Integrated application of poultry manure and chemical fertiliser on soil chemical properties and nutrient uptake of maize and soybean

ABSTRACT

Low soil fertility due to monoculture cereal production systems and inadequate fertiliser application are some of the major causes for declining crop production in developing countries. Integrated use of organic and inorganic fertilisers is an option to alleviate soil fertility problem as it utilises available organic and inorganic nutrients for sustainable agricultural production and productivity. A field experiment was conducted in 2014 at Universiti Putra Malaysia to evaluate the effect of the integrated application of poultry manure and inorganic fertiliser on soil chemical properties and nutrient uptake of maize and soybean in maize-soybean intercropping. Treatments comprised combinations of three cropping systems (sole maize, sole soybean, and maize + soybean) and four fertilisation regimes (control, 100% NPK, 100% poultry manure (PM) and 50% NPK + 50% PM). The experiment was laid out in a randomised complete block design (RCBD) with three replications. Results showed that either growing soybean alone or as an intercrop with maize resulted in increased soil organic matter (OM) ($P<0.05$), total N ($P<0.0001$), soil available P ($P<0.0001$) and soil cation exchange capacity (CEC)($P<0.05$). Intercropping maize with soybean significantly reduced N, P and K uptake of soybean ($P<0.0001$), but uptake of N, P and K by maize was not significantly ($P>0.05$) affected by intercropping. Application of 100% PM and integrated application of 50% NPK+50% PM gave significantly higher soil pH ($P<0.001$), soil OM ($P<0.0001$), soil total N($P<0.0001$), soil available P ($P<0.0001$), soil exchangeable K ($P<0.001$) and soil CEC($P<0.0001$) compared to control and 100% NPK. For both maize and soybeans, the highest uptake of N, P and K was observed from the integrated application of 50% NPK+50% PM ($P<0.0001$). It can be concluded that integrated application of organic and inorganic fertiliser is the best option to improve soil chemical properties and nutrient uptake of maize and soybean.

Keyword: Intercropping; Chemical fertiliser; NPK; Poultry manure; Soil chemical properties