundup Ultra applied alone, 3,4, or 5 WAP averaged 72 bu/A. As in 1998, it was only when Roundup Ultra only application was delayed until 6 WAP, when soybeans were 16 inches tall and velvetleaf pigweed about 24 inches tall that a significant yield reduction (17 bu/A) occurred.

As a result of these and other experiments, the use of a PRE residual herbicide is not currently recommended for annual weed control with Roundup Ready® soybeans. If growers are using this technology to suppress/control difficult perennial weeds, it may be helpful to suppress annual weeds with a reduced (one-half) rate of a residual herbicide program PRE and then time the Roundup Ultra application for maximum effect on the perennial species. For broadleaf perennials, such as horsenettle, this would be at the bud stage and beyond. Such sequential Roundup Ultra application would also control escaped annual weeds.

Figure 2. Effect of time of application and residual herbicide on velvetleaf control in Roundup Ready soybeans at Mt. Morris in 1999.

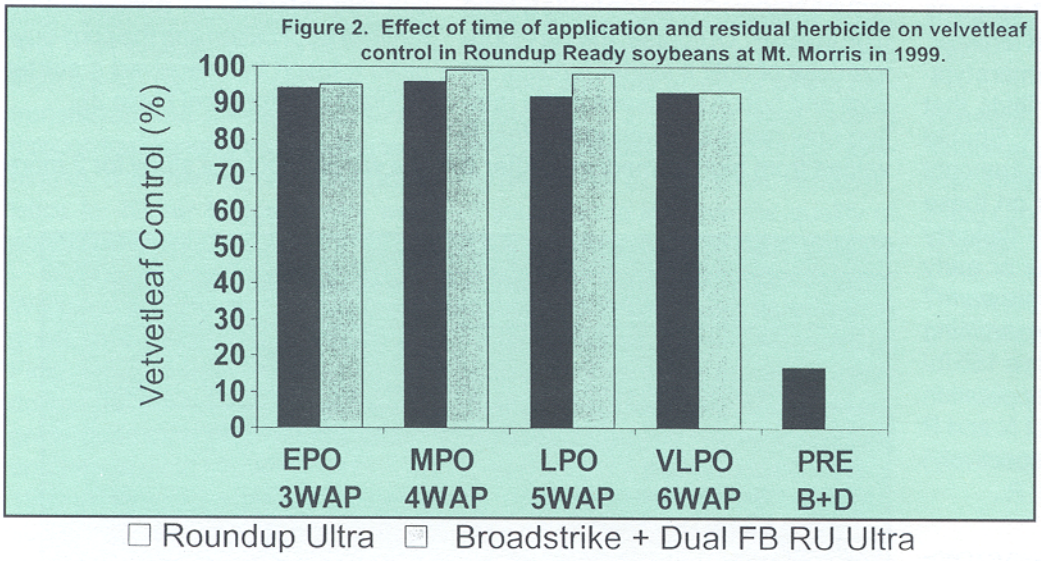
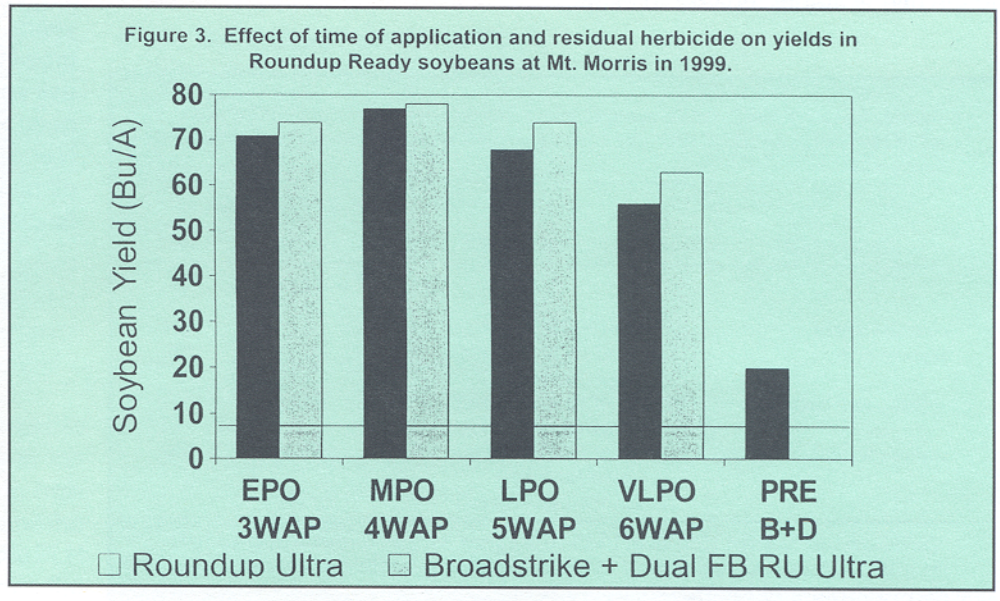


