

## **Abstract**

A study was conducted in a Rainshelter (RTrial) at the Horticultural Research and Teaching Farm of Egerton University to determine the effect of integrated application of irrigation water, nitrogen (N) and phosphorus (P) on seed potato physiological quality and performance of plants resulting from them. The treatments arranged in a split-split plot in a completely randomized block design, consisted of three irrigation water rates (40%, 65% and 100% field capacity), four N rates (0, 75, 112.5 and 150 kg N/ha) supplied as urea (46% N), and four P rates (0, 50.6, 75.9, 101.2 kg P/ha) supplied as triple superphosphate with experiment replicated three times and repeated once. After harvest seed specific density, starch and dry matter contents were determined after which 15 seed tubers per treatment were stored for 90 days under diffuse-light sprouting conditions for postharvest (PTrial) evaluation. Later, three potato tubers were selected per treatment and planted to study growth vigour and tuberization capacity of resultant potato plants both in PTrials I and II. Data collected were subjected to analysis of variance and significantly different means were separated using Tukey's Studentized Range Test at  $P=0.05$ . Specific density, starch and dry matter contents increased from 40% to 65% irrigation water. Application of irrigation water beyond 65% reduced the specific density, starch and dry matter contents by 0.03, 2.6%, 3.7% and 0.04, 3.7%, 5.2% in RTrials I and II, respectively. The 100% compared to 65% irrigation rate reduced post-treatment evaluation stem number, density and height at 57 DAP by 1.3 and 1.1, 15.1 and 12.6, and 13.4 cm and 10.3 cm, and tuberization capacity in resultant plants by 5 and 8.7 tubers, in PTrials I and II, respectively. Application of N and P significantly increased seed potato specific density, starch and dry matter contents but application of N and P beyond 112.5 kg N/ha and 75.9 kg P/ha respectively reduced the same both in RTrials I and II, respectively. In postharvest evaluation integration of N at 0 to 112.5 kg N/ha with 65% irrigation rate increased the number of tubers produced by the resultant plants by 3.4 and 5.4, while high P rate at 75.9 kg P/ha increased tuberization by 8.4 and 10.7, 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, and vigour of resulting potato plants.