Journal of Food Science and Technology (Iran)

Homepage: www.fsct.modares.ir

Scientific Research

The Effect of Plantago Ovata seed gum as an edible coating on postharvesting time of cucumber

Ebrahimi Emarat[1], Akram., Arianfar, Akram[2*]

1 &2: Department of Food Science and Technology, Qu.C, Islamic Azad University, Quchan, Iran.

ARTICLE INFO	ABSTRACT

Article History:

Received:2024/07/24

Accepted:2025/07/22

Keywords:

Plantago Ovata,

Shelf Life,

Edible coating,

Cucumber

DOI: 10.48311/fsct.2025.82627.0

*Corresponding Author E-

ak.arianfar@iau.ac.ir

Food films and coatings are used to protection, quality improvement and increase the shelf-life of food. ..The aim of this study was to investigatation the effect of *Plantago ovata* seed gum with concentrations of 0/05, 0/1 and 0/2% as an edible coating on increasing the on postharvesting time of cucumber.The fruits after being treated with *Plantago ovata* seed gum and storage in an incubator at 4 degrees Celsius were taken out of the incubator once in six days and the indicators of weight loss percentage, hardness, vitamin C, acidity, soluble solids and so Chlorophyll was evaluated.. The experiment was conducted as a complete randomized design with SPSS 22 software. The results of the experiment showed that, except for acidity, the application of the *Plantago ovata* seed gum coating had an significant effect on other parameters. The lowest weight loss and the most hardness were found in 0/1 % of gum, which were significantly difference from other treatments. The highest chlorophyll content (0/95 mg / g fresh weight) and vitamin C (4/9 mg / 100ml) and the lowest soluble solids content (6/7 %) were found in 0/1% treatment, which showed a significant difference between the control and batymar. Based on the overall results of this study, 0/1 % *Plantago ovata* seed gum is recommended to increase the shelf life of the cucumber fruit.

1-Introduction

Fruits and vegetables are of particular importance as one of the most important elements of human nutritional needs, and humans have used these products to meet some of their needs since the beginning of their existence. Fruits and vegetables are a major source of vitamins.CThey are a significant source of carotene, thiamine, riboflavin, niacin, folic acid, and other vitamins of the group.BFresh fruits and vegetables also contain significant amounts of minerals such as calcium and iron, which play an important role in meeting the nutritional needs and health of the community. One of the most important problems in the trade of fruits and vegetables is their short shelf life after harvest. Given the high demand for horticultural products, it is essential to prevent damage between the time of harvest and consumption of these products. Fruits and vegetables are living organisms that continue to respire after harvest [1].

The post-harvest losses of fresh fruits and vegetables are estimated to be 5-25% in developed countries and 20-50% in developing countries. These losses in some low-income and developing countries reach 80-100% in some cases. The shelf life of these products can be extended by various methods, including: initial cooling, changing the composition of gases ($CO_2O_2$and ethylene) around the fruit, pretreatment with waxes or other substances, and the use of new packaging methods increased [2].

Cucumber is an annual plant of the Cucurbitaceae family and is a warm-season crop. The average daily temperature of 18-24 degrees Celsius is the most suitable temperature for cucumber growth. About 30 species have been recorded in Asia and Africa. Cucumber is one of the important vegetables of the Middle East, which is consumed in the market almost all year round, either fresh or processed [3]. Cucumber fruit is susceptible to frost, which occurs when temperatures below°C 10 degrees Celsius causes this condition in the fruit. Meanwhile, temperatures higher than°C15 It also causes yellowing of the fruit. The storage life of cucumbers at°C 13-10 and relative humidity of 90-95% of the environment, 8-10 days [4]. Reduced humidity can cause loss of crispness, undesirable changes in color, flavor and nutritional quality, and also make vegetables that are consumed fresh, such as cucumbers, unusable. Wrapping paper, perforated plastic bags and waxing the product are the most important methods that can be used to preserve the moisture and freshness of cucumbers. Products that have a waxy surface lose their water slowly [2]. Several types of wax and different waxing methods have been used to increase the shelf life of cucumbers. The most important waxes used today are edible coatings. The use of edible films and coatings is an environmentally friendly technology that has significant advantages for increasing the shelf life of fruits and vegetables [1]. One of the best edible coatings is psyllium gum coating, which has been useful in increasing the post-harvest life of many fruits.

Considering that Iran is the second or third largest producer of cucumbers in the world every year, but so far the export of this product has been very limited due to its low shelf life, so increasing its shelf life is considered both economically and technically and managerially. In this regard, it is important to choose methods that are based on scientific and practical principles.

The aim of this research was to determine the best concentration of psyllium gum coating to increase the shelf life of cucumber at room temperature.°C4It is based on examining its physicochemical properties.

2-Materials and methods

The seeds of esfarzeh gum were purchased from a grocer in late May and were transported to the laboratory for gum extraction as soon as possible. The cucumbers used in the experiment were purchased from the Ab Raan greenhouse and transported as soon as possible for the treatments. The cucumbers were harvested at a stage suitable for fresh consumption, and an attempt was made to use cucumbers that were as uniform, of the same size, and healthy as possible. To be used for research. After extracting the gum powder from its seeds, preparing and coating the samples and storing them for 18 days, the desired indicators were measured every 6 days after the samples were taken out of the warehouse and performing multiple tests on the samples. The experiments were carried out in a completely randomized basic design in the form of a split-plot design in time with 3 replications, each replication consisting of 6 fruit slices, in which psyllium gum was considered at four levels of zero (control), 0.05, 0.1 and 0.2 percent as the first experimental factor and sampling time (day) at three levels of 6, 12 and 18 days as the second experimental factor. In each time interval, the desired fruits were placed at laboratory temperature for 2 hours after being taken out of the refrigerator and then the desired indicators were measured. The data obtained from the components of this design were analyzed using the softwarespssAnalyzed from software EXCELwas also used to draw graphs. In this study, variance analysis was used to measure significant differences between samples.(ANOVA)To compare the means, Duncan's multiple range test was used, and the maximum acceptable error was considered to be 5%.

