ABSTRACT

Sustainable food production to meet the demand of increasing population is a challenge as the yield is stagnant or under decline in intensive chemical farming. Field experiments were conducted to study the effect of varying amounts and timing of application of different organic and inorganic nutrient sources on yield and quality of crops and changes in chemical and biological properties of soil in rice-chickpea cropping system under lateritic belt of subtropical India. The organic nutrient sources were vermicompost (VC), vermiwash (VW), crop residue (CR), and Azotobacter (AZ) and the inorganic source was chemical fertilizer (CF). The nutrient management treatments were Control (no fertilizer application), CF at 100% recommended dose of N, P and K (CF100), VC at 100%N recommendation as basal application (VC-b100), VC at 100%N recommendation in two splits (VC100), VC50+CF50, CR, CF50+CR, VC50+CR and VC50+VW+AZ. Effect of direct application of these nutrient treatments was studied on rice crop grown in wet season (June-October) and their residual effect was assessed on chickpea crop grown in dry season (November-March) in the cropping system during 2013 to 2015 at Kharagpur, India. During rice growing season, the VC based treatments (VC100 and VC-b100) registered significantly higher soil organic carbon content as compared to rest treatments. The split application of VC (VC100) was comparable with VC50+CF50 and CF100 in registering high NH₄⁺-N and NO₃⁻-N content of soil towards reproductive stages of the rice, hence increased the grain yield and protein and amylose content of rice grain. The direct and residual effect of VC100 gave significantly higher rice equivalent yield as compared to rest nutrient treatments in the rice-chickpea cropping system. All the VC based treatments increased soil pH, available P, K, and micro-nutrients (Fe, Mn, and Zn) content and microbial population, whereas the CF100 increased Pb and Ni content at the end of two-years cropping. The split application of VC at recommended N dose was effective in improving productivity of the rice-chickpea cropping system in lateritic soil.

Key words: Lateritic soil, Nitrogen status, Organic and inorganic nutrients, Rice-chickpea system, Soil organic carbon, Vermicompost