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Assesment of the effect of aloe vera gel on the shelf life of pear fruit and its effect on fungi Penicillium expansum and Aspergillus niger

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ABSTRACT

Today, chemical agents are used to control post-harvest lesions of Fruits but its harmful effects could be considered as an important factor in reducing shelf life.Recently aloe vera has played an important role in maintaining the quality and health of fruits as well as controlling the pathogenic fungi.Aloe vera coating was used in different concentrations of gel (100,75,50,25%) during 36 days of storage at 4 degrees Celsius.Microbial stability, physicochemical properties (weight loss,tissue stiffness, pH, Soluble solids) and color sensory properties pears coated with aloe vera gel were evaluated after 36 days of storage compared to the control as well as the effect of aqueous and ethanolic extracts of aloe vera on two species of fungi penicillium expansum and aspergillus niger were investigated. The results showed that the growth of microorganis has siginificantly been delayed by aloe vera gel coating and there was a reduction in weight loss compared to control and this coating to maintain better rigidity and reduction of soluble solids and it had a significant effect on the pH of the treatments.And had no significant effect on the sensory properties of color in different treatments compared to the control. Also,aqueous and ethanolic extract of aloe vera has a growth in habiting effect on these fungi.As a result,coating aloe vera gel on pear fruit increases its shelf life.

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1. Introduction

Today, the demand for products with similar fresh quality and long shelf life is increasing. From the beginning, mankind has been looking for ways to preserve food, fruits, vegetables and increase their shelf life and usability.[1]. These products, including fruits, continue to breathe after harvesting, and due to continued breathing, they gradually deteriorate. Also, immediately after harvesting, they are exposed to the intensification of spoilage resulting from the activity of bacteria, fungi and other microorganisms, which greatly affect the taste, aroma and appearance of the product and are one of the main factors of economic challenges in the economic field.[2]. Among the fungi that grow dominantly on stored products are Aspergillus, Fusarium and Penicillium species.[3]. In fact, another way to prolong the freshness of the product is to use a protective food coating, which acts like storage under a controlled atmosphere.[4]. Today, the use of medicinal plants in developed countries is increasing rapidly, and the percentage of people who use herbal medicines is increasing.[5]. Aloe vera is one of the oldest medicinal plants and a member of the Liliaceae family that grows in hot and dry areas and is called Sabrzard or Sabrtalkh in Iran.[6-8]. Aloe vera gel is one of the new food coatings that has attracted the attention of researchers[10 and 9]. Aloe vera having active biological compounds such as: anthraquinone and dehydroxy anthra as well as saponin has antimicrobial effects.[11]. A kind of pear*(Pyrus)* A member of the underworld*((Pomoideae* and dark*((Rosaceae*And after apples, it is considered the most important commercial product of the sub-group of seeded fruits[12]. Different types of pears are shrubs and trees with a trunk height of 15-20 meters[13]. Pear is a source of sugars, minerals, various biologically active compounds such as vitamin C and phenolic compounds.[14]. And they contain thiamin B1, riboflavin B2, niacin B3, B6 and also contain calcium, iron, magnesium, phosphorus and potassium. Some varieties of pears are grown in Iran: Prophet (Sard Roud), China Sahne, Shah Meuh, Natanz Kashan, Kosi, Sabri, Mohammad Ali, Saif Tabrizi, Darghazi, Tashkent, Anjou, Boreh Hardy, Williams (Bartlett) and Duchess. is[13]. The purpose of this research is to use the edible coating of aloe vera gel on pear fruit in cold storage in order to preserve it, and to use aloe vera gel and alcoholic extract to prevent the growth of two types of fungi, Penicillium expansum and Aspergillus niger.

2- Materials and methods

2-1- Preparation of fruit

Pear fruits of the Shah Meow variety, which were good in terms of quality and color, were procured from Ahvaz market at the end of November 2015, then they were transported to the laboratory as soon as possible and with the necessary precautions to avoid any bruises. To remove the excess microbes, then dry them and some fruits were considered as witnesses.

2-2- Preparation of gel (preparation of aloe vera gel)

To prepare aloe vera gel, the method of Valord et al. (2005) was used, in such a way that they bought two leaves of aloe vera plant, washed them with water and dried them before use, and cut the jagged edges in half with a sharp hand knife. The upper layer of the leaf is split lengthwise so that the transparent aloe vera gel can be seen, carefully separate the aloe vera gel from the leaf, and after separating the gels, they are crushed and mixed well for 5 minutes with a blender, and the gel is prepared. prepared with sterile distilled water in dilutions (100, 75, 50, 25% w/w)[15].