1-2 Raw materials

The raw materials included psyllium seeds and fresh, healthy, sized cucumbers.

2-2 Extraction of psyllium mucilage

In order to extract safflower seed mucilage, the method of Akhondzadeh et al. (2022) was used.، It was used with slight changes, so that initially after purchasing psyllium seeds of the variety*pysiliom aventa*From the local market in late May, psyllium seed impurities such as stones, leaves, and branches were separated by sieving.andgr 50 g of psyllium seeds were weighed and divided into 2 equal parts. 25 g of seeds were poured into a beaker and 1 liter of distilled water was added. To extract the mucilage, the beaker containing water at 70°C and psyllium seeds was placed on a heater for 2 hours, and the beaker containing water and seeds was stirred intermittently during this time. After the end of the two hours, it was placed at room temperature and cooled [5].

After the contents of the beaker reached room temperature, the beaker was covered with foil and placed in the refrigerator for 24 hours. After this time, the contents of the beaker were separated into 3 separate layers. The transparent top layer was separated using a small beaker. The middle layer was passed through a strainer and the mucilage of the seeds was completely separated. To evaporate and reduce the water content, the glass plates containing the mucilage were placed in a bain-marie at a temperature of°C60-70 for 2.5 to 3 hours. In the next step, the plates were placed in the oven.°C70 for 2 hours to dry completely. After drying, the gum was separated from the plates and the dried gum was ground by a model mill.Powdered 14 It was powdered to a size of 80 microns. The final product was stored in a clean and dry glass container.

3.2 Preparing the solution for coating the samples

To prepare the psyllium solution, first, 0.5, 1, and 2 grams of psyllium powder were weighed and added to one liter of water. Then, glycerol was added to the solution at a concentration of 10% (weight-weight of gum powder) as a softener and heated. Also, to strengthen the texture, 2 grams of calcium chloride was added to 1000 ml of the coating solution. For coating, 50 greenhouse cucumbers of the same size and health were selected. The cucumbers were washed and cut into one-centimeter pieces. The cucumber slices were immersed in the solutions for 3 minutes. Then, the cucumbers were placed in a colander to remove excess gum.The cucumbers were allowed to air dry.In order to investigate the construction of the bar,Cucumbers in plastic containersThey were packaged in ethylene and stored in the refrigerator for 18 days. Sampling and examination of the physical and chemical properties of cucumbers were performed every 6 days [6].

4-2 Examination of physicochemical properties

1-4-2% weight loss

Cucumbers from each replicate were weighed with a digital scale with an accuracy of 0.001 g at the beginning of the experiment, after transfer to the laboratory, and at certain intervals during storage in the refrigerator, and the percentage of weight loss was calculated using the following equation:[6].

$(In_1 - In_2) / In_1 * 100 =$ Weight loss percentage

IN_1, weight measured before storage

In_2‘Weight measured after storage.

2.4.2 Tissue stiffness

Permeability test on cucumber slices using a tissue tester (modelPerten TV600(It was carried out using a cylindrical probe with a diameter of 5 mm. The penetration depth in the samples was 5 mm and the penetration speed was 2 mm/s. The maximum force (Newton) in the force versus penetration time curve was determined as stiffness.[7].

3-4-2 Solid-soluble materials (TSS)

To measure dissolved solids, use a handheld refractometer (model2WAY Made in Japan) was used. A quantity of the sample was ground with a mortar, the water was passed through a filter and placed on the prism of the device, and the percentage of dissolved solids was obtained based on the Brix degree, which is mainly dependent on the concentration and viscosity. The basis of this device is to determine the amount of light refraction that enters the device and passes through a thin layer of fruit juice containing dissolved solids. The higher the amount of dissolved substances in the fruit juice, the larger the number the device shows.[8].

4.4.2 Titratable acidity

To determine titratable acidity, use the titration method with 0.2 normal sodium hydroxide along with measurement.pH Fruit juice was used. Weigh about 5 mg of fruit extract and add 20 ml of distilled water to it. pHIt is bypHWe measured the meter and titrated with a gain of 0.2 normal. The end point of the titration was whenpHThe extract reached 2.8 and the volume of the used extract was recorded and the amount of titratable organic acid was calculated in terms of percentage of malic acid (the predominant acid in cucumber) using the following relationship:[9].

$$C = (N \times V \times E) / D \times 100$$

COrganic acid content of the extract in milligrams per milliliter of extract

N Normality of consumer interest

In Consumption profit volume

ANDEquivalent gram of the dominant organic acid

D Sample volume is based on milliliters.

Citric acid and malic acid are the dominant organic acids in cucumbers, but in commercial quantities of the fruit, malic acid with the chemical formulaTHE$_2$H$_5$THE$_6$H$_4$C And Equivalon 167 is the main acid in cucumber. .

5.4.2 Vitamin C measurement

To determine the amount of ascorbic acid, the method of Ghasemzadeh et al. (2010) was used. In this method, the amount of ascorbic acid was determined by titrating the solution with 2,6-dichloroindophenol (DIP)was determined. When the ascorbic acid solution was DIPThe blue color was titrated. As this blue compound is reduced by ascorbic acid, the solution will eventually become colorless. When all the ascorbic acid has been oxidizedDIPThe excess turned the solution pink, indicating the end point. [10].

