Response of Cotton to P and K Soil Fertility Gradients in North Carolina

Authors: Carl R. Crozier, Bobby Walls, David H. Hardy, and J. Steven Barnes
Pages: 130-141
Agronomy and Soils

Full Text PDF (482K)

Yield response of cotton to P and K soil fertility gradients in North Carolina was studied to augment the limited calibration data of the Mehlich-3 extractant procedure that is available. Sites were a Goldsboro fine loamy sand (1999, 2002), a Hiwassee clay loam (2002), and a Portsmouth fine sandy loam (1998, 1999). Linear-plateau and quadratic-plateau regression estimated critical soil and plant nutrient levels. Yield responded to fertility, but in some cases even fertilized plots remained below critical levels. The mean critical soil P level was 40 mg kg^{-1} on Portsmouth and 21 mg kg^{-1} on Goldsboro. There was no P response plateau on Hiwassee soil. In 2002, the critical soil K level was 64 mg kg^{-1} on Goldsboro and 137 mg kg^{-1} on Hiwassee soil. All plant tissue critical levels declined during the interval 1 wk prior to 5 wk after first bloom; critical leaf P declined from 3.1 g kg^{-1} to 2.0 g kg^{-1}, critical leaf K declined from 10.4 g kg^{-1} to 5.5 g kg^{-1}, and critical petiole K declined from 41.3 g kg^{-1} to 20.2 g kg^{-1}. The response data are within ranges of published critical levels, except P responses on the Portsmouth soil indicate a higher critical level than previously reported. Since Portsmouth and Goldsboro soils are likely to adsorb moderate amounts of P, and none of the soils are likely to adsorb K, fertilization at rates exceeding the P deficit (critical level minus actual concentration) by three-fold and equaling the K deficit should correct nutrient deficiencies.