

Study the Physicochemical and Sensory Attributes of Seedless Barberries Treated by Edible Coating and Packaging of During Storage

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Abstract: *In this study, the effect of an edible coating based on natural Aloe vera (AV) gel (0, 5 and 10%) and a Packaging type: 1- Vacuum packaging (VP), 2- Modified atmosphere packaging (MAP), 3- Atmospheric packaging investigated on postharvest quality of Seedless Barberries at 0, 4, 8 and 12 weeks of storage at 20°C. After 12 weeks of storage, packaging under MAP conditions with Aloe vera gel sample received the highest colour, taste and appearance score by the Panelists. these results demonstrate that AV gel in combination with Packaging the MAP is proved to be the most effective treatment to maintain the quality of Seedless Barberries for 12 weeks of storage.*

Keywords: Aloe vera, Barberry, Edible coating, MAP, Packaging, Sensory attributes

I.INTRODUCTION

Barberries belong to the Berberidaceae family and are widely grown in Asian and European countries. They contain large amounts of minerals, anthocyanin and phenolics, known as natural antioxidants [1].

Aloe vera gel as a natural edible coating compound has been successfully applied to some fruits and has had great effects on quality preservation and microorganism spoilage inhibition. Aloe vera gel coating could be an effective natural way to ensure quality retention in fruits or minimally processed fruit sector [2].

Modified atmosphere packaging is widely used to minimize respiration rates, water and flavor loss, microorganism counts and discoloration, improving storability and shelf life of packaged fruits and vegetables [3]. Decreases in O₂ concentration in modified atmosphere packaging would cause lower respiration rates due to slower oxidizing enzyme activities, extending the shelf life of the product [4].

To the best of our knowledge, there is no report demonstrating the extension of the shelf life of Seedless Barberries using a combination of both technologies including edible coatings and packaging. Therefore, the development of more efficient

processing and packaging technologies for Seedless Barberries is required to ensure quality and value after longer storage times. The objective of the present study is to evaluate combinations of edible coatings (AV) and modified atmosphere treatments to maintain the shelf life of ready to Seedless Barberries beyond weeks 12 at 20°C.

II. Materials and methods

A. Barberry and Aloe vera preparation

Clean seedless barberries were bought from a local factory and transferred to the laboratory as fast as possible.

Aloe vera gel was extracted with slight modifications, using the method by Jasso de Rodriguez et al [5] 5% and 10% solutions were obtained adding a suitable amount of distilled water and stirred at 30 °C to reach uniform solutions. Aloe vera at 5 and 10% was used to prepare coating solutions and the barberry samples were dipped in them for 1 min and dried at ambient temperature [2].

Coated and uncoated samples were packed in (PE / PA / PE) bags with a thickness of 80 microns and sealed using Map Henkel Man machine in three O₂ concentrations:

1. Normal air (21% oxygen)
2. Modified atmosphere (6% oxygen and 94% nitrogen)
3. Vacuum (0% oxygen).

After packing, all samples were stored at 20 °C, with the tests being implemented after 0, 4, 8 and 12 weeks.

B. Weight Loss

The initial and final weights of packed barberries were measured using a digital precision balance and their weight loss was calculated according to the following equation [6]:

$$WL = [(W_0 - W_f) / W_0] \times 100,$$

W₀ is initial weight and W_f is final weight.

C. Anthocyanin

Anthocyanin pigments were identified with reversible structural alterations, changing their pH at different absorption spectra [7].

$$A = (A_{520} - A_{700})_{pH 1} - (A_{520} - A_{700})_{pH 4.5}$$

The concentration of anthocyanin pigments in the original sample was measured using the following formula:

$$\text{Monomeric anthocyanin pigments (mg / L)} = \frac{(A \times MW \times DF \times 1000)}{(\epsilon \times l)}$$

In which MW is molecular weight; DF is dilution; ϵ is molar absorption.

D. Sensory evaluation

Descriptive analysis was used for sensory evaluation. Thirty trained referees including participated to assess the quality of the samples. To evaluate sensory attributes, such as color, texture, flavor and overall acceptability, a five-point hedonic was used [8].

E. Statistical analysis

Coating factors were determined at three percentages (0%, 5%, and 10%), as well as gas concentrations (normal air, modified atmosphere with 6% of oxygen and 94% of nitrogen, and vacuum at 0% of oxygen). Experiments were implemented factorially in a completely randomized design with three replications, at one storage temperature (20 °C) and four different storage-time periods (0, 4, 8 and 12 weeks). Then, the results were analyzed using SAS software, version 4.9, and the variance and mean were compared with LSD test at 95%.