6.4.2 Chlorophyll measurement

In the measurement of chlorophyll, one gram of the sample was ground well in a porcelain mortar with 10 ml of 80% acetone. Then the resulting solution was filtered with Whatman filter paper number two using a funnel. The mortar, funnel and the remaining materials on the filter paper were washed again with 10 ml of 80% acetone and the final filtered volume was recorded. At this stage, the absorbance of the solution was measured at wavelengths of 645 and 663 nm using a spectrophotometer and 80% acetone was also used as a control solution to adjust the zero optical absorption of the spectrophotometer. It was calculated according to the following formula [3].

$$V/W \quad [\ A_{663}\ )*\ A_{645})+(8/02\ *\ \ 20/2\ )] \quad chlorophyll =$$

in whichA_{645}The number obtained from the device at wavelength 645

A_{663}The number obtained from the device at wavelength 663

InThe volume of the solution, which is 20 ml.

InThe sample weight is 1 gram.

7-4-2 Data analysis

The data from the components of this design were analyzed using SPSS software.EXCELwas also used to draw graphs. In this study, variance analysis was used to measure significant differences between samples.(ANOVA)To compare the means, Duncan's multiple range test was used, and the maximum acceptable error was considered to be 5%.

3-Results and discussion

1-3 Weight loss

As can be seen in Figure 1, the lowest fruit weight loss was related to the 0.1% treatment, which showed a significant difference from other treatments ($p<0.05$The 0.2% and 0.05% psyllium treatments showed the lowest weight loss after the 0.1% psyllium treatment, respectively, but there was no significant difference between them ($p>0.05$).The control treatment, which had the highest weight loss, also showed a significant difference with other treatments, except for the 0.05% esfarzeh treatment ($p<0.05$). During the 18-day storage period, weight loss in all treatments generally showed an increasing trend, so that after 18 days of storage, the highest weight loss belonged to the control (6.4%) and the lowest weight loss belonged to the 0.1% esfarzeh treatment (3.9%).

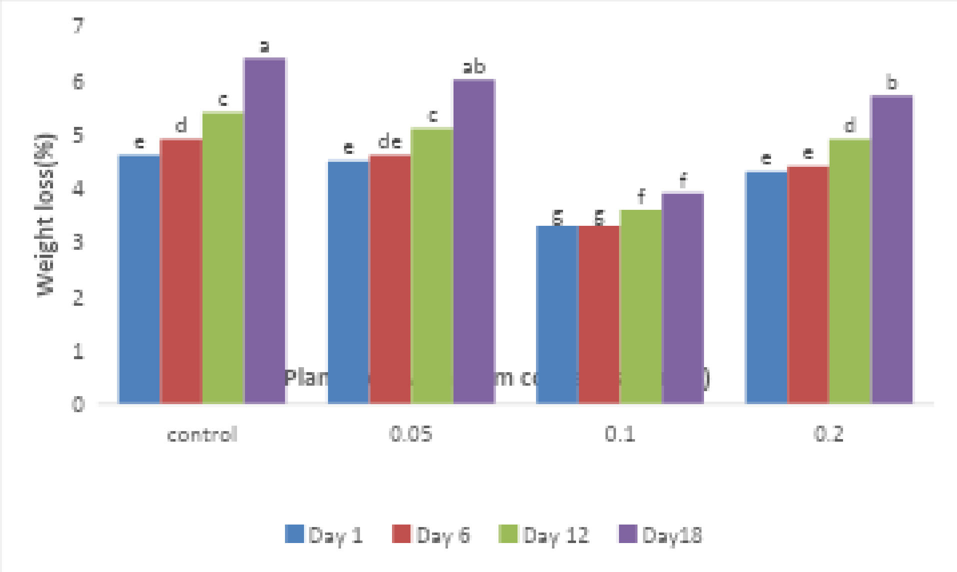

Fig 1.The effect of Plantago ovata seed gum concentration and storage time on weight loss of cucumber slices during 18 days

Edible coatings increase the shelf life of food products by delaying water loss and loss of aromatic compounds, reducing respiration, and delaying structural changes in the fruit. As storage time increased, the percentage of weight loss increased. The rate of weight loss in control samples was greater than in treated samples, and coating fruits with edible coatings significantly reduced weight loss during storage. Weight loss of vegetable products during post-harvest storage is often due to water loss through transpiration [11].
. Loss of more than 5% water changes the appearance of the fruit in many horticultural crops, causing wilting and a decrease in their freshness and appearance quality. Many researchers have reported the effect of edible coatings on reducing the loss of juice in fruits and vegetables. The extent of this reduction depends on the composition of the edible coating, its physical properties, and its ability to form skin membranes and seal discontinuities in the fruit skin [12].
Post-harvest procedures such as slicing, dicing, and seeding remove the natural epidermis and increase the surface area of tissues exposed to the air. This increases transpiration and results in weight loss. As a result of water loss, fruit quality is severely affected. The first obvious signs are wilting and wrinkling of the cucumber slices.
Ghasemi Tolaei et al. (2015), in coating cucumbers with edible chitosan coatingsThey showed thatDuring 20 days of storage in storage, the weight loss in all treatments showed an increasing trend, but chitosan concentrations showed a significant effect on the weight loss of fruits, so that after 20 days of storage in storage, the highest weight loss belonged to the control and the lowest weight loss belonged to the 1% chitosan treatment.[3].
Azizi and colleagues, studying plant mucilages as edible coatings, showed that coating cucumbers with nanoparticle coatings had no significant effect on their weight loss percentage.[13].
Al-Sharkaw et al. (2015) investigated the effect of coating with 0.5, 1.0, and 1.5% psyllium solution on weight loss of papaya slices, and they showed that psyllium coating could significantly reduce the weight loss

process in papaya slices at a temperature of 4°C.[14].

