World Academy of Science, Engineering and Technology
International Journal of Agricultural and Biosystems Engineering
Vol:10, No:03, 2016

The Effect of Chloride Dioxide and High Concentration of CO2 Gas Injection on the Quality and Shelf-Life for Exporting Strawberry 'Maehyang' in Modified Atmosphere Condition

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Abstract : The strawberry 'Maehyang' cultivated in South Korea has been increased to export to Southeast Asia. The degradation of quality often occurs in strawberries during short export period. Botrytis cinerea has been known to cause major damage to the export strawberries and the disease was caused during shipping and distribution. This study was conducted to find out the sterilized effect of chlorine dioxide(ClO2) gas and high concentration of CO2 gas injection for 'Maehyang' strawberry and it was packaged with oxygen transmission rate (OTR) films. The strawberry was harvested at 80% color changed stage and packaged with OTR film and perforated film (control). The treatments were a MAP used by with 20,000 cc·m-2·day·atm OTR film and gas injection in packages. The gas type of ClO2 and CO2 were injected into OTR film packages, and treatments were 6 mg/L ClO2, 15% CO2, and they were combined. The treated strawberries were stored at 3℃ for 30 days. Fresh weight loss rate was less than 1% in all OTR film packages but it was more than 15% in a perforated film treatment that showed severe deterioration of visual quality during storage. Carbon dioxide concentration within a package showed approximately 15% of the maximum CO2 concentration in all treatments except control until the 21st day, it was the tolerated range of maximum CO2 concentration of strawberry in recommended CA or MA conditions. But, it increased to almost 50% on the 30th day. Oxygen concentration showed a decrease down to approximately 0% in all treatments except control for 25 days. Ethylene concentration was shown to be steady until the 17th day, but it quickly increased on the 17th day and dropped down on the final storage day (30th day). All treatments did not show any significant differences in gas treatments. Firmness increased in CO2 (15%) and ClO2 (6mg/L) + CO2 (15%) treatments during storage. It might be the effect of high concentration CO2 known by reducing decay and cell wall degradation. The soluble solid decreased in all treatments during storage. These results were caused to use up the sugar by the increase of respiration during storage. The titratable acidity showed a similarity in all treatments. Incidence of fungi was 0% in CO2 (15%) and ClO2 (6mg/L)+ CO2 (15%), but was more than 20% in a perforated film treatment. Consequently, The result indicates that Chloride Dioxide(ClO2) and high concentration of CO2 inhibited fungi growth. Due to the fact that fresh weight loss rate and incidence of fungi were lower, the ClO2(6mg/L)+ CO2(15%) prove to be most efficient in sterilization. These results suggest that Chloride Dioxide (ClO2) and high concentration of CO2 gas injection treatments were an effective decontamination technique for improving the safety of strawberries.

Keywords : chloride dioxide, high concentration of CO2, modified atmosphere condition, oxygen transmission rate films
Conference Title : ICABBSS 2016 : International Conference on Agro-Biotechnology, Biosafety and Seed Systems
Conference Location : Singapore, Singapore
Conference Dates : March 03-04, 2016

Open Science Index, Agricultural and Biosystems Engineering Vol:10, No:03, 2016 publications.waset.org/abstracts/46882.pdf