2-3- extract preparation

Aloe vera leaves were procured from Ahvaz market in mid-autumn of 2015, and after collecting fresh aloe vera leaves and washing them with distilled water, 70% ethanol was used to disinfect them, then they were cut into small pieces, and the leaves were placed in the oven. The model (U-40) was placed at a temperature of 50-60 degrees Celsius for 3 days until it dried completely. After the leaves are completely dried, 100 grams of dried aloe vera is soaked in 70% ethanol for 3 days, and after removing the 70% ethanol, 76% ethanol is added to it, and in a rotary machine (RV10D) at a temperature of 40 degrees Celsius to give us an alcoholic extract[16].

2-4-preparation of mushrooms

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Aspergillus niger with number (5057) and Penicillium expansum with number (5033) were purchased from the regional center of the collection of industrial fungi and bacteria of Iran in the form of lyophilized ampoules and kept in the refrigerator until use.

5-2-Coating fruit with aloe vera gel (Coating with aloe vera gel solution)

105 pears of the same size and each with a certain weight in a diluted solution of aloe vera gel with sterile distilled water in concentrations (zero (control), 100, 75, 50, 25% weight-weight) for 5 minutes at 25 degrees Celsius and they were immersed in sterile containers and transferred to a mesh container to be drained, and then placed in a sub-laminar hood for 30 minutes, and the fruits that were partially dried and their surface moisture evaporated were placed in plastic boxes Especially for the fruit, which were previously washed and dried and disinfected with ethyl alcohol in 5 packages, each package contained 21 fresh pears and were transferred to a cold storage with a temperature of 4 degrees Celsius and a relative humidity of 85%. Then, the fruits were examined in terms of microbial population reduction, weight loss, appearance spoilage, color, pH, texture firmness and soluble solids.[18 and 17].

2-6- pH measurement

The pH of fruit juice was measured with a pH meter (Multi 9310) calibrated with buffers 4, 7, and 9.

2-7-Measurement of dissolved solids

For this purpose, a few drops of fruit juice were placed on a digital refractometer model (PAL-1) at room temperature, and the corresponding number was read from the graduated column. The data were recorded in Brix percentage.

8-2-measuring tissue stiffness

Measurement of tissue hardness by digital penetrometer (MARMONIX MMH-101 model) according to the recommended standard method. After calibrating the device for each pear sample, the samples were tested on both sides and the numbers were calculated and recorded in terms of force.

9-2-Weight measurement

To evaluate the amount of weight loss, the fruits coated with different dilutions of aloe vera gel were weighed with a digital scale (PT1200) with an accuracy of 0.001 at the beginning of the experiment and before storage, and then they were weighed again on the last day. The amount of weight loss of fruits, which is actually caused by the decrease in moisture content of fruits, was calculated.

2-10- Sensory test

The characteristics of color, which is one of the sensory characteristics, were evaluated using a 5-point qualitative rating. In this evaluation, the number 5 was very good, the number 4 was good, the number 3 was average, the number 2 was weak, and the number 1 was very weak. 5% level was analyzed.

2-11-Microbial test

In order to investigate the spread of microbial contamination (moldy spoilage), a microbial test was performed for coated and control samples. In this test, first, 10 grams of pear skin and flesh were separated by a sharp sterile knife, weighed with a weight, and poured into a mortar. We mixed it well and put it into a 200 ml Erlenmeyer flask containing 90 ml of sterile peptone water (0.1% w/v) for dilution.$^{-1}$10 was transferred and mixed well with a tube shaker, then using a sterile pipette, one tenth of the above dilution was used for microbial culture. To count the molds, the method of surface culture and culture medium (SDA) of Sabers dextrose agar was used. Weigh a portion of the solid culture medium, pour it into an Erlenmeyer flask and add sterile distilled water to it, cover it with cotton and clarify it on a magnet heater and put it in an autoclave at a temperature of 121 degrees Celsius to sterilize the culture medium and after sterilization Gentamycin was added to it and placed under the laminar hood in disposable plates, and in this way we prepared the culture medium and performed the microbial culture. The cultured petri dishes along with the control petri dishes were placed at 25 degrees Celsius for 3 days and after growth, the microbes were counted by the colony counter device. were reported in each gram of pear Log(cfu/g).

