Studies in North Carolina have shown that high plant populations lead to increased yield. Because ear size is determined by V6, good early growth is essential to obtain maximum ear size and yield. Recent research has shown that by combining a starter or popup fertilizer with management practices that increase early root growth, a larger root system can be developed that enhances early plant growth, resulting in larger ear size, better stress tolerance, less lodging, and greater yield.

However, there are no clear answers as to the best blend of nutrients for starter fertilizer or the best rate of starter to use. Even more questions have been raised as to the values of fertilizer additives.

The studies reported here were designed to answer these questions.

Yields by County Pamlico & Currituck. When data were combined across these two locations there were significant location, starter treatment, and starter rate effects.

The Currituck County site had a slightly greater yield (200.6 vs. 193.7 bu/A in Pamlico County) as shown in Figure 1. The plots at the Pamlico site were flooded by heavy rain shortly after emergence, resulting in the presence of the disease “Crazy Top.” This
contributed to the yield differences between locations. Differences among treatments with an additive added to 10-27-0 were small with only a 3 bu/A increase in yield.

The key difference among starter treatments occurred at the Pamlico location where 10-27-0 plus an additive resulted in a significantly higher grain yield compared with other treatments. Yield was increased by 10 bu/A when an additive was added to 10-27-0. The impact of the additive may have been enhanced by the cool, wet conditions at this site.

When the data were combined across locations, there were differences in yield among application rates for starter materials (Figure 2). The check treatment (no starter) had the lowest yield while the highest grain yield was achieved when 10 gal/A or more of the starter material was applied.

**Davidson.** The only significant differences at this site occurred among the control treatment and the high rates of 17-17-0 with or without an additive (Figure 3). While the two starter materials with potassium (K) did not improve yield, they did reduce the amount of stalk lodging observed in the field. The use of these materials in the furrow did impact the rate of plant emergence and this probably resulted in the lack of yield response observed with these materials.

**Perquimans.** A significant yield increase was observed between the plots receiving 12-12-4 alone and those where an additive was mixed with the 12–12-4 (Figure 4). The 11-bu/A yield increase observed at this location was similar to that observed in Pamlico County. This site (Perquimans) had the lowest soil test index for phosphorus (P) of any of the sites tested (P index of 37) and the starter material had less P compared to materials used at the other locations. The use of an additive in this situation may have increased the amount of P available to the crop.

**Treatments by County**

**Pamlico and Currituck.** Main treatments were 10-27-0, 10-27-0 plus an additive, 17-17-0, and 19-19-0 (at Pamlico location only). Each of these materials was applied using four application rates: 5, 10, 20 and 40 gal/A in a 2 x 2
band with the exception of the 19-19-0, which was applied in a deep band 8 inches below and 2 inches to the side of the seed.

**Davidson.** Main treatments were 17-17-0, 17-17-0 with an additive, 3-18-18, and 0-0-27. The 17-17-0 and 17-17-0 plus an additive were applied at 10 and 20 gal/A in a 2 x 2 band, while the 3-18-18 and 0-0-27 were applied at 10 gal/A in a furrow.

**Perquimans.** Main treatments were 12-12-4 and 12-12-4 plus an additive. These were applied at 20 gal/A in a 2 x 2 band.

At all locations 30 percent UAN was applied at layby at rates adjusted within each starter treatment to provide an N total of 180 lbs/A.

Dr. Heiniger is professor of crop science and cropping systems, College of Agriculture, North Carolina State University.