EFFECT OF MODIFIED ATMOSPHERE STORAGE ON POSTHARVEST QUALITY OF SOME NON-TRADITIONAL VEGETABLE CROPS

By

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M. Sc. Agric. Sc. (Vegetable Crops), Ain Shams University, 2005

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ABSTRACT

Mohsen El-Sayed Mohamed Saad: Effect of Modified Atmosphere Storage on Bostharvest Quality of Some Non-Traditional Vegetable Crops. Unpublished Ph. D. Thesis, Department of Horticulture, Faculty of Agriculture, Ain Shams University, 2013.

The experiments were carried out on broccoli during 2009 and 2010 seasons to study the effect of packaging materials and active or passive modified atmosphere packaging (MAP) on quality attributes of broccoli florets during storage and shelf life,. The allowable maximum cooling delays between harvest and the start of initial cooling also estimated. Another experiment on red cabbage was carried out during 2009 and 1010 seasons to study the effect of precooling and active or passive MAP on quality of fresh-cut red cabbage during storage.

For broccoli florets, the obtained results revealed that broccoli florets packed in polypropylene film showed the highest intensities of freshness, greenness, compactness and had less off-odor as compared with those stored in polyethylene bags. The optimum gas composition of MAP used for maintaining quality of broccoli florets during storage was 5 % O_2 + 10 % $C0_2$.

Broccoli florets packed in polypropylene film in addition to exposing to active MAP at 5 % O_2 + 10 % $C0_2$ was the most effective treatment for reducing weight loss and color change, total count bacteria and maintaining high content of chlorophyll and gave florets with good appearance after 16 days at 0^oC or 16 days at 0^oC + 2 days at 10 ^oC (shelf life).

Delaying the precooling for 2h after harvest was the most effective treatment for maintaining quality of broccoli florets indcating by lower weight loss, color change and gave florets with good appearance for 21 days at 0^oC + 2 days at 10^oC. The allowable maximum cooling delay

between harvest and the start of initial cooling for broccoli florets was 4h, which generally not affect the postharvest quality and shelf life of product and gave florets with good appearance for 14 days at 0^oC + 2 days at 10^oC.

As for red cabbage, results showed that postharvest precooling of fresh-cut product reduced weight loss, color change and anthocyanin loss and gave better appearance when compared with non-cooled. No off-odor was detected till the end of storage (12 days) in active MAP at 5 % O_2 + 3 % $C0_2$. Precooling of fresh-cut red cabbage and then exposing to active MAP at 5% O_2 + 3% Co_2 significantly reduced weight loss and color change and maintained high content of anthocyanin and gave product with good appearance after 12 days of storage at 0^oC.

Key words: Broccoli florets, Red cabbage, Fresh-cut, Postharvest, MAP, Cooling delay, Precooling.

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1. INTRODUCTION

Broccoli and red cabbage have a relatively high respiration and transpiration rates and short shelf life. They are also, extremely sensitive to ethylene and lose water rapidly, especially at fresh-cut product. The shelf life of broccoli florets was 1-3 days at 20^{o}C **(Wang and Hrusckka, 1977)** and of fresh-cut red cabbage was 3-4 days storage. The most commonly method for shelf life extension is low temperature which reduce metabolism of product and as a result shelf life is prolonged. But storage quality of broccoli florets and fresh-cut red cabbage can be further improved by altering the gas atmosphere surrounding the product and rapid cooling after harvest.

Recently there has been an increasing market demand for minimally processed fresh-cut broccoli and red cabbage due to their freshness convenience, good taste and human-health benefits. None the less, the physical damages caused by preparation increase respiration rate and ethylene production associated with increase in rates of other biochemical reactions responsible for changes in color, flavor and texture and causing microbiological contamination.

Modified atmosphere packaging (MAP) combined with proper refrigeration has been considered to be an effective method to maintain the quality and extend the shelf life of fresh-cut broccoli and red cabbage by delaying decay, softening and color changes. Also, the low O_2 and high CO_2 levels, that are modified through the product**'s** respiration and the permeability slow down respiration, and have an effect on inhibiting microbial in MAP.

Fresh-cut red-cabbage has a very limited life after harvest if held at normal harvesting temperatures. Postharvest cooling rapidly after harvest is important in reducing respiratory activity, degradation by enzymes, water loss and wilting and slow or inhibit the growth of decay-producing microorganisms in addition to help maintain quality.

Cooling delay reduce the product quality for three main reasons; 1) allowing respiration and associated normal metabolism to continue at high rates, consuming sugars, acids, vitamins and other constituents, 2) fostering water loss, and 3) increasing decay development. Delay may also allow increased susceptibility to ethylene damage, but ethylene concentrations are usually causing as much damage as the other three factors.

Therefore, the aim of this study was to evaluate the effect of packaging materials, active and passive MAP and cooling delay on quality attributes of broccoli florets during storage and shelf life condition. Besides, to evaluate the potential effect of precooling treatment and modified atmosphere packaging in preserving the quality and extending the shelf life of fresh-cut red cabbage.