Corn Talk News

RESEARCH UPDATE

CORN TALK NEWS
PENNSYLVANIA MASTER CORN GROWERS ASSOC., INC.

TILLAGE AND CROP ROTATION EFFECTS ON CORN YIELDS

Greg Roth

A recent study published in the Journal of Production Agriculture by M. G. Lund, P. R. Carter, and E. S. Oplinger evaluated the effects of two tillage systems — no-till and moldboard plowing — and crop rotations (continuous cropping, corn/soybean, wheat/soybean/corn, and soybean/wheat/corn) on the growth and yield of corn wheat and soybeans.

The study showed that continuous cropping reduced yields of corn by 10 percent and soybean by 15 percent compared to when the crops were in rotation. Generally, yield reductions because of continuous cropping were greatest under no-till.

The effects of rotation and tillage were less consistent on wheat as the effect varied from none in one year to a 36 percent reduction in another. With wheat, the tillage influence on the rotation effect was less consistent — in some years the tilled plots were most affected and in another year when Septoria and leaf rust diseases were severe, no-till treatments were more affected by continuous cropping.

Corn yields were similar in each of the three rotation sequences except for no-till corn after wheat, where yields were reduced by 6 percent. The authors suggest that the same allelopathic factors that reduce yields of corn following rye may cause the yield reductions following wheat, since the early season corn was about 8 inches shorter than the no-till corn following soybeans. In this study, the straw from the wheat was not baled or removed and this may have increased the potential for allelopathic effects.

This study did not show any difference in soybean yields for a one- or two-year rotation. Some previous research has shown a benefit from increasing the time between soybeans in the rotation to more than just one year, but the authors suggest it may need to be more than two years as they had in this study to be significant.

In summary, the study did not show any consistent improvement in corn and soybean yields by going to a three-year rotation, including wheat.

In Pennsylvania, the advantages of wheat in a rotation may be greater than in this study for several reasons:

- In southeast Pennsylvania, wheat yields are not reduced by late planting following corn and soybeans as much as they are in Wisconsin.
- In some areas, soybeans can be double cropped with the wheat, adding to the profitability of the wheat.
- Control of perennial weeds in no-till programs can be successful following wheat harvest.

NITROGEN MANAGEMENT OF UREA-AMMONIUM NITRATE SOLUTION (UAN) IN NO-TILL CORN

Greg Roth
Doug Beegle

A common problem with surface applications of urea-containing fertilizers such as urea and UAN solution is the potential for a significant loss of N from the fertilizer by volatilization.

The results of a three-year study designed to evaluate the effect of application timing and method of liquid nitrogen (UAN) to corn was recently published in the Journal of Production Agriculture. The study was performed by Richard Fox and William Piekielek, from the Department of Agronomy at Penn State.

In this study, UAN applications were made either at planting or at sidedressing. The at-planting treatments were either dribbled or sprayed on. The sidedress applications were dribbled between the rows or injected.

All except the injected treatments were applied with one of three urease inhibitor treatments — none, ammonium thiosulfate, or an experimental compound called NBPT. Urease inhibitors, if effective, should inhibit ammonia volatilization losses from surface applied urea fertilizer.

The three-year average results showed that injecting UAN at sidedressing produced the most yield (129 bushels/acre) and spraying UAN at planting the least (114 bushels/acre). The dribble at planting (121 bushels/acre) and the dribble sidedress yields (124 bushels/acre) were intermediate.

The study indicates that to obtain the highest yields, producers should consider applying N at sidedressing in either a band or injected application.

About one-half of the studies in the literature have shown a response to injecting UAN at sidedressing, while the others have shown no benefit compared to banding.

In this case, assuming $2.50/bushel corn, the 5-bushel-per-acre advantage with injecting would have been profitable.

Of the two inhibitors evaluated, NBPT and ammonium thiosulfate, NBPT was the most consistent at increasing the efficiency of the fertilizer application. For UAN sprayed on at planting, there was a 7-bushel-per-acre advantage to adding NBPT. Unfortunately, NBPT is not yet commercially available.

There was no advantage in adding ammonium thiosulfate when spraying UAN. This is consistent with the findings of several other researchers. Neither of the inhibitors showed any advantage when applied in banded applications.

The researchers were also able to estimate losses from surface-applied urea applications. In the three different years of the study, they estimated 29, 11, and 27 percent loss from applying these fertilizers to the surface.

The losses in the first and third years occurred when there were four days between application and 0.4 inch of rain fell. In the second year, when the loss was smaller, there was only one day until 0.4 inches of rain fell.

The researchers recommend that the most efficient ways to apply UAN are to dribble or inject at sidedressing.