2-12-Preparation of microbial suspension

For mushroom cultivation, after sterilizing the mushroom lyophilized glass, pour some sterile physiological serum into the glass to dissolve the

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fungal spores in it, then add some of this physiological serum containing fungal spores into the Sabarz dextrose agar and Sabarz dextrose broth culture medium, which have been prepared in advance in the plates and tubes. was poured and placed at a temperature of 25 degrees Celsius to grow the mushrooms[20 and 19].After the growth of the microbes from the 24-hour fungal culture, he prepared a 0.5% McFarland solution by adding half a milliliter of 0.048 mol/liter chlorbarium to 99.5 milliliters of 0.18 mol/liter sulfuric acid and Continuous stirring of the suspension is achieved. The correct density of the standard turbidity is determined by measuring absorption in a spectrophotometer with an optical path length of 1 cm. The absorption at 625 nm should be between 0.08 and 0.13. It was poured into a screw cap of the same size as the microbial suspension tubes. To prepare a fungal suspension equal to half of McFarland, add 10 cc of sterile Sabarz dextrose broth to the sterile tubes with lids under the laminar hood, and add enough of the fungal spores that were dissolved in the sterile physiological serum solution to The tubes were added until a turbidity similar to half McFarland turbidity was obtained, and to ensure the work, they were read by a spectrophotometer model (T90) at a wavelength of 625 nm, the absorbance of which was between 0.11[21].

2-13- Determination of the effect of aloe vera gel on fungi

After that, we poured 0.1 cc of McFarland's half solution of microbial culture in the sterile Sabers Dextrose Broth culture medium and cultured it everywhere on the plate and created wells in the culture medium with a sterile pipette and from different dilutions of aloe vera gel that We had already prepared it, added 40 microliters with a sterile sampler, and after drying it at 25°C for 3 days, we examined the antimicrobial property of the gel and the aura of the absence of mushroom growth [20,19]. .

2-14- Minimum inhibitory concentration and minimum lethal concentration

After preparing the extract, the minimum growth inhibitory concentration (MIC) and minimum lethal concentration (MFC) of the alcoholic extract of aloe vera were measured using the Broth Macro Dilation method. For this purpose, two series of 8 tubes were used. 5 tubes were used to test different dilutions of the extract and one tube as a positive control (containing the diluted extract plus the culture medium) and two tubes as the negative control (containing the suspension of Penicillium expansum mold plus the culture medium) and (containing the suspension Aspergillus niger mold plus culture medium) was considered. One milliliter of liquid culture medium (SDB) was added to all the tubes. 2 ml of alcoholic aloe vera extract was removed by a pipette and added to the first tubes. We take 1 ml from the first tubes and add them to the next tubes. In this way, until tube number 6, it will be half of the previous one. From tube number 6, one milliliters were removed and discarded, then into the tubes except tube number 6 (positive control), 40 microliters of each suspension containing 10^6 We inoculated spores. All test tubes were placed at 25°C for three days. After the incubation time, the tubes were checked for turbidity caused by the growth of inoculated mold. The lowest concentration of aloe vera alcohol extract above which no turbidity was observed was considered as MIC. Of all the tubes in which the lack of growth of molds was observed, samples were taken and to determine the minimum lethality of the extract, it was cultured by surface method. For this purpose, 100 microliters of the tubes that showed the lack of growth of molds were cultured on SDA (Sabarzdextrose Agar) solid culture medium. The first dilutions in which no mold grew were considered as MFC[22].

2-15-Statistical design of data analysis

The results of examining the shelf life of pear fruit with the treatment of aloe vera gel concentration in five levels zero (control) 25, 50, 75, 100, weight-weight percentage and storage time (in seven levels 0, 6, 12, 18, 24, 30, 36 days after harvest) was repeated factorially based on a completely random design, and the results were analyzed using SPSS software and ANOVA statistical analysis and comparison of averages using Duncan's test.± standard error (Mean ± SE was given at the 5% level.