Figure 3. Effect of time of application and residual herbicide on yields in Roundup Ready soybeans at Mt. Morris in 1999.



Crop Management

Soybean Fertilization

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New York farmers will plant 150,000 acres of soybeans in the year 2000, almost 4 times the 40,000 acres planted in 1990. Soybeans usually follow corn in the rotation, a crop that receives liberal amounts of N, P, and K fertilizer. Consequently, New York farmers typically plant soybeans into fields that test medium-high to high in P. Should soybean producers use a small amount of starter N and P fertilizer on these fields, especially since they typically plant soybeans in late May or early June when soil temperatures are warm? We initiated a study in 1999 examining the response of soybeans to a 155 lb/acre (14 gallons of 10-34-0) application of a liquid starter fertilizer of N and P (about 15 and 55 lbs/acre, respectively) on fields testing high in soil P .

The 1999 growing season was exceptionally warm and dry so yields were exceedingly low (Table 1). Soil test P values were high to very high, averaging 22 lbs/acre in one experiment and 42 lbs/acre in the other experiment (Table 1). We did not see a response to the use of starter fertilizer in either experiment. The lack of response could be attributed to the warm soil temperatures at planting, the low yields, or perhaps because soybeans do not require starter fertilizer on fields testing high in soil P. Of course, the very long-term use of only a starter fertilizer on corn and not on soybeans in the rotation may result in lowering soil test P values from high to medium. After 6 years in a separate continuous corn vs corn-soybean rotation study, however, soil test P and K values did not differ between a continuous corn rotation that received an annual starter fertilizer application and the corn-soybean rotation that received a starter fertilizer only for corn(Table 2).

We will conduct this study for 2 more years, hopefully under more favorable growing conditions. In the meantime, ask yourself the question. Do I really need to add a small amount of starter N and P fertilizer to my soybeans if I'm planting in late May or early June on fields that test high for soil P?

Table 1. Soybean yields in two experiments under different inoculum and starter fertilizer combinations at the Aurora Research Farm in 1999.

Treatment Combinations	YIELD Experiment I*	Experiment II*	Mean
	----------bu/acre----------		
Starter Fertilizer (18-34-0)	31	24	28
Hi-Stick + Starter Fertilizer (18-34-0)	32	23	28
Cell-Tech + Starter Fertilizer (18-34-0)	30	25	28
Cell-Tech	30	25	28
Check	32	21	27
Hi-Stick	31	22	27
LSD 0.05	NS	NS	NS

*Soil test P averaged 42 lbs/acre.
*Soil test P averaged 22 lbs/acre.

Table 2. Soil test P and K values, averaged across moldboard plow and chisel tillage, in the fall of 1991 and in the fall of 1997 after 6 years under four rotations with different starter fertilizer use.

ROTATION	STARTER FERTILIZER*	SOIL P 1991	SOIL P 1997	SOIL K 1991	SOIL K 1997
		----------lbs/acre----------			
continuous corn	250 lbs of 10-20-20 (annual)	8	12	86	104
soybean-corn	250 lbs of 10-20-20 (corn) none (soybean)	8	13	88	102
soybean-corn-corn	250 lbs of 10-20-20 (corn) none (soybean)	9	12	84	100
soybean-wheat/clover-corn	250 lbs of 10-20-20 (corn) none (soybean) 200 lbs of 6-24-24 (wheat)	8	12	84	106

*Continuous corn received 1500 lbs of 10-20-20 in 6 years, soybean-corn-corn received 1000 lbs of 10-20-20, soybean-corn received 750 lbs of 10-20-20, and soybean-wheat/clover-corn received 500 lbs of 10-20-20 and 400 lbs of 6-24-24.

