

Yield of tomato grown under continuous-flow drip irrigation in Bauchi state of Nigeria

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Abstract

Current global concerns on attainment of food security and poverty alleviation require new strategies with marked potential for water conservation and yield increase. This informed the design of an affordable continuous-flow drip irrigation system that applies the exact peak crop water requirement continuously throughout the 24 h of a day, and so maintains the crop root zone near field capacity all through the growth season. The design continuous-flow rate was nine drops of water per minute (0.03 l/h) for tomato used as test crop. The system was constructed from inexpensive off-the-shelf components, incorporating the medical infusion set as emitter. The drip system was evaluated in Bauchi State, Nigeria during the 2003/2004 and 2004/2005 irrigation seasons under four continuous-flow rates of 0.03, 0.05, 0.06, and 0.07 l/h against a bi-daily application as the control. The recorded yields were 42.9, 42.6, 44.4, and 44.4 t/ha, respectively for the four treatments and 22.3 t/ha from the control. The associated Water Use Efficiencies were 15.5×10^{-2} , 10.7×10^{-2} , 8.5×10^{-2} , and 6.4×10^{-2} t/ha mm in same order for the four discharges, while that of the control was 10.1×10^{-2} t/ha mm. The continuous-flow drip schedule offered water savings of about 42.3 and 15.7% at 0.03 and 0.05 l/h, respectively over short level impoundment furrow irrigation widely used by resource-poor farmers in Nigeria. However, at the higher discharges of 0.06 and 0.07 l/h, the system rather applied 10.1 and 32.2% additional water over furrow irrigation. Results of this study summarily demonstrate promising prospects of the affordable continuous-flow drip irrigation system in delivering high crop yields especially if the crops are grown under appropriate agronomic practices that enable protraction of the growth season. The recommended range of continuous dripping for tomato is 0.03–0.05 l/h.