EVALUATION OF TILLAGE SYSTEMS IN NORTH CAROLINA PEANUT PRODUCTION

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RESEARCH QUESTION

Reduced tillage production is being viewed as a viable option by some peanut growers in the southern United States. However, peanut response to reduced-tillage practices has been inconsistent. Defining factors that affect response of peanut to varying tillage practices is important. The objectives of this research were do determine the effect of conventional and reduced tillage systems on peanut response to preplant fertilizer and mid-season gypsum applications.

LITERATURE SUMMARY

A variety of reduced tillage crop production systems are being evaluated in the southern United States. Although farmers who produce cotton and other row crops in reduced tillage systems would also like to produce peanut in this manner, they are reluctant to reduce or eliminate primary tillage for a variety of reasons. Moldboard plowing has been recommended for many years to reduce southern stem rot and other soil-borne diseases, to reduce weed populations, and to bury crop residue in an effort to prepare a clean and uniform seedbed that allows good seed placement. However, tillage practices are expensive and time consuming, and timing for tillage practices comes when growers are involved in many other farming operations. Research with reduced tillage systems in peanut have shown variable results. Research suggests that eliminating primary tillage practices such as disking or moldboard plowing can delay peanut maturity. Other research suggests that planting peanut into a killed cover crop with strip tillage equipment can lower insect infestations. The effect of tillage practices on disease reaction varies by pathogen and has not been conclusively determined. From an agronomic standpoint, fertilizer placement is important in maintaining yield and optimum market grades. Preplant fertilizer for peanut is often applied to the crop planted the year before peanut or it is incorporated throughout the soil profile using deep tillage in the fall or spring prior to planting peanut. Excessive amounts of potassium or magnesium can compete with absorption of calcium by developing pegs. Calcium is critical in kernel formation. Tillage systems that eliminate deep tillage such as chisel plowing or moldboard plowing make incorporation of fertilizer and lime throughout the soil profile more difficult. Additionally, existing residue my affect movement of supplemental calcium into the pegging zone. Research is needed to define how these factors affect peanut response to tillage systems.

STUDY DESCRIPTION

Field studies were conducted during 1997 and 1998 to compare pod yield, market grade, and gross economic value of peanut in conventional tillage systems compared with strip tillage systems. In one study, tillage treatments consisted of: 1) disk and bed; 2) disk, chisel plow, and bed; 3) disk, moldboard plow, and bed; 4) strip till into beds established the previous fall (stale seedbeds); 5) strip till into existing corn or cotton stubble; and 6) strip till into beds with a desiccated wheat cover crop. A PTO-driven Ferguson strip tillage implement was used at two locations. Subsoiling was included at one location. Also, a non-PTO-driven Ferguson strip tillage implement with in-row subsoiler and two crumblers was included at one location. Twelve to twenty inches of the row was tilled. In these experiments, preplant fertilizer [100 lb/acre potash or 150 lb/acre 5-10-10 (N, P_2O_5, K_2O)] was included as a treatment variable in each tillage system. In two experiments, fertilizer was applied in the spring prior to disk, chisel, and moldboard plow operations but following establishment of beds and the cover crop the previous fall. At the other location fertilizer was applied after moldboard

plowing. Gypsum was applied uniformly over the entire test area at peanut pegging. In a separate study, peanut response to supplemental calcium (0, 300, and 600 lb/acre gypsum) was evaluated in conventional till, strip till (non-PTO-driven Ferguson strip tillage implement described previously), and no-till (culter only) systems. Plot size was 4 rows (36-inch spacing) by 50 feet in both studies.

APPLIED QUESTIONS

How does tillage affect peanut response to preplant fertilizer applications?

Peanut response to tillage varied among locations and years. However, tillage systems did not affect peanut response to preplant fertilizer placement. Tillage systems did affect peanut pod yield and gross value independent of preplant fertilizer. Yield and gross value were generally lower in reduced tillage systems compared with conventional tillage systems on a sandy clay loam soil. This soil is in the Roanoke soil series and has a distinct and deep clay layer 6 to 10 inches below the soil surface. In contrast, yield and gross value in reduced tillage systems equaled or exceeded that of conventional tillage systems on a sandy loam soil in the Norfolk soil series. Subsoiling was included in studies on sandy loam soils but not on the sandy clay loam soil. On the sandy clay loam soils, where reduced tillage systems were less effective, compacted soil may have adversely affected peanut growth and pod development. These soils often are not subsoiled because of a distinct clay layer below the sandy clay loam top soil. Bringing clay particles and clods to the soil surface would interfere with harvesting and digging efficiency. However, more vigorous tillage within the pegging zone and above the clay layer may be needed on these soils in order to obtain yields comparable to conventional tillage systems. Additional research is needed to address this subject. These data suggest that tillage does not affect peanut response to preplant fertilizer. However, fertilizer at higher rates may have a different affect.

How does tillage affect peanut response to gypsum applications?

In the gypsum study, interactions among tillage systems and gypsum rates were not significant. Pod yield and gross value in conventional tillage systems equalled or exceeded that in the no-till and strip till systems. Although peanut generally responded to gypsum, response was independent of tillage systems. This suggests that peanut response to gypsum is similar in conventional, strip till, and no-till systems.

RECOMMENDATIONS

These studies suggest that additional research is needed to further define variables that affect peanut response to tillage systems. Variability in response was noted among locations, soil characteristics, and tillage systems. In these studies preplant fertilizer did not affect peanut yield or gross value. However, higher rates of fertilizer may have a different affect. The impact of subsoiling on soils with substantial clay content should be addressed. Results from these studies also suggest that peanut response to gypsum is independent of tillage systems. Collectively, these studies suggest that reduced tillage systems are a viable alternative to conventional tillage systems in some situations. Because digging is required prior to harvest, and because soil characteristics greatly influence efficiency of digging, growers should experiment with tillage systems on a fraction of their acreage before wide-scale expansion.

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