How to (from p. 1)

In the presence or absence of PLH, the resistant varieties have higher forage quality (i.e., higher protein and lower fiber) than the susceptible varieties. The PLH resistance was developed from a wild species of alfalfa and was transferred into conventional alfalfa through traditional plant breeding techniques. It seems that plant characteristics for higher forage quality were also transferred.

We used a computer-modeling program called FORVAL (Wilkens and Fick, 1988) to estimate hay value in dollars per acre. This computer program combines both forage quality and forage yield into one number. In 1999 at Harvest 2 when the PLH were above threshold, the unsprayed PLH-resistant varieties always had lower value per acre than the sprayed PLH-susceptible varieties. However, the difference in value was similar to or less than the cost of applying insecticides.

We think there is a place on NY farms for PLH-resistant varieties, particularly as the breeders continue to improve the PLH-resistant varieties for yield and disease resistance. For now, the best place to plant PLH-resistant varieties is on that field next to the woods where you always have to spray for PLH, or on that field that is next to your in-laws house or at a difficult spot to spray, or on that rented piece of ground that is 10 miles away from the farm.

Keep in mind that you may need to spray a PLH-resistant variety in the seeding year if the PLH are in high numbers, or if you planted late and the seedlings are very small when the PLH arrive with the warm winds from the south.

Forage Quality

Most if not all of the companies selling alfalfa varieties have one or more varieties that have higher protein and lower fiber than conventional varieties. It has been our experience in NY that the protein and fiber levels of alfalfa harvested on a 3 cut, 5-6 week cutting interval have the optimum forage quality needed for a dairy ration. However, if you need to improve the quality of your ration by lowering fiber, then the alfalfa varieties developed with lower fiber levels may be useful to you. The other scenarios where alfalfa varieties with lower fiber would be useful are on fields that are usually cut last and are often past the 1/10th bloom stage, or if you plant your alfalfa with a grass.

At Cornell, alfalfa varieties are being developed with more digestible fiber rather than less fiber, and with higher pectin concentrations. It is expected that these types of alfalfa varieties would add more available energy to the ration. These types of alfalfa are still in the research phase.

If you like multileaf alfalfa varieties, certainly there are some multileaf alfalfa varieties that have higher forage quality. However, not all multileaf alfalfa varieties are higher in forage quality. Be sure to look at any available forage quality data.

Summary

There are many very good alfalfa varieties on the market that are being tested in NY. Pick one or more varieties based on the alfalfa attributes that most fit your needs and on yield data from at least second production year trials, preferably from third production year trials.

References

Wilkens, P.W., and G.W. Fick. 1988. FORVAL: A computer program using chemical analyses and market data to price hay. J. Agron. Educ. 17:122-127.

Hansen, J., J. Miller-Garvin, K. Waldron, and D. Viands. 1997, 1998, and 1999 New York State Dairy and Field Crops Project Reports Relating to IPM.

Calendar of Events

June 13, 2000	Small Grain Field Day, Aurora, NY
June 18-21	Northeastern Branch ASA and SSSA Annual Meeting, Newark, DE
July 5	Cornell Weed Science Field Day, Valatie, NY
July 7	Aurora Farm Field Day, Aurora, NY
July 11	Cornell Weed Science Field Day, Aurora, NY
July 12	Cornell Weed Science Field Day, Freeville, NY
August 12-16	American Phytopathological Society Meeting, New Orleans, LA
August 16-17	NYSABA Summer Tour, Hudson Valley
October 24	Field Crop Dealer Meeting, Clifton Park, NY
October 25	Field Crop Dealer Meeting, New Hartford, NY
October 26	Field Crop Dealer Meeting, Batavia, NY
October 27	Field Crop Dealer Meeting, Waterloo, NY
November 1-3	Northeast Division of American Phytopathological Society Meeting, Cape Code, MA
November 5-9	ASA-CSSA-SSSA Annual Meeting, Minneapolis, MN

What's Cropping Up? is a bimonthly newsletter distributed by the Department of Soil, Crop and Atmospheric Sciences 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 subscribe, send a check for $8.00 along with the form at the right.**

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