Ballesteros et al. (2022), in a study conducted on the effect of edible coatings on tomatoes during 20 days of storage at 20 °C, it was found that with increasing storage time, the coating was more effective on the percentage of weight loss, so that on the thirteenth day of storage, the weight loss of uncoated samples showed a significant increase compared to coated samples. The results showed that the use of these two types of edible coatings reduced the weight loss of tomatoes during storage and the effect of the coating increased with time.[15]. Anoushirvani et al. (2022), in their study of carboxymethyl cellulose edible coating on cucumbers during 16 days of storage at 10°C, showed that the rate of weight loss increased during storage in all treatments, although this increase was highest for the control sample.[6].

2-3 Tissue stiffness

In the study of the effect of psyllium gum concentration on cucumber tissue stiffness (Figure 2), the 0.1% treatment had the highest tissue stiffness (14.7 Newtons) and the control treatment had the lowest tissue stiffness (9.6 Newtons) among the treatments. The 0.1% psyllium treatment showed a significant difference from the other treatments ($p<0.05$) However, other eschar treatments did not differ significantly from the control treatment ($p>0.05$During the storage period, tissue stiffness decreases and the tissue becomes soft and damaged.

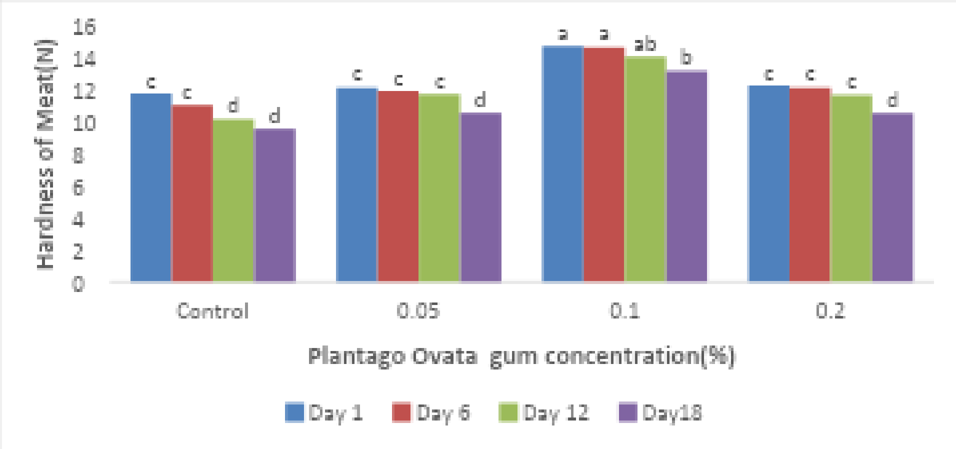

Fig 2. The effect of Plantago ovata seed gum concentration and storage time on hardness of cucumber slices in 18 days

The reason for the decrease in tissue strength may be enzymatic activity and cell wall destruction, loss of parenchymal tissue, and dissolution of pectin in the intracellular fluid.[17].Considering that the coating solution contained calcium chloride along with gum, the coated samples maintained their tissue stiffness to a greater extent than the control, it can be concluded that calcium chloride played a significant role in preventing the reduction of the strength of cucumber slices along with other coatings. Sphagnum plays a role in reducing the activity of polygalacturonase and beta-galactosidase enzymes, pectin methyl esterase, which are among the most important enzymes that destroy the cell wall and are responsible for softening the fruit.[3].Polygalacturonase leads to the destruction of the pectin composition of rhamnogalacturon and an increase in soluble pectin in most fruits, which leads to softening of the fruit tissue. In a study conducted by Ibrahim et al. (2016), using carrageenan coating and whey protein concentrate on apples and examining the tissue strength, they concluded that calcium chloride strengthens the tissue due to the creation of cross-links. Control samples after 16 days significantly ($p<0.05$)They have decreased tissue stiffness and there was no significant difference between the different concentrations of horseradish coating to preserve the tissue at the end of the sixteenth day, but their difference compared to the control and mushrooms treated with citric acid and calcium chloride was significant and significant.[18].

Tolai et al. (2015), on coating cucumbers with edible chitosan coatingsThey showed thatDuring 20 days of storage in the warehouse, the 1% chitosan treatment had the highest meat hardness (16.7 Newtons) and the control treatment had the lowest meat hardness (16.2 Newtons) among the treatments. The 1% chitosan treatment showed a significant difference with the other treatments, but the other chitosan treatments did not differ significantly with the control treatment.[3].

Maghsoudloo et al. (2017), by conducting a texture test on mushrooms coated with watercress seed gum during 16 days of storage at 4°C, showed that among the various coating formulations, a concentration of 0.6% watercress gum was the best coating for maintaining texture firmness after 16 days. However, considering that mushrooms treated only with citric acid and calcium chloride also maintained their texture firmness to a greater extent than the control, it can be concluded that calcium chloride played a significant role in preventing the decrease in the strength of these mushrooms along with other coatings. [19].

3-3 Solid Solution Materials

As can be seen in Figure 3, the concentration of psyllium had a significant effect on the amount of dissolved solids ($p<0.05$)The results showed that the psyllium treatments had a significant difference from the control treatment, but no significant difference was observed between the psyllium treatments themselves ($p>0.05$).The highest amount of soluble solids was found in the control treatment (9.8%) and the lowest in the 0.1% eschar treatment (6.9%).

