

**Growth, Water Relations, Yield and Quality of Tomato (*Lycopersicon esculentum* Mill. cv. Anna F1) as influenced by Type and Volume of Media under Capillary Wick Based Irrigation System**

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## ABSTRACT

Water supply is limited worldwide and there is an urgent need to identify and adopt effective irrigation management strategies. Capillary wick irrigation system (CWS), a newly innovated irrigation technique to save irrigation water was tested on greenhouse grown tomato using locally available wick material and media. The objective of this study was to assess suitability of CWS by investigating plant growth, water relations, yield and quality in greenhouse grown tomato (*Lycopersicon esculentum* Mill. cv. Anna F1) under CWS. Best locally available wick material and media for use with the CWS were selected through laboratory experiments. Five wick materials and four media types were tested. Wick materials were selected based on the materials' water holding capacity (WHC), water absorption pattern (WAP) and maximum capillary height (MCH). Types of media were selected based on medium water holding capacity, water absorption pattern, bulk density and moisture release characteristics (MRC). Of the five wick materials tested, cloth material (CL) had the highest performance in WAP and MCH ( $P \leq 0.01$ ) but had slightly lower WHC. Therefore cloth material was selected as the best locally available wick material for use in CWS. Of the four media types tested, media SCMP and SSM had the highest performance in WAP and MRC ( $P \leq 0.01$ ). These two media types were selected and further evaluated in a greenhouse experiment. A greenhouse experiment was carried out to evaluate performance of capillary wick irrigation system (CWS) with Tomato cultivar Anna FI under two media types: SCMP (2 parts soil, 4 parts cocopeat, 1 part manure and 1 part pumice) and SSM (3 parts soil, 2 parts sand and 1 part manure) and three media

quantities (2 L, 3 L, and 4 L). The experiment was laid out in a randomized complete block design (RCBD) replicated four times. The two media types were significantly different ( $P \leq 0.05$ ) in plant growth, water relations, yield and quality of tomato under CWS. Media SCMP was superior to media SSM. Where significant interactions between media type and media volume were observed, effect on plant growth, yield and quality was in the following order of performance: 4 L > 3 L > 2 L for medium SCMP and 3 L > 2 L > 4 L for medium SSM. Plant height was significantly higher by 4 – 19% under media SCMP than media SSM at 49 and 56 days after transplanting in 2008 and 2009. Number of leaves, number of branches and leaf length were significantly higher ( $P \leq 0.05$ ) by 26%, 19% and 23% respectively in plants grown under media SCMP than those grown under media SSM in 2009. Leaf area development and dry matter accumulation were higher under media SCMP than media SSM by 27 - 44% and 14 – 22% in 2008 and 2009 respectively. Leaf relative water content was higher by 8% and medium water content was higher by 11%. Yields were 58% higher and quality was better under media SCMP than media SSM. These results show that CWS is suitable for production of greenhouse tomato in Kenya. Plant growth, water relations, yield and quality was better under media SCMP than under media SSM. Cloth material and 4 L volume of media SCMP are best suited for use with CWS.