AGRONOMY RESEARCH BRIEFS #2

Crop Rotations-Part 1

Have you ever wondered what's the benefit of crop rotations in terms of grain yield?

We have had so many crop rotation studies across the state it is difficult to know where to start! Let's look at sorghum studies.

At the Cornbelt Experiment Field in northeastern Kansas, results of a five-year study from the early 1980s looking at continuous sorghum compared to a sorghum-soybean rotation provide us some compelling information. In this study, five nitrogen (N) fertilizer rates (0, 40, 80, 120, and 200 lb N/a) were imposed on the continuous sorghum and the sorghum in the sorghum-soybean rotation. There was an advantage for having soybeans in the rotation. Averaged over all the fertilizer treatments, there was a 17 bu/a advantage for sorghum after soybeans compared to continuous sorghum. But at the 0 N rate there was a 37 bu/a advantage for the sorghum in the sorghum-soybean rotation compared to the continuous sorghum (79 bu vs. 41 bu). Also, an item of particular note is the fact that with continuous sorghum the 120 lb N /a rate was required to equal the 40 and 80 lb N/a in the sorghum after soybean rotation.

At the North Central Experiment Station, results of an 18-year study comparing continuous sorghum to a sorghum-soybean rotation provide us similar results. In this study, four N fertilizer rates (0, 30, 60, 90 lbs N/a) were imposed on the sorghum of both rotations. Averaged over all fertilizer treatments, there was a 23 bu/a yield advantage for sorghum in the sorghum-soybean rotation over continuous sorghum. At the 0 N rate, the rotated sorghum was 32 bu/a higher than the continuous sorghum (75 bu vs. 43 bu) and the continuous sorghum yields increased with each incremental increase in N rates. However, rotated sorghum increased yields only up to the 60 lb N/a rate. At the 90 lb N/a rate, rotated sorghum had a 12 bu/a yield advantage over the continuous sorghum (92 bu vs. 80 bu). Because continuous sorghum yields were increasing up to the 90 lb N/a rate, four additional N rates were added to the study (120, 150, 180, and 210 lb N/a) six years ago. Averaged over all N rates, rotated sorghum yielded 16 bu/a more than the continuous sorghum. And just like the previous 18-year average, the six-year average indicated the rotated sorghum peaked out at 60 lb N/a and the continuous sorghum peaked out at 90 lb N/a. One point of interest is that the rotated sorghum reached mid-bloom approximately 7 days before the continuous sorghum.

What's the bottom line?
Sorghum in the sorghum-soybean rotation produced higher yields than it did in continuous sorghum. Thus, one would think the nitrogen from the soybeans provided that yield boost. (You remember the old rule of thumb, one pound of nitrogen credit for every bushel of soybeans produced.) But if that's the case, why didn't the yields of continuous sorghum at the higher nitrogen rates ever catch up to the yields of rotated sorghum? So, there's more to the "rotation affect" than just a nitrogen credit. What is it then? There are several possible factors, in addition to the nitrogen credit, that contribute to the rotation affect and they include: breaking disease, insect, and weed pressures and soil moisture differences. Whatever the factors are for the rotation affect, the bottom line is there is a benefit for crop rotations.

For more details about these studies see:
Kansas Fertilizer Research 1985. P. 77-78. K-State Report of Progress 488.
Field Research 2001. P. 60-61. K-State Report of Progress 876.

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