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3- Results and discussion of control sample and samples covered with aloe vera gel

1-3-Comparison of the results of the pH factor of the control sample and the samples coated with aloe vera gel

Comparison of the average data showed a significant decrease in the pH of pear extract coated with aloe vera gel during 36 days of cold storage, so that the maximum decrease in the pH of the extract was seen after 24 days from the beginning of the study, and the largest decrease was related to the control samples and The lowest was seen in coated samples (100%, 75%, 50%, 25%) respectively. During fruit ripening, the main changes that occur include: reduction of tissue stiffness, starch breakdown, increase in acidity, production Oily and waxy substances, esterase and alcohol production, chlorophyll decomposition, increased respiration rate and ethylene production[23]. In this research, all the fruit treatments had an increase in acidity, among which the aloe vera gel coating decreased the pH of pear extract in different treatments and was able to prevent the ripening speed of the fruit. Aloe vera gel is one of the polysaccharide coatings and has properties such as creating The protective layer on the product protects the cells under the protective layer against mechanical damage, reducing the loss of fruit juice, reducing the speed of gases passing through the skin of the fruit by creating a cover on the lenses and apertures, and as a result, changing the atmosphere around the product.[10 and 9]. In a research, Asghari and Khalili (2015) investigated the effect of gel on cherries and their results showed that aloe vera gel was able to keep the pH of cherries low in all samples, which was consistent with the results of this research.[24]. Siahroudi et al. (2015) investigated the effect of different food coatings on the pH of the mushroom extract, and the highest pH of the extract during storage in cold storage was related to the coating of button mushroom with aloe vera gel and 1.5% nettle extract with ascorbic acid. Their results were consistent with the results of this research[25]. Shirazi et al. (2012) investigated the effect of essential oils of medicinal plants on the pH of Valencia oranges and showed a significant difference between the treatments in terms of pH increase during storage, which is contrary to the results of this research.[26]. Alexander et al. (2012) also reported that the pH value of strawberries coated with aloe vera does not change significantly during storage at refrigerator temperature for up to 14 days, which contradicts the results of this research.[27].

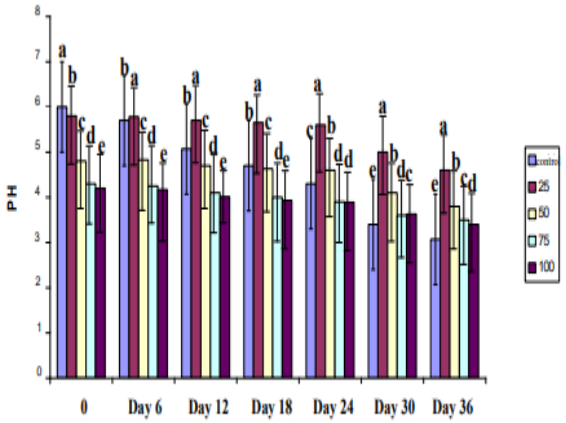

Figure (1):pH changes at five percent (control, 25, 50, 75, 100) Form aloe vera gel for 36 days

2-3-Comparison of the results of the soluble solid factor of the control sample and the sample coated with aloe vera gel

According to figure (2), in all samples, the amount of soluble solids up to 6 days after storage did not show a statistically significant difference and was relatively stable, with increasing storage time of soluble solids as a function of storage time. It went through an increasing process so that on the 30th and 36th days, the dissolved solids increased more intensively, and this could be due to the weight loss and concentration of these substances over time, and the highest increase was seen in the control samples and the lowest in

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It was related to the samples covered with 100% aloe vera gel and then related to 25%, 75% and 50% gel, respectively. The increase in soluble solids is related to the decrease in fruit juice, which in turn causes an increase in the concentration of soluble solids, as well as the respiration and aging of the fruit causes polysaccharides to break down and convert them into simpler compounds and increase the soluble solids.[28].

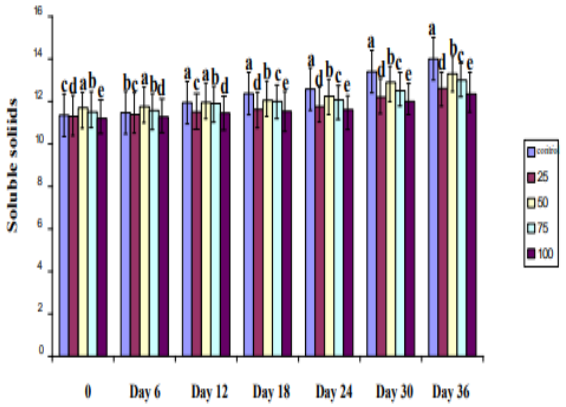

Fig 2 changes in soluble solids in five groups (control, 25, 50, 75, 100) Form aloe vera gel for 36 days

Valverde et al. (2005) showed in a study that the soluble solids of control grapes stored at 20°C were higher than those treated with aloe vera gel under the same conditions, which was consistent with the results of this study.[15]. Vahdat et al. (2012) investigated the effect of different concentrations of aloe vera gel on the soluble solids of strawberry fruit and showed that the fruits treated with a concentration of 100% aloe vera had the lowest amount and the fruits without coating had the highest amount of soluble solids. showed that it is consistent with the results of this research[29]. Also, the increase in the amount of total dissolved solids during storage was consistent with the findings of Zarin Bal et al. (2010).[30].

