Title Effect of application of shellac on the storability of 'Fuyu' persimmon

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Citation Program and Abstract. 2007 Australasian Postharvest Conference. Crowne Plaza Terrigal, NSW, Australia. 12 September 2007. 87 p.

Keywords persimmon; shellac; coating agent

Abstract

Shellac and other coatings such as carnauba and wood resin are often used commercially to prolong the shelf life of fruit like citrus and apples. Aside from extending storage life by reducing weight loss and retarding senescence, these coating also improve appearance by conferring gloss. Highly perishable fruit such as persimmon could greatly benefit from exogenous wax application. However, its use has been limited party due to the unique interplay between the fruit and the calyx which is a characteristic organ involved in controlling gas exchange in persimmon fruit. This study used 'Fuyu' persimmon to evaluate shellac, a coating with low O_2 permeance, applied solely on the peel or the calyx, with aim of understanding the role of this organ in gas exchange. The putative ethylene inhibitor, 1-MCP was also used in order to clarify the role of ethylene in the process. Fruits were coated individually with about 0.3 g of shellac by hand (latex gloves) and air-dried for about 10 min. The coated fruit were stored at 5°C, 80% RH in a coolstore for 21 days and transferred to ambient thereafter. Physiological characteristics such as firmness, respiration rate and internal CO_2 concentrations were measured at one-week intervals and one day after transfer to ambient conditions. Treatment with shellac, both on the peel or the calyx alone, reduced weight loss, suggesting that shellac serves as a good barrier for water vapour loss: it also imparted good gloss when applied on the peel. In addition, shellac-treated fruit remained firm during storage at 5°C but softened significantly one day after transfer to ambient, as indicated by fruit firmness evaluation. Cross-sections of fruit upon removal from 5°C show the appearance of symptoms characterized by watery and translucent tissues (Fig. 1), possibly due to anaerobiosis, with more severe symptoms observed in fruit with peel coated with shellac. These observations partly agree with previous findings suggesting an important role for the calyx in as exchange; however, it appears that the peel does play an important role as well. Treatment with 10 µL.L 1-MCP on the other hand conferred some degree of tolerance to physiological damage resulting in sound fruits with longer shelf-life. This should warrant further investigation. On the other hand, respiration rate across treatments remained almost constant during the entire period of observation except in fruit with calices coated with shellac where a significant dip in respiration rate was noted towards the end of the 21 day storage period. The decrease in respiration was coupled with decreases in both internal CO_2 and C_2H_4 with the latter almost nil in shellac-treated fruit. Taken together, our results suggest that gas exchange in persimmon fruit occurs predominantly through the calyx, followed by the peel, specifically, via the cuticle. Furthermore, although shellac was effective in controlling water loss and

adding gloss it restricted gas exchange which led to the development of symptoms associated with anaerobiosis. In addition, although application of shellac on the calyx may have also led to physiological breakdown, its severity was less compared to shellac application on the peel. Based on these observations, future studies can focus on the application of shellac or another coating with better permeance on the calyx of persimmon fruit.

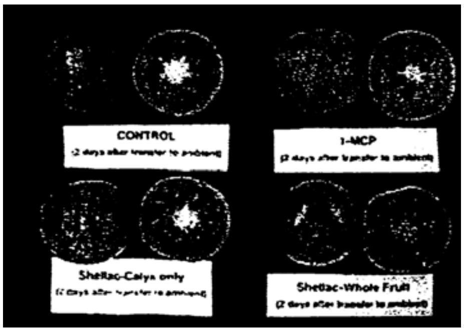

Fig.1. Changes in quality of 'Fuyu' persimmon coated with shellac and 1-MCP two days after transfer to ambient from storage at $5^{\circ}C$ for 21 days.

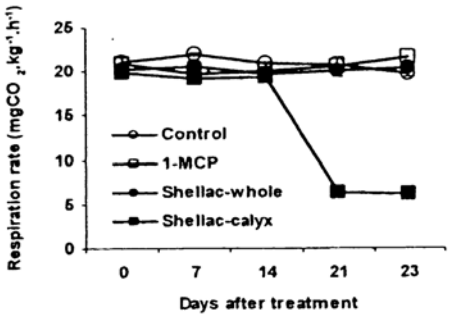

Fig.2. Changes in respiration rate of 'Fuyu' persimmon coated with shellac and 1-MCP during storage at $5^{\circ}C$ for 21 days and upon transfer to ambient (indicated by arrow).