Improve Soybean Yields through Attention to Genetics, Planting Practices, and Pest Management

by Bruce Erickson

Soybeans have the potential to yield more than 100 bu/A, but few farmers have been capturing those types of yields. To those in a corn/soybean rotation, which includes most Midwest crop producers, shoring up the soybean end of production is a key part of the profit equation.

"Today, many farmers struggle with soybean yields, and question even if soybean should be included in their future crop rotation," said Palle Pedersen, Iowa State University Soybean Extension Specialist, speaking last week at both the Illinois and Indiana Certified Crop Adviser continuing education programs. Pedersen thinks that this supposed "yield barrier" is largely the result of an oversimplified management system that has been possible in our corn production systems, but taking this approach to soybean production limits yield potential.

Most farmers have yet to capture the full yield potential of soybeans (USDA).

Pedersen feels that variety selection is a good example of what is often a series of decisions that is not taken seriously enough by the farmer. Variety selection is the foundation of a successful management plan. Although weather conditions cannot be predicted during the growing season, selecting the right variety can help minimize weather-related risks. "But despite the importance, variety selection is often the least considered management decision a farmer makes each year," said Pedersen.

Pedersen contends that variety selection for soybeans is more complicated than for corn. The criteria for selecting corn varieties are yield, maturity, and post-emerge herbicide program. If one adds deciding whether or not varieties have European corn borer and rootworm resistance, there are still only five major selection criteria. There is at least double that number for soybean including yield, lodging, maturity group, resistance to soybean cyst nematode, sudden death syndrome, brown stem rot, Phytophthora, post emergent herbicide program, and grain composition. "Finding varieties that match field conditions can be extremely difficult. Many, therefore, give up and ask others who don't always understand the field to select their varieties."

Another factor is that many believe that planting date for soybean is not as important as it is for corn, but Pedersen says that is not the case. There is a yield benefit for planting early despite cold soil temperatures that slow plant growth during the seedling phase. The yield response is a result of increased seasonal canopy photosynthesis, greater number of nodes, more rapid crop growth rate during seed filling, increased length of the reproductive period, and greater seed filling rate.

Row widths and correct seeding rates are other profit opportunities for growers, but the vast majority of Eastern Corn Belt farmers already plant soybeans in rows narrower than 30 inches. Many farmers have cut soybean seeding rates, a response to increased seed costs in recent years. New Iowa seeding rate recommendations to be announced this winter are about 20% lower than previous recommendations. According to Pedersen, growers maximizing returns should aim to finish with at least 100,000 plants/A at harvest, regardless of row spacing. Protecting stands with seed treatments has resulted in more uniform stands in their tests, but fungicide/insecticide seed treatments have not provided a consistent yield

advantage and are currently not recommended. More research is underway to see if it will pay to use a seed treatment as insurance in conjunction with using low seeding rates.

Before 2005 it was rarely cost-effective to treat soybeans in-season for any pest or other anomaly, but the soybean aphid has effected fundamental changes in how farmers view pest control in soybeans.

"The soybean aphid, a native of Asia, has been in the Midwest since 2000 and has quickly become the most serious pest of soybean in much of Illinois, Indiana, and Michigan," noted Christian Krupke, Purdue University Extension Entomologist, speaking to the Indiana CCA group. As with many aphids, the soybean aphid has a complicated life cycle that requires the presence of its overwintering host the buckthorn, common in many parts of the Midwest. The ability of the aphids to travel long distances, though, means that aphids can spread over a wide area quickly if conditions are right.

And once on soybeans, female aphids produce live, female offspring (clones) without eggs during the summer months. The potential for rapid spikes in aphid populations makes timely detection and treatment of the aphid "a must" for soybean growers.

Soybean aphids on the back side of a soybean leaf (Purdue University).

The soybean aphid uses sucking needle-like mouthparts to extract plant juices. If aphid numbers per plant are large, this feeding may reduce plant vigor and growth rates, as well as cause leaf puckering, reduced pod/seed counts, and ultimately reduced yield. Aphid damage is exacerbated by other stressors on the plant, such as drought. Stressed plants are, in turn, more favorable hosts for aphids, resulting in increased reproductive rates. Aphid "honeydew", a waste product produced during feeding, promotes the development of gray, sooty mold on leaf surfaces and reduces the photosynthetic capacity of plants. Yield losses from 10% to 15% have been reported in past years.

Scouting for aphids is time consuming, partially because finding and counting the tiny aphids can be difficult. But Krupke and his colleagues at Purdue and other Midwest universities are testing the potential of a new "speed scouting" method. "This method still uses the previously-determined threshold of 250 aphids per plant. However, the number of plants surveyed is lower and thus treatment decisions can be made more quickly," said Krupke.

The Illinois and Indiana CCA conferences provide continuing education for Certified Crop Advisers, the agronomic professionals that serve the technical crop production needs of growers and agribusiness. Along with other soybean production experts, Drs. Pedersen and Krupke will be speaking at next summer's Top Farmer Crop Workshop, to be held July 16-19, 2006.

For more information:

Soybean Management at Iowa State:
http://www.soybeanmanagement.info

Soybean Aphid Biology and Control:
http://www.entm.purdue.edu/Entomology/ext/targets/e-series/EseriesPDF/E-217.pdf

Speed Scouting for Soybean Aphids:
http://www.soybeans.umn.edu/pdfs/2005aphid/speedsampling_blank.pdf