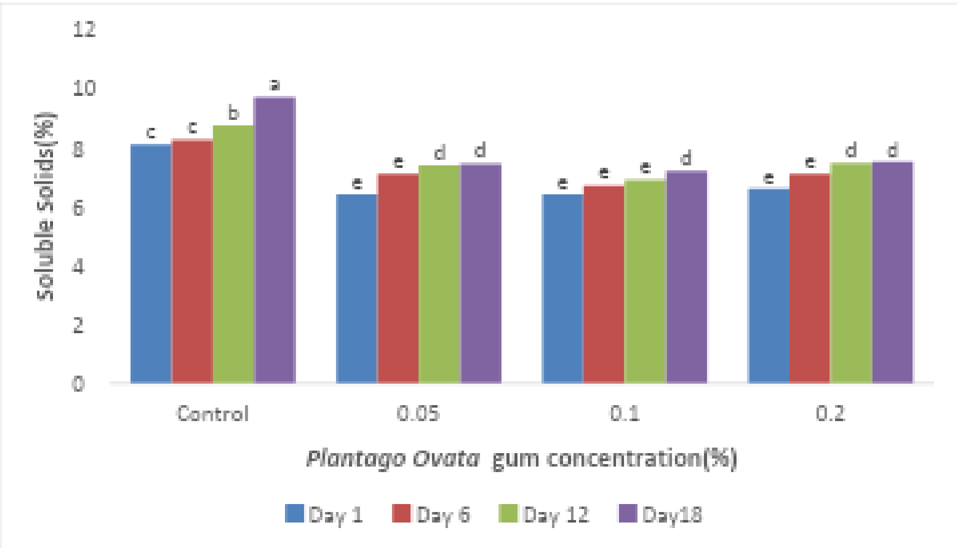

Fig 3. The effect of Plantago ovata seed gum concentration and storage time on soluble solids of cucumber slices during 18 days

By creating a barrier to gas passage, plantain reduces respiration, fruit juice loss, gas exchange, and ethylene production, and is accompanied by the fixation of dissolved solids. While in the control treatment, due to the progress of senescence, cell wall polysaccharides are digested and dissolved solids increase. Plantain coating delays ripening by reducing respiration rate and metabolic activities.[14].

Tolai et al. (2015) showed that the amount of soluble solids in cucumber in the control sample was higher than in the coated samples during 20 days of storage. They believe that the reason for this is the effect of the edible coating on reducing respiratory rate and metabolic activities, which is involved in reducing the increase in soluble solids in the fruit.[3]. Hong et al. (2012) consider the effect of chitosan to be involved in reducing the increase in soluble solids in guava fruit due to its ability to slow down respiration and metabolic activities.[16].

4.3 Acidity

As can be seen in Figure 4, the highest amount of organic acid was in the 0.1% psyllium treatment (mg/100 mlIt was observed that there was no significant difference with other treatments (1/136).$p>0.05$).

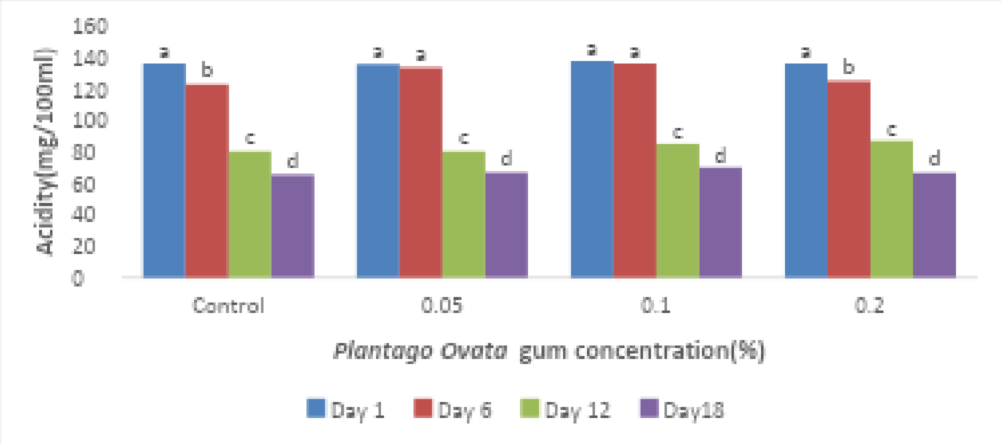

Fig 4. The effect of Plantago ovata seed gum concentration and storage time on acidity of cucumber slices during 18 days

The amount of titratable acidity is related to fruit ripeness and causes sour taste in fruits. As the fruit ripens, the amount of organic acids decreases. The amount of organic acids during the fruit harvest period depends on the soluble solids and the rate of acid decomposition. The decomposition of organic acids during fruit ripening depends on the rate of respiration, because these acids are used in the enzymatic activity of respiration. During ripening and increasing metabolic activities, the organic acids of the fruit decrease. Food coatings, by changing the internal atmosphere and reducing the rate of fruit respiration, cause better preservation of organic acids.[15].

Akhondazeh et al. (2022), in the results obtained from titratable acidity during 20 days of storage at 4 °C, showed that the titration of acidity in the coated papaya slices sample remained constant during the storage period compared to the control sample. In the control sample, the increase in acidity at the end of the storage period is due to the production of organic acids by microorganisms.[5].

Tolai et al. (2013), the highest amount of organic acid was observed in the 0.1% chitosan treatment, but there was no significant difference with other treatments. Chitosan concentrations also caused better preservation of organic acid in fruits in this experiment, but there was no significant difference with the control. [3].

Ballesteros et al. (2022), by measuring the titratable acidity in tomato fruit coated with edible coatings, showed that the titratable acidity in tomato fruit decreases during storage in the refrigerator as the fruit ripens. The titratable acidity in the control sample at the end of the storage period showed a significant decrease compared to the coated samples, but no difference was observed between the two types of coatings in this regard.[15].