III. RESULTS AND DISCUSSION

A. Weight Loss

As in Fig 1, the slope of weight loss in barberry seeds dramatically increased in the control group over time, but there was a smaller slope in samples treated with 5 and 10% of AV gel with the MAP. Less weight loss was observed in samples with 5 and 10% of AV gel in MAP compared to the others.

In research conducted by Sogvar et al. (2016), less moisture loss was seen in samples treated with Aloe vera gel compared to the control group during the 18-day storage.

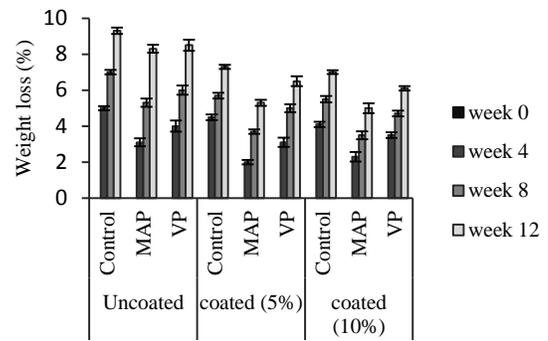


Fig. 1 Weight loss of barberries in different packaging at 20 °C. (MAP: 6% O₂; VP: 0% O₂; Control: atmospheric conditions) during storage.

B. Anthocyanin

The results showed no significant difference between the samples treated with 5 and 10% of AV gel packed with AP (air condition) compared to the control group. There was also no significant difference between the samples treated with 5 and 10% of AV gel with the MAP as well as the samples coated with gel under VP. However, a significant difference was observed in all treatments of the control group. The results showed that the quality of antioxidant in AV gel would inhibit the degradation of anthocyanin pigments in barberries during storage, and VP could maintain more anthocyanin compared to AP and MAP.

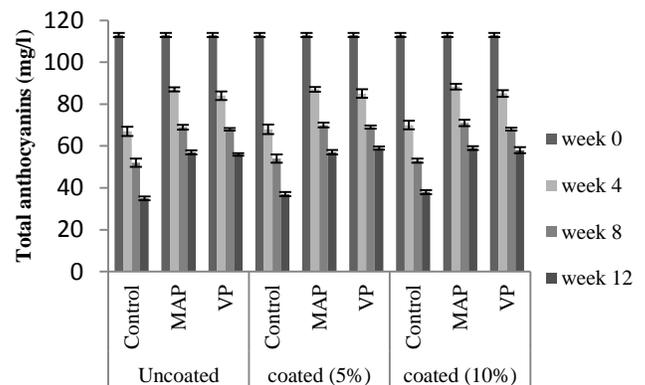
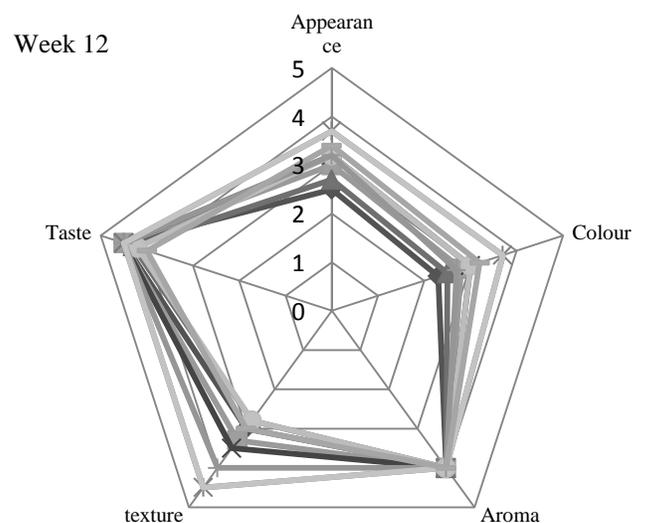
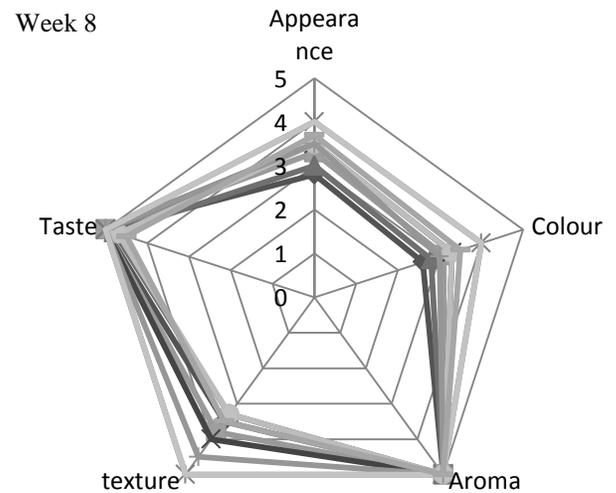
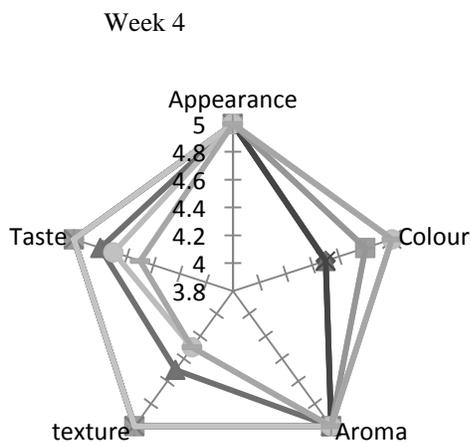
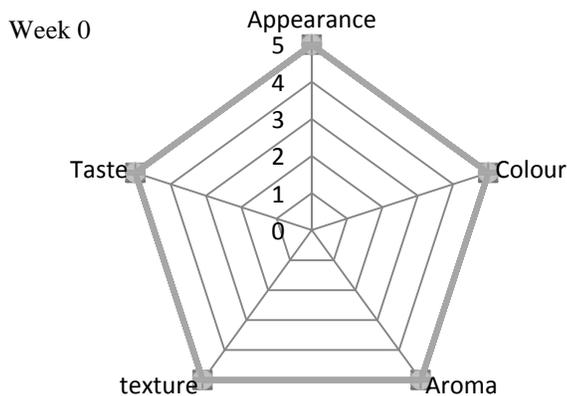


