EVALUATION OF ADDED NITROGEN INTERACTION EFFECTS IN IRRIGATED COTTON

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Nitrogen (N) is commonly a limiting factor in cotton (Gossypium spp.) production systems in the desert Southwest. Thus, supplemental N is nearly always added in the form of inorganic fertilizers to supply sufficient levels of N to meet crop needs. Due to the relatively inexpensive nature of N fertilizers in relation to total costs of production, amounts are often applied in excess of crop demands to insure adequate levels. There is concern that this practice can lead to low fertilizer use efficiencies and unnecessary increases in production costs. Strategies have been developed in an effort to increase fertilizer use efficiencies and to help producers reduce production costs and avoid potential environmental hazards commonly associated with excessive N fertilization. Nitrogen recovery efficiency (NRE) is often used to measure the efficiency of N fertilizer applications. The NRE is simply a ratio of the amount of fertilizer N taken up by the plant to the total amount applied. There are some inherent problems with the various methods used to calculate NRE, the cause of which are commonly associated with a phenomena known as added nitrogen interaction (ANI). The two most common methods for calculating NRE are the difference technique and the isotopic technique and ANI can have a different effect on both methods. The effects of ANI on the difference technique can lead to an over-estimation of the true value of the NRE due to the possibility of additional soil N being released and available for uptake by the plant with the application of fertilizer N. This is commonly referred to as a 'real ANI'. This can be attributed to an over-stimulation of the mineralization/immobilization processes in the soil due to the addition of fertilizer N. Isotopic determination of NRE can also be affected by an ANI. This commonly leads to an underestimation of the true value of the NRE. The under-estimation is a result of pool substitution. This occurs when added labeled N fertilizer stands proxy for unlabeled N in soil N transformations. These transformations render the added ^{15}N unavailable for plant uptake thus reducing the overall pool that can be recovered. This type of ANI is commonly referred to as an 'apparent' ANI due to pool substitution. The difference in NRE observed between the two methods indicates the extent of an ANI. A series of studies were conducted in 1996, 1997, and 1999 at the University of Arizona Maricopa Agricultural Center (MAC) to evaluate the ANI on the determination of NRE. The method employed was to compare NRE as calculated by the two different methods. Results from these studies demonstrated no significant differences between NRE calculated by the two methods in both 1996 and 1997. The data from 1999 has yet to be analyzed. Therefore no ANI, real or apparent, was observed in the field. These results indicate that the less expensive method of calculating NRE (difference technique) is sufficient for general purposes in irrigated cotton production systems in the desert Southwest.