

Abstract:

Based on their performance attributes, butter bean (variety Ex-kasuku) and grass pea (Selection 1325) have been identified as potential alternative legumes for the maize-based cropping system in the cold semi-arid region of Laikipia County in Kenya. However, their nitrogen fixation potential and nitrogen residual effects have not been established. A green house experiment was therefore conducted to determine the nitrogen fixation potential and residual effects of the introduced legumes (butter bean and grasspea) relative to the local checks (common bean cv. Katumani 330 and chickpea cv. Desi). The legume seeds were planted in perforated polythene bags, measuring 14 cm diameter and 20 cm high, containing 3.6 kg air dried soil collected from Matanya in Laikipia County, Kenya. Barley, a non-nitrogen fixing reference crop, was also planted in polythene bags and used to determine the amount of nitrogen fixed according the N-difference method. Butter bean and grass pea significantly out-performed chickpea in total nodule number, active nodule number, total nodule dry matter, total plant dry matter, dry matter N yield, amount of N-fixed, percent N derived from the atmosphere and residual N effect, but were comparable to common bean in all these attributes. There was a significant, positive linear relationship between quantity of N-fixed and quantity of total plant biomass accumulated. Butter bean, grass pea and common bean significantly increased soil mineral nitrogen while chickpea had no influence on soil nitrogen. Butter bean and grasspea can therefore provide N to cropping systems in the cold semiarid region through biological N fixation.