Fig. 2 Total anthocyanin content of barberries in different packaging at 20 °C. (MAP: 6% O₂; VP: 0% O₂; Control: atmospheric conditions) during storage.

Hassanpour (2014) reported that simulating gene expression of enzymes in the anthocyanin biosynthetic pathway, Aloe vera gel might regulate anthocyanin in fruits describing the higher amount of anthocyanin in coated barberries.

B. Sensory analysis

After 4 weeks of storage, packaging MAP with AV gel and the control sample received the highest color score by the Panelists. Texture and taste of all samples except for samples packed under VP were appropriate. After 8 and 12 weeks, results were almost identical, with the best sample being the one packed in the normal atmosphere in terms of evaluated properties of the samples. According to Figure 4, after 12 weeks the panelists gave the highest scores to the pack with the MAP along with AV gel coating (5% & 10%).



- ◆ Uncoated-Control
- ▲ Uncoated-VP
- ✱ coated (5%)-MAP
- ⊕ coated (10%)-Control
- coated (10%)-VP
- Uncoated-MAP
- ✕ coated (5%)-Control
- coated (5%)-VP
- coated (10%)-MAP

Fig. 4 Effect of coating, packaging and storage time on organoleptic properties of Seedless Barberries. Three different packages were evaluated per sample by ten people per test day. Means \pm SD (n = 30).

Figure 3 shows the evaluation of color, texture, taste, aroma, and appearance of both control and barberry samples coated with AV gel and packaged in different concentrations of oxygen within 12 weeks. After 4 weeks of storage, packaging MAP with AV gel and the control sample received the highest color score by the Panelists. Texture and taste of all samples except for samples packed under VP were appropriate. After 8 and 12 weeks, results were almost identical, with the best sample being the one packed in normal atmosphere in terms of evaluated properties of the samples. According to Figure 4, after 12 weeks the panelists gave the highest scores to the pack with the typical AP along with Aloe vera gel coating (5% & 10%).

IV. CONCLUSION

The results indicated that using polysaccharide edible coating of Aloe vera might be highly effective in maintaining the quality of barberries during storage. Lastly, the results showed that coating with 10% of Aloe vera and Modified atmosphere packaging would further maintain Weight Loss and anthocyanin, the main components of barberries.

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