

Abstract

A study was conducted in a Rainshelter (RTrial) at Egerton University to determine the correlation between irrigation water, nitrogen (N) and phosphorus (P) application on seed potato growth, harvest index (HI) and net economic benefit (NEB). The Rainshelter was to separate the effects of rainfall from those of irrigation water treatments. The treatments arranged in a split-split plot layout in a completely randomized block design, consisted of irrigation water (40%, 65% and 100% field capacity), N (0, 75, 112.5 and 150 kg N/ha) and P (0, 50.6, 75.9, 101.2 kg P/ha), replicated three times and repeated once. During growth plant height, days to 50% flowering and physiological maturity were determined and at harvest seed potato tuber yield and total biomass were determined to estimate HI and NEB. Data collected were subjected to analysis of variance and significantly different means separated using Tukey's Studentized Range Test at $P \leq 0.05$. 100% irrigation water yielded plant heights of 98.3 and 103.3 cm for RTrials (Rainshelter Trials) I and II compared to 76.2 and 80.4cm for the 40% treatment, while days to 50% flowering were 53.5 and 54.7 days compared to 68.3 and 69.8 days, and delayed days to physiological maturity were 109.8 and 108.7 days compared to 89.6 and 88.3 days. High N and P application significantly increased plant height and delayed days to 50% flowering and physiological maturity. 100% compared to 65% irrigation rate reduced HI by 5.3% and 4.9%, seed potato NEB by 2,852 US \$ (Ksh. 288,991) and 2712 US \$ (Ksh 274,792) in RTrials I and II, respectively. The N and P rates improved potato growth and development, HI and NEB. Combined application of N and P at 112.5 kg N/ha and 75.9 kg P/ha, compared to 0 kg N/ha and 0 kg P/ha increased seed potato HI by 8.5%, and NEB by 4,837 and 6,115 US \$, in RTrials I and II, respectively. Integration of 65% irrigation rate, 112.5 kg N/ha and 75.9 kg P/ha rates optimized potato growth characteristics, and net economic benefit.