ABSTRACT

Maize (Zea mays L.) is the most widely cultivated staple food crop in sub-Saharan Africa. However, its production is severely constrained by abiotic and biotic factors of which declining soil fertility is a major contributor. A study was conducted to evaluate the efficacy of fecal matter based organic fertilizers on growth, nutrient uptake, yield and yield components of maize, in two distinct agro-ecological zones. Five fertilizer treatments (control, Diammonium Phosphate (DAP), cow manure, struvite, compost from fecal matter) were tested in a randomized complete block design (RCBD) with four replications per site. Data were collected on crop emergence (%), plant height, number of leaves per plant, leaf area index (LAI), tasseling (%), nutrient uptake and grain yield and yield components. Data were subjected to analysis of variance and treatment means separated using Tukey's HSD test. Results showed that crop emergence in the control treatment, except for struvite, was significantly higher than DAP and fecal matter based organic fertilizer plots in Bahati and Lanet sites. The end-point plant height (9 WAP), LAI and tasseling were significantly ($P<0.005$) influenced by location and organic fertilizer treatments. At the Lanet site, DAP and struvite treatments equally had the tallest maize plants (163 cm) followed by fecal compost (128 cm), manure (121 cm), and the control (79 cm). Similar result trends were recorded in Bahati where struvite (193 cm) had the tallest plants followed by fecal compost (166 cm), DAP (155 cm), manure (151 cm) and the control (98 cm), respectively. A contrasting result was observed at the Egerton University site in which cow manure and the control plots equally had the tallest plants (117-121 cm), followed by DAP and fecal compost (98-99 cm), and struvite (91 cm). The LAI, tasseling and grain yield were significantly influenced by location with struvite and fecal compost treatments producing the highest grain yield (≈8 t/ha) and one thousand (1000)-seed weights (480-560 g) at the Egerton University and Bahati experimental sites. Nitrogen uptake by maize for organic fertilizer treatments was higher than the control at all three locations. However, there was no difference in uptake of phosphorous and potassium between control and organic fertilizer treatments. These findings have demonstrated the potential of fecal matter based organic fertilizers as alternatives to inorganic fertilizers in smallholder agriculture.

Keywords: Zea mays, fecal compost, struvite, nutrient uptake, manure, Nitrogen, Phosphorus, Potassium