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“Solidarity in a competing world —
fair use of resources”

Evaluation of Potato (*Solanum tuberosum* L.) Nutrient Use Efficiency under Legume Intercropping Systems

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Abstract

A field study was carried out to assess the effect of potato - legume intercropping on a number of nutrient use efficiency indices, i.e. nitrogen use efficiency (NUE), nitrogen uptake efficiency (NUpE) and nitrogen harvest index (NHI) and yield. The experiment was laid in a randomised complete block design (RCBD) with four replicates at Upper Kabete Campus field station, University of Nairobi during the 2014 short (October-December) and 2015 long (March to June) rainy seasons. Treatments comprised of Sole Potato (CS1) and Potato intercropped with either climbing bean (*Phaseolus vulgaris* L.) (CS2) garden pea (*Pisum sativum*) (CS3) or dolichos (*Dolichos lablab*) (CS4). A basal 200 kg ha⁻¹ of 17N:17P:17K fertiliser was band applied at planting and an equivalent quantity of CAN (27% N) as a top dress to potato crop only at tuber initiation stage. The indices differed significantly among treatments ($p < 0.05$) during the two seasons. In season one, CS4 and CS2 had the highest, lowest total nutrient uptake (Mg ha⁻¹) at 0.062 and 0.045 respectively, while in season two, CS1 and CS3 had the highest (0.12) and lowest (0.05) respectively. Tuber dry matter yield, which reflected the NUE followed the significant trend CS4 > CS3 > CS1 > CS2 and CS1 > CS4 > CS3 > CS2 in season one and two respectively ranging between 0.018 Mg ha⁻¹ and 0.030 Mg ha⁻¹. Only in the second season did the NHI (proportion of nitrogen retained in the tubers to the total plant uptake) showed a significant trend (CS3 > CS4 > CS1 > CS2) ranging from 50% – 65%. In terms of tuber yield, CS4 and CS2 recorded the highest (26.63 Mg ha⁻¹) and lowest (18.31 Mg ha⁻¹) respectively in the short rains and CS1 with 39.32 Mg ha⁻¹ and CS1 with 36.91 Mg ha⁻¹ in the long rains season. *Dolichos lablab* (CS4) was the most effective intercrop and could be recommended for integration into potato cropping systems to improve NUE and productivity.

Keywords: Nitrogen harvest index, nitrogen uptake efficiency, nitrogen use efficiency, tuber yield