**Abstract**

1-methylcyclodextrin (1-MCP) was used to prolong the freshness of tomatoes during postharvest storage. The effect of storage temperature and 1-MCP treatment conditions on the ripening process of tomatoes was evaluated. Change in two major tomato pigment (chlorophyll and lycopene) contents in tomatoes was also investigated. Sorption behavior for the 1-MCP/adsorbing agents was studied using inverse gas chromatography. The specific retention volume and various thermodynamic parameters relating to adsorption of 1-MCP on the adsorbing agents were calculated. Adsorption and 1-MCP release studies from the adsorbing agents in the sachet system were conducted to evaluate delivery of the 1-MCP gas to the tomatoes under the environmental conditions within the package.

Skin color, firmness, fruit weight, and ethylene production were used as quality indicators for the stored tomatoes. Total chlorophyll and lycopene contents in tomatoes were quantified using a specific extinction coefficient method. Sorption isotherms of 1-methylcyclopropene (1-MCP) on silica gel, Tenax-TA, and activated clay were determined at low sorbate concentration. Sachets made from Tyvek ®, paper, LDPE, and PVA materials were fabricated to contain silica gel and activated carbon. The 1-MCP release study was performed using a closed system under two different environmental conditions, dry air (0%RH) and 90%RH. The partitioning of 1-MCP between the gas/polymer matrix was determined for several adsorbing agents, and in sachet materials to estimate the adsorb ability of 1-MCP in dry air at 23°C. The water and 1-MCP permeability of the sachet pouch film were measured.

Once-a-day 1-MCP treatment at 10°C was very effective in retarding changes in the skin color of the tomatoes. Exposure of tomatoes to 1-MCP gas at 10°C, using a once-a-day method was the most effective in delaying chlorophyll degradation and lycopene synthesis. The sorption isotherms followed Henry's law, and behaved according to the binding site theory. Silica gel had a much higher number of binding sites for 1-MCP, compared to Tenax-TA and activated clay agents. PVA sachets containing silica gel indicated slow release of 1-MCP. The amount of 1-MCP released from the PVA sachet containing silica gel at 90%RH was larger than the amount of 1-MCP released at dry air condition.

The results showed that combination of 1-MCP treatment with low storage temperature was very effective in delaying color change in tomatoes. PVA sachets containing silica gel have potential use for slow release of 1-MCP from the experimental results in a closed system. Delivering the 1-MCP gas to the tomatoes, from the sachet containing an adsorbing agent may help maintain the freshness of tomatoes during postharvest storage.