Evaluating evaporative cooling system as an energy- free and cost- effective method for postharvest storage of tomatoes (*Solanum lycopersicum* L.) for smallholder farmers

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Abstract

This study evaluated the effectiveness of a low-cost evaporative cooling system and its effect on postharvest storage potential and physicochemical quality properties of tomatoes. The performance of the cooling system was evaluated in terms of temperature drop, increase in relative humidity (RH) and cooling efficiency. Two tomato cultivars ('9065' jam and round) were harvested from smallholder farms in Umsinga, South Africa (28°45′56.45″S, 30°33′42.37″E). Tomatoes were assigned to one of the three storage conditions namely; evaporative cooling system (ECS), cold room (CR) and room temperature (RT). Quality parameters evaluated included mass loss, respiration rate, colour, firmness, total soluble solids and titratable acids for both tomato cultivars. ECS reduced temperature to 19.8 °C which was 13% lower than RT (23.0 °C). RH increased from 63.59% in RT to 83.91% in the ECS with an average cooling efficiency of 67.17%. Storage treatments and time had significant ($p < 0.05$) effect on fruit quality. Fruit in the CR retained colour, mass, firmness, respiration rate, TA and TSS of both cultivars longer than the other treatments. However, the ECS was able to preserve the freshness of tomatoes for 20 days and had a slower rate of change in mass, respiration, colour, firmness, TA and TSS compared with those stored at RT. This suggested that the evaluated ECS is capable of maintaining postharvest quality and increasing shelf-life of tomatoes. Therefore, ECS has a potential as a low-cost and energy-free system for preserving quality and reducing postharvest losses under smallholder farming systems.