

Tillage and Irrigation Effects on Plant Available Nutrients in Peanut-Based Cropping Systems

W. H. FAIRCLOTH and D. L. ROWLAND; USDA/ARS
National Peanut Research Laboratory
Dawson, GA 39842.

Abstract

Much research has demonstrated the extent to which conservation tillage improves soil characteristics such as increased plant available water, increased carbon, decreased runoff, and increased infiltration to name a few. However, little work has examined the effect of tillage on nutrients in the soil, particularly plant available nutrients in a peanut-based cropping system. Ion exchange resin membranes, specifically Plant Root Simulator[®] (PRS) probes, (Western Ag Innovations, Saskatchewan, Canada) have been shown to be excellent indicators of the relative differences in plant available nutrients in a wide range of soils and environmental conditions. Four probes, 2 each cation and anion, were buried in the soil within a root exclusion cylinder for a predetermined length of time to measure nutrient flux as available to the crop. This sampling method was utilized in an existing study located near Dawson, GA during 2006. The study investigates the interaction of tillage (conventional, strip, none) with irrigation level (100, 66, 33, 0% of a recommended amount) in a peanut-cotton-corn rotation, with each crop present each year in three replicates. PRS probes were placed in each plot during May (corn), June (corn), and August (cotton) for a 14 d burial. Mixed Models ANOVA indicated a significant ($P=0.05$) main effect of tillage for Ca, K, P, Zn, and S. Irrigation was significant for each burial time for the following plant nutrients: total N, $\text{NO}_3\text{-N}$, $\text{NH}_4\text{-N}$, Mg, Fe, Mn, Cu, B, Pb, and Al. The interaction of tillage by irrigation was significant for Mn and Zn only. Plant available total N, $\text{NO}_3\text{-N}$, $\text{NH}_4\text{-N}$ were decreased in higher irrigation treatments due to leaching. However, those nutrients such as Ca, K, P, Zn, and S that showed significance due to tillage was due to increased availability in the strip-tillage plots as opposed to either no tillage or conventional tillage.