3-3-Comparison of the tissue stiffness factor results of the control sample with the sample coated with aloe vera gel

In this research, the control samples with oral aloe vera coating with different percentages of gel were kept in cold storage for 36 days and the results showed that the tissue stiffness of all samples decreased over time during the storage period and aloe vera treatments in maintaining the firmness of pears. They were significantly effective compared to the control group and this coating could prevent the softening of the fruit, so that the greatest decrease in firmness was related to the control samples, followed by 50%, 25% and 75% gel, and the best treatment It was related to 100% aloe vera gel. The softness of the fruit tissue occurs as a result of the activity of cell wall hydrolyzing enzymes such as polygalacturonase, pectin methylesterase and betaglucosidase, all of which target pectin.[31]. The softening of the fruit has been attributed to the destruction of the cell wall components, mainly pectin, due to the action of special enzymes such as: polygalacturonase, and one of the reasons for maintaining the firmness of the coated fruit tissue was preventing weight loss and delaying shriveling by closing the stomata. . during a researchMohebi et al. (2011) physical and appearance characteristics of button mushroom, including color and Texture, weight loss, carbohydrate content were evaluated during mushroom storage period. The tested mushrooms were kept at different storage temperatures (15, 10, 4) degrees above zero and without edible aloe vera gel and kathira gum. The results showed that cold storage temperatures in mushrooms without edible coating of aloe vera gel and kathira gum resulted in weight loss, color changes and softening of the texture, which was similar to the results of this research.[32]. Martínez Romero et al. (2005) showed that aloe vera gel acts as an edible coating and reduces the weight loss of cherry fruit and thus preserves the firmness of the tissue, which is consistent with the results of this study.[33]. Vahdat et al. (2009) investigated the effect of aloe vera gel in maintaining the quality of strawberry fruits and stated that aloe vera treatment with concentrations of 75 and 100% showed a significant effect on tissue stiffness from the third day, which is consistent with the results of this research. It was consistent[34].

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Ghasemkhani et al. (2013) investigated the effect of aloe vera on strawberry fruit and stated that aloe vera treatments were significantly effective in maintaining the firmness of strawberries compared to the control group, which was consistent with the results of this research.[35].

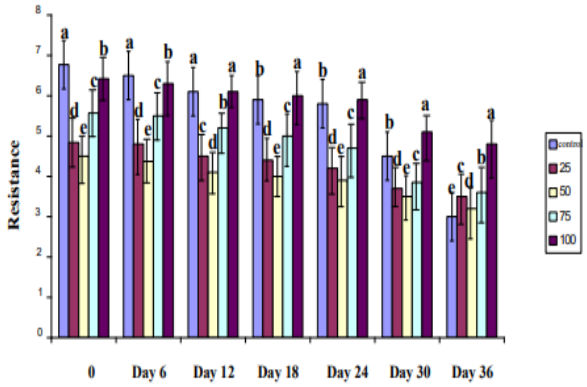

Fig 3 Resistance changes in five groups (control 25, 50. 75, 100) Form aloe vera gel for 36 days

4-3-Comparison of the weight factor results of the control sample and the samples coated with aloe vera gel

The comparison of the means showed that the coating of aloe vera gel significantly delayed the weight loss in all the treated fruits, so that the weight of the control samples stored in the cold room decreased more than the samples coated with aloe vera gel. It showed that the lowest weight loss was related to samples covered with 100% aloe vera gel, and then samples with 75%, 25% and 50% gel had the lowest weight loss. This is attributed to the hygroscopic property of the gel, which is able to form a barrier against water diffusion between the fruit and the environment.[36]. The amount of weight loss can be different depending on the type of product, variety and texture characteristics[37]. In general, the weight loss of fruit increases with the increase of storage period, the main reason of which is the loss of water and the consumption of fruit reserves as a result of respiration, and controlling the weight loss of fresh fruits is one of the most important goals of coating. In a study conducted by Ahmad et al. (2009), they reported that the weight loss process in nectarine fruits treated with aloe vera gel decreased compared to the control fruits, which was consistent with the results of this study.[38]. Serrano et al. (2004) reported in a research that the weight loss process of table grapes increased during cold storage and open air storage, as a result of which aloe vera gel significantly prevented weight loss, which was consistent with the results of this research.[39]. Asghari and Khalili (2015) reported with a study on cherry fruits that the fruits treated with aloe vera gel had less weight loss than the control, which was consistent with the results of this study.[24].

