Program 2CR-2

Nitrogen Application For Irrigated Corn In The Mid - South – How Critical Is The Timing

Presented by Dr. M. Wayne Ebelhar
Research Professor and Agronomist, Mississippi State University

Nitrogen (N) management for many crops requires key decisions for most producers in the Mid-South. The decisions depend greatly on the crops being grown and the availability of water following application. With some crops such as cotton both too little and too much N can be detrimental to optimum yields. The form of N preferred by crops can also dictate the best source of N to use. For example, rice preferentially uses the ammonium form (NH4+) rather than the nitrate form (NO3-) thus ammonium sources would be a better selection than a nitrate source. Corn preferentially takes up nitrate and is able to do so for much of the growing season ranging from seedling emergence through tasseling. The actually timing of applications and the rates of application should fit the A4R=s@ of nutrient stewardship developed by the International Plant Nutrition Institute (IPNI). These 4R=s are the framework for fertilizer best management practices (BMP=s) and help to minimize pollution of surface and ground water from fertilizer or manure; supply nutrients to the plants when they are needed (increasing nutrient use efficiency [NUE]); build and maintain the physical, chemical and biological condition of the soil; and save money by reducing input costs and increasing production. The scientific principles of the 4R framework are the 1) Right Source applied at the 2) Right Rate based on soil nutrient supply and plant demand; applied at the 3) Right Time based on the dynamics of plant uptake, soil supply, nutrient loss risks, and field logistics; and applied in the 4) Right Place taking into consideration root-soil interaction and the movement of nutrients within and across the soil.

Corn production in the Mid-South has gained in popularity in the last 10 to 15 years and with the aid of irrigation has become quite profitable. With shifts in the infrastructure, on-farm storage and handling, and favorable prices, grain crops have surpassed cotton as the main crop. Both corn and soybean continue to produce record crops year after year. Due to early planting and the resulting early harvest, Mid-South producers are able to put new corn into the marketplace in late-July and early-August. With the implementation of on-farm drying, producers are getting the crop out earlier and with less harvest loss, again increasing profitability. Unlike cotton, corn yields are not generally reduced by excess N but applying more N than needed leads to lower profitability. Corn requires the highest N rates of the current crops being grown of those crops needing fertilizer N applications. In general, Mississippi recommendations call for 1.3 lb N/bu for each bushel of expected yield. Research in recent years has shown that with favorable weather conditions, far less N may be needed than pre-

viously thought, especially when corn is grown in rotation with soybean. Research with several cultivars in both 2012 and 2013 showed optimum yields with 180 to 210 lb N/acre and yields averaging near 250 bu/acre. Research has also shown that the cultivars vary in their responsiveness to N applications. Some of the earlier maturing cultivars tested have not shown as much response as the later maturing cultivars. The growing conditions in a given year exert a strong influence on yield potential. Cooler night-time temperatures favor higher yields in most years. Even though the central Mississippi Delta averages more than 53 inches of rainfall in a year, grain yields have been stabilized with irrigation in most years. In the last 15 years, 2014 was the first year where, in most areas, irrigation was not needed. Some areas received an irrigation followed shortly by rainfall negating the benefit of the irrigation or the rainfall.

Over the years, research at the Delta Research and Extension Center has focused on all aspects of N management including different sources, varying timing of applications, ratios of preplant to sidedress N, and most recently the benefits of pre-tassel N applications. Producers have inquired repeatedly about the possibilities of touching up yellow spots (N deficient areas) in corn fields by flying on urea. He practice has been used over the years where heavy rainfall or standing water has led to denitrification and N loss from the field. More producers have inquired about using the practice to push yields when conditions are favorable for higher yields. Both higher N rates and higher plant populations have been used to increase grain yields in twin-row production fields. The higher seeding rates have been more profitable than the higher N rates when examined in grower fields. While the practice of pre-tassel N application has been met with skepticism by some, research data over multiple years has shown significant responses to the practices when too little N was initially applied. Thus the results have shown that the plants continue to take up soil N through tasseling. The application of 20-40 lb N/acre applied as urea (46% N) has been the most beneficial rate. With higher N rates, >210 lb N/acre applied 50% prepant + 50% sidedress (V4-V5) little response has been shown.

Additional research is underway in an attempt to determine the amount of flexibility in the pre-tassel N application window. Applications could be made any time after the plants are too big through tasseling. Whether the timing can be related to growing degree days (GDD=s) is still under investigation. One must remember that the later applications require water to move the N into the roots system in order for it to be taken up into the plants. In non-irrigated fields, delaying the application until tasseling, could prove ineffective in relieving an N deficiency.

To summarize, it is important to get ample N into the plant to support vegetative and reproductive growth without having excess N that can be lost from the field. Following the 4R=s offers a fundamental management system to optimize yields and reduce the impact on the environment. Many systems can be effective depending on the year and what the environment has to offer.

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