



Comparative Effects of Soil Amendments on Phosphorus Use and Agronomic Efficiencies of Two Maize Hybrids in Acidic Soils of Molo County, Kenya

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Authors' contributions

The authors jointly designed the study and wrote the protocol. Authors RNO and JLL performed the statistical analysis and wrote the first draft of the manuscript. Authors JLL and JKM managed the analyses of the study. Authors RNO and JLL managed the literature searches and addressed subsequent reviewer comments and suggestions for improvement. All authors read and approved the final manuscript.

Research Article

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ABSTRACT

The deficiency of P and the shortened growing seasons due to climate change are identified constraints in the production of commonly grown long maturing maize hybrid (H614) in the acid soils of Molo County, Kenya. The current study therefore investigated (i) the effect of soil amendments; lime (L), minjingu phosphate rock (MPR) and manure (FYM) on soil available P and its uptake, phosphorus use efficiency (PUE) and maize grain yield of long (H614) and short (H513) maturing maize hybrids and (ii) the relative agronomic efficiency (RAE) of MPR. Field experiments were set up at the Kenya Agricultural Research Institute, Molo during the long rain seasons of 2009 and 2010. A randomized complete block design with a 2³ factorial arrangement was used for the first objective. The factors, each at two levels, were L (0 and 3 t ha⁻¹), MPR (0 and 60 kg P ha⁻¹) and FYM (0 and 5 t ha⁻¹) giving a total of eight treatments; C (control), L, MPR, FYM, L+MPR, L+FYM, FYM+MPR and L+FYM+MPR. The relative

agronomic efficiency (RAE) of MPR was determined in a parallel experiment laid out in randomized complete block design with a split plot arrangement and replicated thrice. Maize hybrid H513 and H614 were the test crops in both experiments and constituted the main plots. The split plots were control (0 kg P ha^{-1}), triple super phosphate (60 kg P ha^{-1}) and MPR (60 kg P ha^{-1}). Soil available P and its uptake, PUE, RAE and maize yields were the parameters measured. The application of soil amendments increased soil available P and its uptake, PUE and maize yields over the control for both maize hybrids. Highest values of the measured parameters were recorded in the L+FYM+MPR treatment and for maize hybrid H614. The two year mean values of relative agronomic efficiency RAE (%) of MPR were 60 (H513) and 66.7 (H614), and significantly higher for the maize hybrid H614. The combined application of soil amendments could thus improve maize productivity and is recommended for the acid soils of Molo County. The maize hybrid H513 though with lower yields, matured faster than H614 and would thus come in handy as an adaptation strategy in the face of climate change and variability. Moreover, it has a low P requirement and a short growth cycle thus making it an ideal variety, economically, for smallholder farmers.