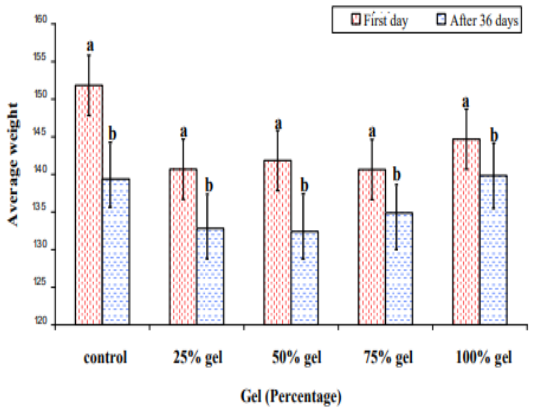

Fig 4 changes in fruit weight pear on the first day and after 36 days

5-3- Investigating sensory characteristics (color) of pear fruit during coating with aloe vera

In this study From the point of view of the evaluators, the highest color acceptance score was given to Shahid gel and 100% gel treatment, and the lowest was 25% gel, and then the lowest color acceptance was related to 75% and 50% gel. Therefore, it can be seen that the pear coating treatment with 100% concentration and the control sample seemed more favorable than other treatments. Probably the most important factor in preserving the color of the 100% gel treatment compared to the control was the effect of the concentration of the coating treatment in reducing the intensity of fruit respiration in storage and thus preventing the decomposition of chlorophyll and changing the color of pears. Emamifar (2014) The use of aloe vera gel on strawberry fruit showed that it did not have a significant effect in any concentration on the results of color sensory

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evaluation, which is not consistent with the results of this research.[40]. In a research consistent with the results of this research, the positive effect of aloe vera gel in maintaining the marketability of coated fruits has been attributed.[41].

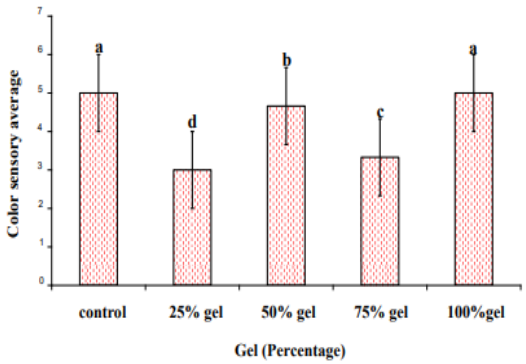

Fig 5 pear fruit changes in color

Derakhshan et al. (2019) measured the effect of aloe vera and putricin on the amount of carotenoid in peach fruit in 3 periods and showed that the highest amount of carotenoid was obtained from the treatment combination of aloe vera 30% and putricin 6 mM in the third period, which was The results of this research were consistent[42]. The study conducted by Mansourgorgani et al. (2018) on the sensory characteristics of kiwi fruit coated with aloe vera shows that the best color quality is related to the coating of aloe vera gel with a concentration of 30%, and the lowest value is related to kiwi without coating, which is consistent with the results of this research. does not have[43].

6-3-Evaluating the results of the microbial population test (molds)

The changes of pear fruit in terms of microbial population (molds) in the control samples compared to the samples treated with aloe vera gel are shown in Figure (6) and the results show that the highest microbial population is related to the control samples and the lowest to The ratio of gel was 25%, and as the concentration of aloe vera gel increased, the microbial population in pears also increased.. Aloe vera gel has various compounds, the most important of which are vitamins, enzymes, amino acids, anthraquinones, salicylic acid and saponins. Salicylic acid and saponins have antifungal properties and prevent the growth and reproduction of fungi.[44]. However, in this study, aloe vera gel was able to prevent microbial growth, but there was no relationship between the higher concentration of aloe vera gel and its antifungal properties on pear fruit.Bavisi and Emamifar (2016) used aloe vera gel to investigate the spread of microbial contamination on strawberries and stated that there is a significant difference between the treatments in terms of mold and yeast growth, and their results were consistent with the results of this research.[45]. Castillo et al. (2010) also showed that the microbial load (aerobic bacteria, yeasts and fungi) of fruits treated with aloe vera gel has a significant decrease compared to the control, which is consistent with the results of this research.[46]. Nabi Gol Vasghari (2013) Aloe vera gel as an edible coating to increase shelf life Pomegranate seeds were used and they reported that this type of coating, in addition to its anti-fungal properties, has the ability to reduce weight loss and respiratory rate in fruits during storage for up to 21 days.[47]. Navarro et al. (2010) reported that aloe vera gel increased the life of nectarine after harvesting by reducing the production of ethylene and breathing intensity and controlling fungal decay, which is in line with the results of this study.[48].