5.3 Vitamin C measurement

According to Figure 5. Comparison of the average effect of psyllium on the physical and chemical properties of cucumber on vitamin C among the treatments has a significant difference. Treatments 0.05 and 0.1 percent have the highest vitamin C content, which are not significantly different from each other ($p>0.05$) But there is a significant difference between the two treatments, control and 0.2%.$p<0.05$).

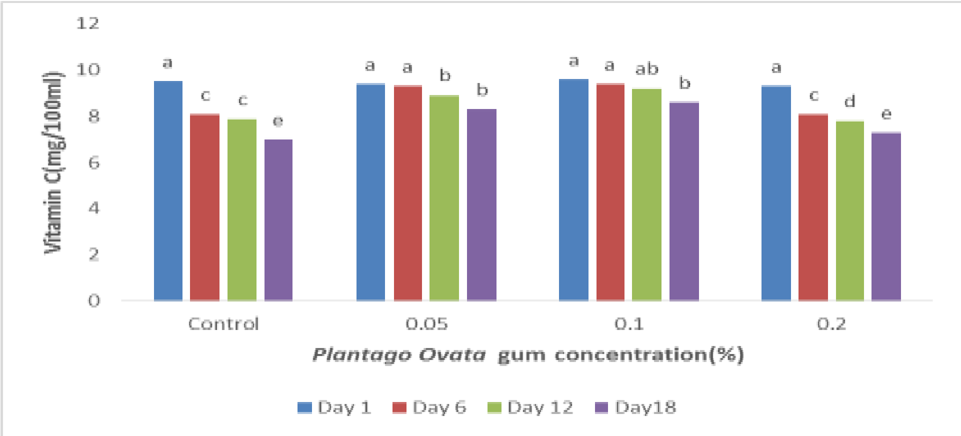

Fig 5. The effect of Plantago ovata seed gum concentration and storage time on vitamin C of cucumber slices during 18 days

Vitamin C loss is undesirable in terms of nutritional value, so preventing vitamin C loss, which is likely to occur by inhibiting the activity of enzymes involved in its oxidation, is very useful in preserving the nutritional value of fruits. The decrease in vitamin C may be due to increased oxidation resulting from water loss. Covering cucumber slices with psyllium reduces the rate of oxygen penetration into the fruit tissue, which in turn reduces the activity of ascorbic acid-oxidizing enzymes and ultimately reduces the rate of ascorbic acid destruction in cucumber slices covered with psyllium. Oxidative processes have been stated to be the main factor in the destruction of ascorbic acid in fruit tissue, and these processes are accelerated in the presence of light, oxygen, heat, and oxidizing enzymes.[3].

Emamifar et al. (2015) examined the effect of aloe vera gel coating on the vitamin C content of strawberries during the day. The results showed that the ascorbic acid content in the control sample decreased to a greater extent (about 42 percent), while the coated samples lost less ascorbic acid.[3].

Akhonzadeh et al. (2022), in the results obtained from the amount of vitamin C in papaya fruit coated with psyllium, showed that the amount of ascorbic acid decreased during storage in all samples, but the maximum decrease in the amount of ascorbic acid was seen in the control sample, while it was less in the coated samples.[5].

Tolai et al. (2015), the amount of vitamin C on cucumbers during the experiment initially showed an upward trend, and from the fifth day to the end of the experiment, the trend was downward, and this decrease was observed in all treatments, and on the twentieth day, the lowest amount of vitamin C was in the control treatment. [3].

6.3 Chlorophyll measurement

Figure 6 shows the effect of psyllium gum concentration on the chlorophyll content of cucumber slices. As can be seen, the highest chlorophyll content was in the first day samples of the control and other treatments (fresh weightmg/g (0.95) and decreased with increasing storage time in all gum concentrations ($p<0/05$The intensity of these changes over time was greater in uncoated samples, and with increasing coating concentration to 0.1%, less changes in chlorophyll content were observed during storage, but at 0.2% gum concentration, these changes increased over time ($p<0/05$).

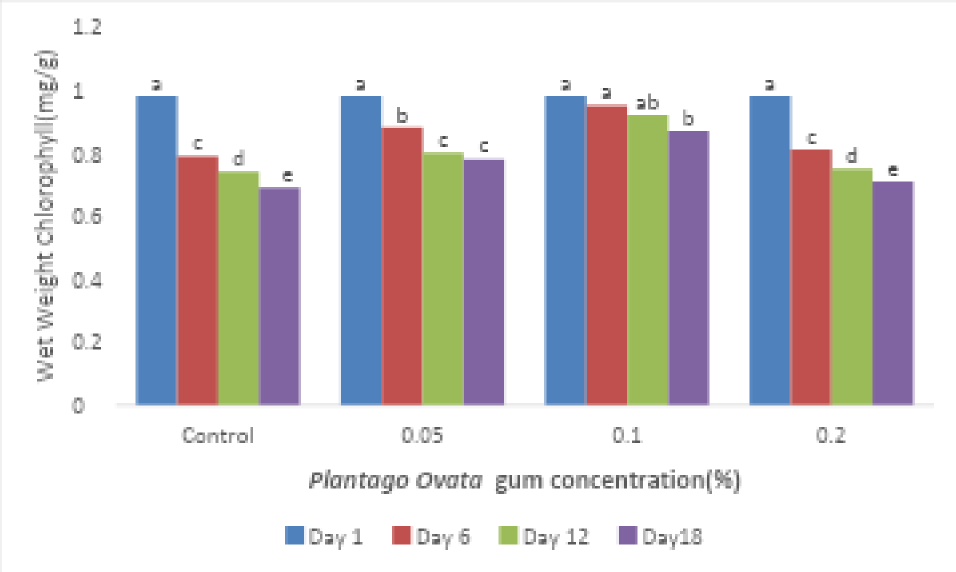

Fig 6. The effect of Plantago ovata seed gum concentration and storage time on chlorophyll content of cucumber slices during 18 days

The psyllium coating on cucumber slices reduced the respiration rate in the fruits and reduced ethylene production, resulting in a reduction in the aging process in the fruits, which in turn reduced chlorophyll degradation.**[16].**In the present study, it appears that the 0.2% concentration of psyllium in this experiment caused damage to the fruit tissue, which increased respiration and increased enzyme activity, and consequently reduced chlorophyll content.

