

Abstract

Inorganic fertilizers have become extremely important in correcting declining soil fertility in seed potato (*Solanum tuberosum* L.) production in Kenya. Unreliable rainfall has also limited seed production. Knowledge on water and nutrient use efficiencies in potato grown under different irrigation regimes with different nitrogen and phosphorus levels will help predict the best application rates for optimal seed potato production and yield. A study was conducted at Egerton University, Horticultural Research and Teaching Farm to determine the effect of integrated application of irrigation water, nitrogen (N) and phosphorus (P) use efficiencies of water, N and P. In a split-split plot design, the irrigation water was applied to maintain soil water at 40, 65 and 100 % field capacity in the main plots, N (0, 75, 112.5 and 150 kg N/ha) to subplots and P (0, 115, 172.5 and 230 kg P₂O₅/ha), which translated into 0, 50.6, 75.9, 101.2 kg P/ha) to sub-subplots, with each treatment replicated three times and the trial repeated once. The irrigation water was applied throughout the potato growth period through drip tube lines, with N supplied as urea (46 % N) in two splits, and P as triple superphosphate (46 % P₂O₅) at planting time. Data on seed potato yield was collected from each treatment at harvest and used to calculate water, N and P use efficiencies. High irrigation water at 100 % compared to 65 and 40 % rate resulted in relatively high N and P use efficiencies, but decreased water use efficiency. Application of intermediate to high N and P nutrient increased the water, N and P use efficiencies. It is recommended to apply low to intermediate irrigation water, intermediate to high N and P to increase their use efficiencies during seed potato production.