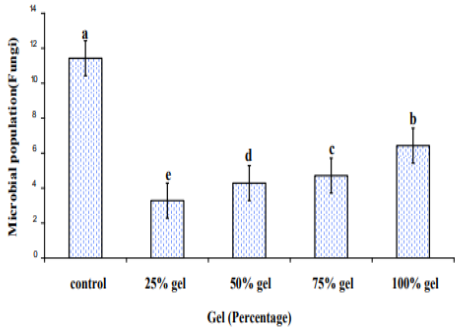

Fig 6 changes in pear fruit in terms of microbial population (fungi)

7-3- Antifungal activity of aloe vera gel on the growth of Penicillium expansum and Aspergillus niger

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Considering the rapid growth of Penicillium and Aspergillus fungi on food products and the damage it causes in the field of health and economic food industries, therefore, inhibiting the growth of these fungi can greatly help the human and animal health society. In this study, the antifungal activity of aloe vera gel on the growth of Penicillium expansum and Aspergillus niger in two concentrations of 25% and 50% of aloe vera gel was investigated by the method of creating a well in the culture medium and measuring the diameter of the growth halo. According to the results, the reduction of growth has been shown significantly, and the effect of gel on the diameter of growth halo of two types of mushrooms was proven in this research, and the greatest effect was observed in two concentrations (25, 50%) of aloe vera on Aspergillus niger. During a research, Khorram et al. (2009) compared the antimicrobial activity of prepared aloe vera gels (fresh gel, protective gel, cooling gel, and acne cream) against a number of microorganisms using the disk diffusion method. After a period of 48 hours of keeping in the greenhouse at 25 degrees Celsius, the minimum diameter of the inhibitory halo was reported by all four types of gel on Aspergillus ficum (9.5, 10.5, 15.5, 9.5) mm, which was consistent with the results of this research.[49]. Lalita Doi and colleagues (2012) investigated the antimicrobial activity of aloe vera gel using the standard disk diffusion method on several microbial strains including Escherichia coli, Klebsiella pneumoniae, Proteus mirabilis, Pseudomonas aeruginosa, Staphylococcus aureus, Aspergillus niger, Candida sps and expressed showed that no inhibitory effect was observed on Aspergillus niger, which is contrary to the results of this research[50]. Stanley and colleagues (2014) studied the antimicrobial effect of aloe vera on some human pathogens. The raw gel obtained from aloe vera was used to determine the antimicrobial activity, the sensitivity of Escherichia coli, Staphylococcus aureus and Candida albicans to the crude extract. of aloe vera gel was well determined by disk diffusion method in agar. The diameter of the growth inhibitory halo in aqueous extract was 3, 4, 6 mm, respectively, which was consistent with the results of this research.[51]. Castillo et al. (2010) reported in a study that aloe vera gel (10% concentration) inhibited Penicillium digitatum and Botrytis fungi by 87% and 99%, respectively, which was similar to the results of this study.[46].

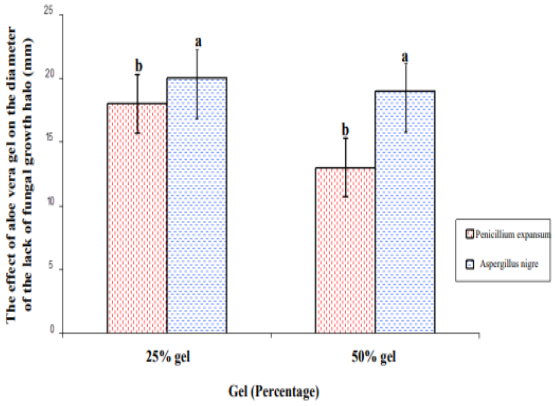

Fig 7 the effect of aloe vera gel on the diameter of the lack halo of fungus growth of penicillium expansum and aspergillus niger

8-3- The effect of aloe vera alcohol extract on the growth of Penicillium expansum and Aspergillus niger fungi.