Muhammad et al. (2011) reported that in papaya fruit, chitosan increased the internal concentration ofCO_2 and as a result, the level ofCO_2Reduces ethylene synthesis and delays fruit aging, resulting in reduced chlorophyll degradation.**[21].**

Aberal et al., in a study, concluded that chitosan has a beneficial effect on the maintenance of chlorophyll content in green peppers. According to their results, at the end of the storage period, the amount of chlorophyll present in the skin of fruits treated with chitosan coating was higher than that of control fruits. **[22].**

4- General conclusion

Edible coatings are considered one of the effective solutions in increasing the shelf life of fruits and vegetables. The use of edible coatings can be considered as one of the effective solutions in increasing the shelf life of fruits. Edible films or coatings consist of a continuous substrate of protein, polysaccharide or lipid. The use of edible coatings affects the shelf life of the product by changing the atmosphere inside the package, reducing the microbial load and delaying weight loss and respiratory reactions, as well as protecting against physical shocks. In this study, the effect of psyllium seed mucilage with concentrations of 0.05, 0.1 and 0.2% as an edible coating on increasing the post-harvest time of cucumber was investigated, and indicators such as weight loss percentage, tissue firmness, vitamin C, acidity, soluble solids and chlorophyll content were evaluated. The results showed that coating cucumbers with psyllium gum is a new method in preserving and increasing the shelf life of fresh cucumber fruit at a temperature of 4 degrees Celsius. The results showed that edible psyllium coating can preserve the quality of fruits for a longer period of time and thus increase the shelf life of cucumbers, and the effect of 0.1% psyllium concentration is better than other concentrations.

5.References

[1].Yousuf, B., Qadri, O. S., & Srivastava, A. K. (2018). Recent developments in shelf-life extension of fresh-cut fruits and vegetables by application of different edible coatings: A review. Lwt, 89, 198-209.

[2].Espitia, P. J. P., Du, W.-X., de Jesús Avena-Bustillos, R., Soares, N. d. F. F., & McHugh, T. H. (2014). Edible films from pectin: Physical-mechanical and antimicrobial properties-A review. Food hydrocolloids, 35, 287-296.

[3].Ghasemi Tavallaiy, M., Ramin, A., & Amini, F. (2015). Effects of Edible Chitosan Coating on Quality and Increasing Storage Life of Cucumber cv. Isfahan University of Technology-Journal of Crop Production and Processing, 5(15), 189-198.

[4].Deng, Y., Tang, B., Zhou, X., Fu, W., Tao, L., Zhang, L., & Chen, J. (2020). Direct regeneration of haploid or doubled haploid plantlets in cucumber (Cucumis sativus L.) through ovary culture. Plant Cell, Tissue and Organ Culture (PCTOC), 142, 253-268.

[5].Akhoondzadeh, H., Taghizadeh, M., & Irani, M. (2022). The effect of psyllium husk and edible colorants (betalain & curcumin) on the stability, physical and sensory properties of Iranian traditional drink (doogh). Journal of food science and technology (Iran), 18(119), 393-409.

[6].Noshirvani, N., & Fasihi, H. (2022). Effect of carboxymethyl cellulose-based active coatings containing savory and ginger essential oils on shelf life and some postharvest properties of fresh cucumber. Journal of Food research, 32(2), 123-138.

