DEEP LIMING EFFECTS ON COTTON DEVELOPMENT AND ROOT GROWTH: A GREENHOUSE STUDY

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Abstract

Cotton (*Gossipium hiristum*) yields in the Virginia coastal plain are limited due to acid subsoils and hardpans, which restrict root growth, and sandy soils with low water holding capacity. The objective of this experiment was to determine if subsoiling or the combination of subsoiling and deep liming had any effects on nutrient uptake, root growth and penetration, and plant development.. Treatments were an untreated check, subsoiled to 24" only and subsoiled to 24" and limed with 1 ton/A applied to the subsoiled trench. Soil cores 12" in diameter and 32" deep were used for the test. Ninety days after planting, all the cotton plants were harvested. Both above ground biomass and rootmass were analyzed for nutrient content and dry weight. Rooting depth and taproot length were measured and approximate total root length was determined by the line intersect method using a root map. Root dry matter weight increased ($p<0.05$) for the subsoiled and limed treatment over the untreated check, 52 and 35 g/plant, respectively. Taproot length and maximum rooting depth were longer ($p<0.05$) in the subsoiled and subsoiled and limed treatments. An increase ($p<0.05$) in Cu, Mn, and Zn uptake in the rootmass of the subsoiled and limed treatment was observed. No difference in both macronutrient or micronutrient (other than Cu, Mn, and Zn) uptake was observed in either biomass or rootmass. The subsoiled and limed treatment had an effect on date of first flower over the untreated and subsoiled treatment. The number of days after planting till first flower was 70, 68, and 57 days for the untreated, subsoiled, and subsoiled and limed treatment, respectively. The relatively short time to first flower can increase the effective flowering period and thereby increase cotton yield. The number of bolls per plant was also higher for the subsoiled and limed treatment over the untreated and subsoiled treatments. The increase in rooting depth can help the cotton plant tolerate drought conditions, while increased micronutrient uptake can decrease deficiencies on the sandy soils of the Coastal Plain.

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