

Title Heat conditioning before ultraviolet-C lightening improves decay control and the keeping quality of cold storage lemon fruit

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Abstract

The demand for alternatives to synthetic postharvest fungicides has implemented the researches on biological control agents, compounds generally recognized as safe (GRAS), physical methods along with studies focused at enhancing fruit natural resistance. In this direction, the induction of phytoalexins, following treatments with ultraviolet-C (UV-C, 254nm) light, was positively correlated to the reduction of decay on cold stored Citrus fruits. On the other hand, the hormetic effects were strictly depended upon cultivar and harvesting time and rind disorders such as pitting and browning have been reported. Since heat treatments have been accounted to reduce postharvest rind disorders we combined hot air and UV-C treatments. Lemon fruit (*Citrus limon* cv di Massa) were harvested twice (April and June) and after grading divided into 6 groups (each of 180 fruit) according to heat conditioning (HT) duration (hours): I) none; II) 3 h; III) 6 h; IV) 12 h; V) 24 h; VI) 36 h. HT was performed by keeping the fruits in boxes in a ventilated room at 36°C with a saturated relative humidity (RH) air. Following HT, within each group, half of the fruit (90 lemons) was treated with 6 kJm⁻² and half remained un-lightened. Then, all fruit was moved to cold storage and kept for 2 months at 5 °C and 90±5% RH. After storage lemons were kept at 20°C and 75% RH for additional 6 days simulating a marketing period (SMP). After 1 month, at the end of storage and SMP the extent of rind damage was scored and the percentage of decay monitored. Rind damage attributed to the UV-C lightening depended upon harvest time (early harvested fruit were more affected) and to HT duration. In the combined treatments, as duration of HT was increased up to 12 h, a significant reduction of rind damage was observed compared to UV-C treated fruit, while among 12, 24 and 36 h HT no significant differences were observed. All fruit subjected to HT did not show rind damage. Molds, mainly caused by *Penicillium italicum* during storage, and *P. digitatum* during SMP were significantly reduced by the combined treatments which resulted synergistic for 12, 24 and 36 h of conditioning. Fruit subjected to HT for 24 and 36 h followed by the UV -C lightening had the greatest weight loss after 1 month of storage, while at the end of storage and SMP no differences were found.