Efficacy of 1-MCP on the quality and internal structure of some selected fruits during storage

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論文題名　：Efficacy of 1-MCP on the quality and internal structure of some selected fruits during storage
（1-MCP処理が貯蔵中の果実品質と内部構造に及ぼす影響に関する研究）

区　　分　：甲

論　文　内　容　の　要　旨

The efficacy of 1-monocyclopropenon (1-MCP) the quality and internal structure of some selective fruits was investigated. Japanese apricot, pear and persimmon fruits were selected for the application of 1-MCP, and X-ray computed tomography was employed to measure the internal structural changes during storage. Quality parameters such as external color (L^* and hue angle value), percent weight loss, moisture content, apparent density, total soluble sold (TSS) and firmness were measured during storage. Ethylene production rate and respiration rate were also measured to evaluate the efficacy of 1-MCP on the selected fruits. Average CT value, standard deviation, peak height and low/high density progressed during storage were extracted from X-ray CT images. X-ray absorption histograms were produced to compare the structural changes during storage of control and treated fruits. The images properties extracted were correlated with the quality parameters observed during storage. Thermo-physical properties: porosity, thermal conductivity and moisture content predicted based on X-ray absorptions and those properties distributions were also visualized during storage. 1-MCP could satisfactorily delayed the postharvest ripening of Japanese apricot, pear and persimmon fruit in terms of quality parameter observed. 1-MCP arrested the ethylene production and respiration rate both in all fruits observed. The representative internal images showed that 1-MCP treated fruit had minimum changes occurred during storage. The average CT value decreased in Japanese apricot and pear, whereas it was increased in persimmon during storage. The standard deviation increased during storage in control and all treated fruit of Japanese apricot, pear and persimmon. But the changes in 1-MCP treated fruit were lower than that of control and other treated fruit. Peak height decreased in Japanese apricot and pear, whereas increased in persimmon. Low density region progressed in Japanese apricot, but higher density region increased in pear and persimmon flesh. Peak height and increment of low/high density region were nearly constant in 1-MCP treated fruit during storage. Shifting of peak of histogram to higher/lower density region in 1-MCP treated fruit was minimum in all fruits. Standard deviation, peak height and % low density region had a strong correlation with apparent density, moisture content, bio-yield stress and TSS in Japanese apricot. Hue angle value, moisture content and TSS were strongly correlated with average CT value, standard deviations, peak height and high density pixel volume progressed, where as L^* and bio-yield stress had poor relationship with those image properties of pear. There was a linear relationship of L^* value, hue angle, apparent density, moisture content, bio-yield stress, and TSS with average CT value, standard deviation, high density pixel volume changes and peak height of persimmon fruit. The porosity of all 1-MCP

treated fruits was nearly constant during the specified storage of the fruits. Thermal conductivity and moisture content also decreased minimum in 1-MCP treated fruit compared to control and other treated fruits. The visualized and quantified porosity, thermal conductivity and moisture content results suggested that low temperature storage could maintain the initial structure of pear and persimmon fruit during storage and increased shelf life in relation with internal structures. The porosity, thermal conductivity and moisture distributions could be visualized for the intact Japanese apricot, pear and persimmon fruits during storage based on X-ray CT data. So, X-ray CT has a strong potential to predict and visualize the thermo-physical quality parameters and structural changes non-destructively during storage. Therefore, 1-MCP could retain the original internal structure and improve shelf life of Japanese apricot, pear and persimmon fruit.