Effect of Laser Ablation OTR Films and High Concentration Carbon Dioxide for Maintaining the Freshness of Strawberry 'Maehyang' for Export in Modified Atmosphere Condition

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Abstract : This study was conducted to improve storability by using suitable laser ablation oxygen transmission rate (OTR) films and effectiveness of high carbon dioxide at strawberry 'Maehyang' for export. Strawberries were grown by hydroponic system in Gyeongsangnam-do province. These strawberries were packed by different laser ablation OTR films (Daeryung Co., Ltd.) such as 1,300 cc, 20,000 cc, 40,000 cc, 80,000 cc, and 100,000 cc•m-2•day•atm. And CO2 injection (30%) treatment was used 20,000 cc•m-2•day•atm OTR film and perforated film was as a control. Temperature conditions were applied simulated shipping and distribution conditions from Korea to Singapore, there were stored at 3 ℃ (13 days), 10 ℃ (an hour), and 8 ℃ (7 days) for 20 days. Fresh weight loss rate was under 1% as maximum permissible weight loss in treated OTR films except perforated film as a control during storage. Carbon dioxide concentration within a package for the storage period showed a lower value than the maximum CO2 concentration tolerated range (15 %) in treated OTR films and even the concentration of high OTR film treatment; from 20,000cc to 100,000cc were less than 3%. 1,300 cc had a suitable carbon dioxide range as over 5 % under 15 % at 5 days after storage until finished experiments and CO2 injection treatment was quickly drop the 15 % at storage after 1 day, but it kept around 15 % during storage. Oxygen concentration was maintained between 10 to 15 % in 1,300 cc and CO2 injection treatments, but other treatments were kept in 19 to 21 %. Ethylene concentration was showed very higher concentration at the CO2 injection treatment than OTR treatments. In the OTR treatments, 1,300 cc showed the highest concentration in ethylene and 20,000 cc film had lowest. Firmness was maintained highest in 1,300cc, but there was not shown any significant differences among other OTR treatments. Visual quality had shown the best result in 20,000 cc that showed marketable quality until 20 days after storage. 20,000 cc and perforated film had better than other treatments in off-odor and the 1,300 cc and CO2 injection treatments have occurred strong off-odor even after 10 minutes. As a result of the difference between Hunter 'L' and 'a' values of chroma meter, the 1,300cc and CO2 injection treatments were delayed color developments and other treatments did not shown any significant differences. The results indicate that effectiveness for maintaining the freshness was best achieved at 20,000 cc•m-2•day•atm. Although 1,300 cc and CO2 injection treatments were in appropriate MA condition, it showed darkening of strawberry calyx and excessive reduction of coloring due to high carbon dioxide concentration during storage. While 1,300cc and CO2 injection treatments were considered as appropriate treatments for exports to Singapore, but the result was shown different. These results are based on cultivar characteristics of strawberry 'Maehyang'.

Keywords : carbon dioxide, firmness, shelf-life, visual quality
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