[7].Gholamhosseinpour, A., Hashemi, S. M. B., & Ghaffari, K. (2023). Physicochemical and microbial qualities of Citrus reticulata cv. Bakraei coated with Lepidium sativum gum containing nanoemulsified Echinophora cinerea essential oil during cold storage. Postharvest Biology and Technology, 199, 112275.
[8].Farina, V., Passafiume, R., Tinebra, I., Scuderi, D., Saletta, F., Gugliuzza, G.2020..Sortino, G.. Postharvest application of aloe vera gel-based edible coating to improve the quality and storage stability of fresh-cut papaya. Journal of Food Quality, 2020, 1-10
[9].Finidokht, R., M. Asghari and H. Shirzad. 2011. The effect of chitosan on postharvest life extension and qualitative characteristics of table grape "Shahroodi". Iranian Journal of Food Science 26(4): 378-384. (In Farsi).
[10].Ghasemnezhad, M., M. A. Shiri and M. Sanavi. 2010. Effect of chitosan coatings on some quality indices of apricot(Prunus armeniaca L.) during cold storage. Caspian Journal of Environment Science 8: 25-33
[11].Ardakani, M. D., Y. Mostofi and R. Hedayatnejad. 2010. Study on the effects of chitosan in preserving some qualitative factorsof table grape (Vitis vinifera). Acta Horticulturae 877: 739-742
[12].Gonzalez-Aguilar G. A., E. Valenzuela-Soto, J. Lizardi-Mendoza, F. Goycoolea, M. A. Martinez-Tellez, M. A. Villegas-Ochoa, I. N. Monroy-Garcia, and J. F. Ayala-Zavala deterioration and preserving the quality of fresh-cut papaya 'Maradol'", 89, 15–23, 2013-2014.
[13].Azizi, M., Oroojalian, F., Orafayi, H., Yazdian, F., Rahmati, M., & Haghiroalsadat, F. (2012). Development of Biodegradable Nanoparticles Derived from Plant Mucilage and Its Application as an Edible Coating. Journal Of Horticultural Science2
[14].Elsharkawy, M. M., & Mousa, K. M. (2015). Induction of systemic resistance against Papaya ring spot virus (PRSV) and its vector Myzus persicae by Penicillium simplicissimum GP17-2 and silica (SiO2) nanopowder. International journal of pest management, 61(4), 353-358.
[15].Ballesteros, L. F., Teixeira, J. A., & Cerqueira, M. A. (2022). Active carboxymethyl cellulose-based edible coatings for the extension of fresh goldenberries shelf-life. Horticulturae, 8(10), 936.
[16].Hong, K., Xie, J., Zhang, L., Sun, D., & Gong, D. (2012). Effects of chitosan coating on postharvest life and quality of guava (Psidium guajava L.) fruit during cold storage. Scientia horticulturae, 144, 172-178.
[17].Gheysarbigi, S., Ramin, A., & Amini, F. (2016). Effect of chitosan coating on fruit quality and storage life of sweet lime (Citrus limetta). Isfahan University of Technology-Journal of Crop Production and Processing, 5(18), 153-163.
[18].Ibrahim Khalifa, I,. Barakat,H., El-Mansy,H., Soliman, A.2016. Improving the shelf-life stability of apple and strawberry fruits applying chitosan-incorporated olive oil processing residues coating.
• Food Packaging and Shelf Life 9:10-19.
[19].Maqsoodlou,Y., Ghorbani.A., Alami M, Sadeghi, 2017. Investigating the effect of edible coating of watercress mucilage on shelf life of button mushroom. Iranian Research Organization for Science and Technology.12(95)-89-96.
[20]Emami far, A., 2015.Evaluation of the effect of aloe vera gel as an edible coating on the microbial, physicochemical and sensory characteristics of fresh strawberries during storage. Iranian Research Organization for Science and Technology. 2(6)-15-29.
[21].Ali, A., Muhammad, M. T. M., Sijam, K., & Siddiqui, Y. (2011). Effect of chitosan coatings on the physicochemical characteristics of Eksotika II papaya (Carica papaya L.) fruit during cold storage. Food Chemistry, 124(2), 620-626.
. Ilyas, R. A., Aisyah, H. A., Nordin, A. H., Ngadi, N., Zuhri, M. Y. M., Asyraf, M. R. .
[22].Abral, H. (2022). Natural-fiber-reinforced chitosan, chitosan blends and their nanocomposites for various advanced applications. Polymers, 14(5), 874.

مجله علوم و صنایع غذایی ایران

سایت مجله: www.fsct.modares.ac.ir

مقاله علمی_پژوهشی

اثر موسیلاژ دانه اسفرزه به عنوان پوشش خوراکی بر افزایش زمان پس از برداشت خیار

اکرم ابراهیمی عمارت[۱]،اکرم آریان فر[۲]*

۱. گروه علوم و صنایع غذایی، واحد قوچان، دانشگاه آزاد اسلامی، قوچان، ایران

۲. گروه علوم و صنایع غذایی، واحد قوچان، دانشگاه آزاد اسلامی، قوچان، ایران

اطلاعات مقاله

تاریخ های مقاله :

تاریخ دریافت: ۱٤۰۳/۰۵/۰۳

تاریخ پذیرش: ۱٤۰٤/۰٤/۳۱

کلمات کلیدی:

اسفرزه،

عمرانبارمانی،

پوشش خوراکی،

خیار.

DOI: 10.48311/fsct.2025.82627.0.

* مسئول مکاتبات:

ak.arianfar@iau.ac.ir

چکیده

فیلم ها و پوشش های خوراکی برای محافظت ، بهبود کیفیت و افزایش ماندگاری موادغذایی استفاده می‌شوند . هدف از این تحقیق تاثیر **موسیلاژ دانه** اسفرزه با غلظت‌های ۰/۰۵ ، ۰/۱ و۰/۲ درصد به عنوان پوشش خوراکی برافزایش زمان پس از برداشت خیار بوده است . نمونه ها پس از پوشش دهی با موسیلاؤ اسفرزه و نگهداری در اینکوباتور با دمای ٤ درجه سانتیگراد در فاصله زمانی شش روز یک بار از اینکوباتور خارج و از نظر شاخص هایی نظیر درصد کاهش وزن، سفتی بافت، ویتامین ث، اسیدیته، مواد جامد محلول و محتوای کلروفیل مورد ارزیابی قرارگرفتند. آزمایش به صورت طرح پایه کاملا تصادفی و پردازش داده ها در محیط نرم افزار spss ۲۲ انجام گردید. نتایج آزمایش نشان داد که پوشش اسفرزه جز در مورد اسیدیته، اثرمعنی داری روی سایر شاخص های اندازه‌گیری شده داشت. کمترین کاهش وزن و بیشترین سفتی در تیمار ۰/۱ درصد اسفرزه بدست آمد که با سایر تیمارها تفاوت معنی‌داری داشت. بیشترین میزان کلروفیل (وزن تر ۰/۹۵ mg/g) و ویتامین ث (mg/ ٤/۹ml۱۰۰) و کمترین میزان مواد جامد محلول (٦/۷ درصد) نیز در تیمار ۰/۱ درصد بدست آمد که با تیمار شاهد تفاوت معنی داری نشان داد. براساس نتایج کلی این تحقیق تیمار اسفرزه ۰/۱ درصد برای افزایش عمر انبارمانی میوه خیار تازه توصیه می شود.