Right Variety Equals High Yields

Consider These Issues When Planting Soybean In Non-Irrigated Fields

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Agronomic applied production research conducted by Dr. Eric Walker, USDA-ARS Research Agronomist of Jackson, Tenn., was the topic of a recent discussion.

"The upper MidSouthern region of the United States, specifically the western portions of Tennessee and Kentucky, and some areas in northern Mississippi, consist of rolling uplands and highly erodible soils," he explained. "Much of this area is non-irrigated. In fact, over 99 percent of the soybean acreage in Tennessee is non-irrigated, so our research is conducted on non-irrigated sites as well. Over the last four years, we've examined soybean planting dates, maturity groups (MG), row spacings, and seeding rates as factors that may be optimized to maximize and stabilize soybean yields in our region."

USDA-ARS Research Agronomist, Dr. Eric Walker, of Jackson, Tenn. discussed the topic of agronomic applied production research.
Photo by John LaRose, Jr.

Concerning planting date, Walker stated that May remains the optimum time to plant soybean in the upper MidSouth, a fact that has been verified by research conducted periodically in this region throughout the last century.

"Still, it is important to re-evaluate soybean planting date and other agronomic factors from time to time to ensure that our practices are best for current soybean varieties and production practices," he added.

Although MG IV and V soybean varieties are most common in the upper MidSouth, Walker's research shows comparable yields among MG III, IV, and V varieties, while MG II varieties provided less consistent, and often lower, yields. However, Walker pointed out that MG III varieties do not perform as well on upland, droughty soils, so if MG III varieties are to be planted in the upper Mid-Southern United States, they should be placed in more productive fields.

"Although more water may be available during the reproductive period of MG III varieties than MG IV and V varieties, according to 30-yr average monthly rainfall data, rainfall occurrences from year to year that make up the 30-year average monthly precipitation totals are variable, and this year to year variability in rainfall patterns makes trying to match a given maturity group's reproductive period to predicted periods of sufficient rainfall a risky practice," he said. "This is what we've tried to do with MG III varieties in this region. While we can't predict when our rains will come in relation to our crop's water needs for the season, we can say with some assurance that July and August will be two of our hottest months, and it is during this time that seeds of MG III varieties are maturing. This combination of seed maturation, extremely hot temperatures, and high humidity has caused significant seed quality problems in MG III varieties grown in our area."

Because the use of MG III varieties is relatively new to this region and the knowledge base is small compared to MG IV and V varieties that have been grown successfully in the region for a longer period of time, Walker is more comfortable utilizing MG IV and V varieties on the majority of acres in this area, and advises that producers who want to try MG III varieties do so on a small number of acres initially.

Walker emphasizes that the most important consideration concerning variety selection is yield.

"The best thing that you can do aside from sound production practices is to always use proven varieties with the highest yield potential," he said. "Do as much research on this as you can, beginning during the winter until you order soybean seed. Look at university variety trials and talk to Extension personnel and seed representatives. If possible, select varieties that produced among the top yields for a couple of years. If you can plant a variety that has been a repeat top performer in yield, and especially if the environment in which the variety was tested is similar to your farm, you will be ahead. Look at each variety's disease package, and give special consideration to diseases that you are likely to encounter that can't be controlled with a foliar fungicide. You can do everything else right, but if you don't select the best varieties to plant, you will give up yield, and you can't make up for it."

From 2005 through 2007, Walker compared MG III, IV, and V soybean planted on 15- and 30-in row spacings.

"Regardless of MG, the narrower row spacing produced higher yields than the wider row spacing in two out of three years by an average of 5 bu/ac, but remember that this is small plot research at optimum field sites," said Walker. "Over a range of sites, including uplands and droughty areas, the advantage may be less. In 2007, we experienced severe drought, and there was no yield difference between 15- and 30-in row spacing, and dry conditions have produced similar results in others' research. Over time, however, most research, including ours, has shown that if one has the ability to plant in rows spaced 20 inches or less apart, there is more potential for increased yields due to more equidistant plant spacing."

Soybean seeding rate has been Walker's most difficult research to summarize because, often, the results are not practical for production. Walker explained, "In years with below average rainfall, particularly years of drought, we have produced top yields with seeding rates ranging from 60,000 to 200,000 seeds per acre. However, when rainfall is sufficient throughout the season, consistent high yields are produced by seeding rates that give a final population of about 100,000 plants per acre, although populations much lower than this can produce equal yields. If our seeding rates will give us 100,000 plants per acre at harvest in a normal year, then we are set for maximum yields if we receive sufficient rainfall. If rainfall is not sufficient during the year, we should still produce yields optimum for the conditions that we face."

The reason for equal yields from final stands of 60,000 and 100,000 plants per acre is that soybean plants in the lower population produce more branches and branch pods than the plants in the higher population. When Walker studied pods per plant, the number of main stem pods per plant were similar from plants of both populations, but the plants from the lower population had many more branch pods than the plants in the higher populations. Overall, total number of pods per acre were similar for the lower and higher populations.

Despite comparable yields among low and high soybean plant populations, Walker cautions against planting at very low seeding rates.

"Soybean has a tremendous ability to compensate for low populations, but rather than regularly relying upon this ability for providing our yields in all years, we should regard this compensatory ability as insurance against bad situations," he said. "By targeting around 100,000 plants per acre at harvest, we set ourselves up to capitalize on seasons with sufficient rainfall and optimum growing conditions. We also provide our crop with resiliency in seasons with severe environmental or pest stresses that reduce stands, and we can take some comfort in the fact that our crop can compensate for the reduced stand by producing more branch pods and maintaining yield. In contrast, if we plant at a low seeding rate, such as 80,000 seeds per acre, we may limit our yields in seasons with sufficient rainfall and optimum growing conditions. Planting at a low seeding rate also removes some of the crop's ability to compensate for reduced stands in seasons where environmental or pest conditions decrease plant populations, resulting in reduced yield."

So what seeding rate will produce 100,000 plants per acre at harvest?

"For MG IV and V soybean varieties, a seeding rate of 150,000 seeds per acre should result in at least 100,000 plants per acre at harvest," Walker said. "Due to the potential for fewer nodes per plant in MG III varieties planted in the upper MidSouth, at least 120,000 plants per acre at harvest may be necessary for optimum yields, so a seeding rate of 180,000 seeds per acre should be used.

"These seeding rates should also provide resiliency against early-season environmental or pest conditions that reduce stands, and as long as your stand is uniform, the crop should compensate for these conditions and still produce optimum yields for the growing conditions."

Although there are formulas available, Walker's research has indicated that by harvest, one-fourth to one-third of the seeds that you plant will not be present as a harvestable plant. This loss is due to a combination of a lack of germination and emergence and in-season plant death caused by disease, insects, competition, and other stresses.

In summary, Walker's research over the last four years has supported the following points for soybean production in non-irrigated fields of the upper MidSouthern United States:

- Choose the best proven variety, preferably a MG IV or V, possible for your situation, with high germ and vigor and a good disease package.
- Apply a fungicide seed treatment and consider an insecticide seed treatment especially if planting early.
- Base seeding rate on desired final stand. Assuming that you will lose one-third to one-fourth of the seeds that you plant, plant 150,000 seeds per acre of MG IV and MG V varieties to achieve 100,000 plants per acre at harvest. Plant 180,000 seeds per acre of MG III varieties to achieve a final population of 120,000 plants per acre.
- Soybean planted in May produces the most consistent high yields. Often, yields significantly decline with plantings past early June.
- Soybean planted on narrow rows (row spacings of 20 inches or less) frequently produces higher yields than soybean planted on wider rows. Δ

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