EFFECTS OF DEEP VERTICAL PLACEMENT OF LIME ON CORN AND SOYBEAN RESPONSE AND SOIL CHEMICAL PROPERTIES IN CONSERVATION TILLAGE SYSTEMS
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ABSTRACT

Midwestern claypan soils managed for corn (Zea mays L.) and soybean (Glycine max (L.) Merr.) production often have optimum surface pH for crop growth, but acidic subsoils. Stratification of soil acidity may inhibit root growth leading to decreased drought tolerance and grain yields. Lime applications can increase soil pH, improve soil structure and provide calcium and magnesium to the soil, but these amendments rarely affect the subsoil, leaving potential chemical and physical restrictions to root growth. The objectives of this study were to determine the effects of surface and deep vertical placement of lime at various rates on grain yield and subsoil characteristics for soils under corn and soybean production. Field trials were conducted from 2012 to 2016 in Northeast Missouri with treatments of lime broadcast to the surface soil or incorporated as a band to depths up 51 cm into the subsoil at 0, 3.4, and 6.7 Mg ha\(^{-1}\). Soil pH of the top 13 cm of soil was not affected by deep vertical lime placement but at depths of 13 to 25 cm soil pH were increased by up to 0.6 and 0.7 units from deep vertical placed lime at 3.4 and 6.7 Mg ha\(^{-1}\) respectively. When compared with control treatments, deep vertical placement at 3.4, and 6.7 Mg ha\(^{-1}\) significantly increased subsoil pH at depth of 13 to 25 and 25 to 38 cm, respectively one year after application. Deep vertical placement treatments at 6.7 Mg ha\(^{-1}\) continued to increased subsoil pH at 13 to 25 cm depths by a 6.5 and 5.7 percent two and three years after application respectively. No differences in soil pH were observed 38 to 51 cm deep in the soil profile. In dry years, deep vertical placement of lime significantly raised corn yields for some plots. However, in years with adequate moisture, deep vertical placement treatments did not result in yield increases for corn or soybeans.