MANAGING UAN SOLUTIONS IN NO-TILLAGE CORN PRODUCTION

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Studies in many states over the past several years have indicated some type of inefficiency associated with broacasting N (nitrogen) as UAN (urea-ammonium nitrate) solution in no-tillage corn production situations. Broadcasting UAN has often given lower yields when compared to injected anhydrous ammonia or broadcast ammonium nitrate. Several theories have been proposed to account for this inefficiency, including volatilization of the urea component of the UAN, immobilization of N during breakdown of crop residues, and increased denitrification in the surface layers of the no-till soil. While the exact mechanism or complex of mechanisms to account for the inefficiency are not fully characterized, it is apparent that the problems encountered are related to the no-till condition, because UAN normally performs quite well when broadcast over clean-tilled seedbeds.

Several methods for overcoming UAN inefficiency have been proposed including injection below the soil surface, dribbling in narrow bands on the soil surface, and split applications in which a significant portion of the N is applied after some residue decomposition has taken place. All of these systems are designed to reduce N-residue contact and have produced yields significantly higher than broadcasting in several experiments. However, few data exist to answer the question of whether one of these alternative systems produces higher yields than the others and should be recommended as the primary method for applying UAN to no-till corn.

Experiments were initiated in 1983 to evaluate several methods of UAN application to no-till corn grown under two residue conditions, cornstalks or soybean stubble. Sites were located on a drained Celina silt loam near Springfield in southwestern Ohio and on a Canfield silt loam near Wooster in northeastern Ohio. Both soils possess CEC's of approximately 10 meq/100 g and organic matter contents of approximately 2%. The drainage characteristics of these soils are such that no-till usually produces equal or greater yields than conventional systems.

Several UAN management practices were evaluated at each site by comparison to injected anhydrous ammonia. Broadcast UAN involved application of the entire rate at planting using a sprayer equipped with flat fan nozzles (similar to a "weed and feed"). Injection was accomplished using planter fertilizer openers running 4" deep and 6" to the side of each row at planting. Several surface dribble treatments were evaluated, including bands on 30" centers, 6" from each row, and bands on 60" centers, midway between every other row. Dribbling was accomplished by mounting metering orifices and drop tubes on the sprayer boom. Split applications consisted of broadcasting at planting followed by surface dribbling when corn reached the 4-leaf growth stage. Nitrogen was applied at rates of 200

lb N/A in cornstalks and 170 lb N/A in bean stubble in 1983, and at 150 lb N/A in all plots in 1984.

Weather was extremely dry in 1983, so dry at Springfield that interpretation of data was meaningless. Conditions were more favorable in 1984, though dry weaher was again noted at Springfield.

A summary of results is presented in Table 1. The data for "Dribbled" and "Split" treatments reflect averages of several methods of each; however these sub-methods did not produce significantly different yields and yields have been pooled to simplify data presentation. Check plots (No N) are included for reference but were not included in data analyses.

Data from Wooster in 1983 showed no difference in yield due to method of N application; however when UAN treatments were pooled and compared to ammonia, analysis showed generally higher yields for UAN. We speculate that this may be due to greater mobility of UAN-N in the soil when compared to ammonia, allowing for greater uptake under very dry soil conditions. Data from Wooster in 1984 showed no effect of N source or method of application under either residue condition.

Studies at Springfield in 1984 showed no difference in yields due to method or N source in soybean stubble. Broadcasting reduced yields in cornstalks but all other methods produced yields equivalent to ammonia.

These data are interesting to us from several standpoints. For one, we have not shown a definite advantage or disadvantage to any of the three alternative UAN management programs studied thus far, which would seem to allow a great deal of flexibility in UAN management for no-till corn in Ohio. Secondly, the data from these studies agree quite well with our earlier work showing that broadcasting UAN may not reduce yields when no-till corn is grown in soybean stubble on <u>well-drained</u> soils. Finally, it is apparent that the inefficiency associated with broadcasting UAN into heavier residue covers is not a constant problem, but is dependent upon climatic and site factors, an observation also made by other investigators.

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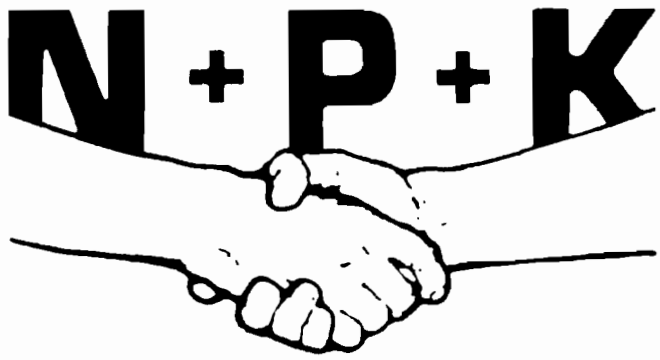

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