

Sustainable phosphorous management in two different soil series of Pakistan by evaluating dynamics of phosphatic fertilizer source

ABSTRACT

Phosphorous (P) plays the prominent role to promote the plants storage functions and structural roles, as it is recognized as a vital component of ADP, ATP, Cell wall as well as a part of DNA. Soils acts as the sink to supply P to plants because soil pH and its physical condition are the main factor which regulate the solubility and availability P element. Phosphorus is not deficient in Pakistani soils but its availability to plants is the serious matter of concern. A pot experiment was conducted to evaluate P dynamics in two different soil series of Pakistan (Bahawalpur and Lyallpur) using Maize as test crop. The treatments applied were T0: Control (without any fertilizer), T1: Recommended DAP @648 mg pot⁻¹, T2: Half dose DAP @324 mg pot⁻¹, T3: Recommended rate of TSP @900 mg pot⁻¹, T4: Half dose TSP @450 mg pot⁻¹. Soil analysis showed that Bahawalpur soil has sandy clay loam texture with 33% clay and Lyallpur series has sandy loam texture with 15.5% clay; furthermore, these soils contain 4.6 and 2.12% CaCO₃, respectively. Results showed an increase in P concentration in roots (23 mg kg⁻¹) with the application of half dose of TSP in Lyallpur series and lowest in Bahawalpur series (14.6 mg kg⁻¹) at recommended dose of DAP. Concentration of P in shoots responded the same; increase at half dose of TSP (16.7 mg kg⁻¹) and lowest at full dose of DAP in Bahawalpur series as (15.58 mg kg⁻¹). Adsorbed P (17 mg kg⁻¹) was recorded highest in Bahawalpur soil with more clay amount in pot with DAP application but lower in Lyallpur soil series (14 mg kg⁻¹) with the application of applied TSP. The PUE was recorded highest in Lyallpur series with the application of half dose of TSP and it was 61% more than control and was Highest in Bahawalpur series was with the application of recommended dose of DAP is 72% more than control treatment. On estimation, results showed that applied sources made an increase in P availability than control, but TSP gave better P uptake than DAP unless of rates applied. Soil of Lyallpur series showed better uptake of P and response to applied fertilizers than Bahawalpur series which showed more adsorption of P by high clay and CaCO₃ amount. Conclusively, the study suggested that soil series play a crucial role in choosing fertilizer source for field application.

Keyword: Maize; Adsorption; Nutrient uptake; Soil type; Diammonium phosphate