In this study, the effect of the alcoholic extract of aloe vera on the growth of two species of fungi, Penicillium expansum and Aspergillus niger, was investigated by the tube dilution method with a concentration of 200 ml/liter of aloe vera and the diameter of the growth halo. In this research, the inhibitory effect of the alcoholic extract of aloe vera was proven and the results showed that in the concentration of 200 ml in the second dilution, it had the minimum inhibitory concentration and in the third dilution, it had the minimum lethal concentration, also on the fungus Penicillium expansum compared to the fungus Aspergillus niger had a greater growth inhibiting effect and was able to form a greater growth halo diameter. Karpagam et al. (2011) investigated the antimicrobial activity of aqueous, ethanolic, methanolic, crude oil and acetone extracts of aloe vera using the minimum inhibitory concentration method. This collection of extracts was tested against 5 bacteria (Escherichia coli, Pseudomonas aeruginosa, Bacillus subtilis, Klebsiella pneumoniae and Staphylococcus aureus).

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According to the results, the methanolic, ethanolic and acetone extracts showed antibacterial activity against Escherichia coli and Bacillus subtilis, which is similar to the results of this research.[52].

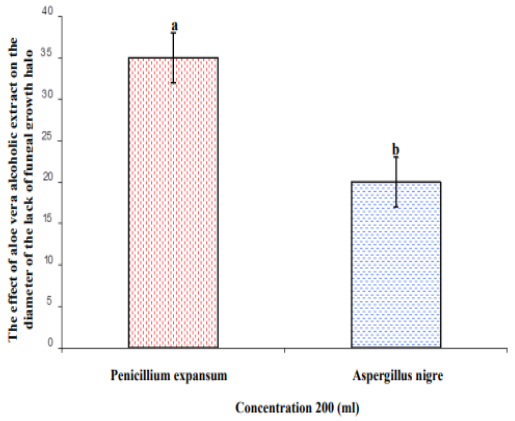

Fig 8 the effect of aloe vera alcoholic extract on the diameter of the lack halo of fungus growth of penicillium expansum and aspergillus niger

Stanley et al. (2014) studied the antimicrobial effect of aloe vera on some human pathogens. Ethanol, methanol and aqueous extract were used as solvents to extract the extract. Ethanolic extract inhibited the growth of Escherichia coli bacteria., Staphylococcus aureus and Candida albicans with a halo diameter of 4, 5, 6 mm and their results were consistent with the results of this research.[51]. Kasian and colleagues (2007) also found that hydroalcoholic extracts from aloe vera plant had an inhibitory effect on the growth of the mycelium of Heterosporium pronti, Botrytis gladiorum, Fusarium oxysporium and Penicillium gladioli, and their results are consistent with the results of this study.[53]. Jasso et al. (2005) evaluated the effect of aloe vera extract in terms of antifungal activity and reported that aloe vera extract inhibited the growth of mycelium in Fusarium oxysporium, Rhizoctoma solani and Collectotrichum coccodes, which was consistent with the results of this study.[54].

4 - Conclusion

Today, medicinal plants, including aloe vera, are used innumerable ways in the field of controlling postharvest diseases, and its gel has also been used to increase shelf life and control pathogenic fungi, and in this research, the effect of edible aloe vera gel on Persistence and control of the microbial population of pear fruit as well as its gel and alcoholic extract against the pathogenic fungi Penicillium expansum and Aspergillus niger were investigated. As a result, this gel was able to reduce the microbial population of pears during 36 days of storage and the storage shelf life increased it and also its gel and alcoholic extract could prevent the growth of Penicillium expansum and Aspergillus niger fungi.

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6- Resources

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ارزیابی تاثیر ژل آلوئه ورا برماندگاری میوه گلابی و تا ثیرآن بر قارچ پنی سیلیوم اکسپانسوم و آسپرژیلوس نایجر

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چکیده

امروزه استفاده از موادشیمیایی برای کنترل ضایعات پس از برداشت میوه ها به دلیل اثرات زیانبار یک عامل مهم درکاهش عمرانباری آنها به حساب می آیند.آلوئه ورا اخیرا نقش مهمی در حفظ کیفیت و سلامت میوه ها و همچنین کنترل قارچ های بیماری زا از خود نشان داده است. از پوشش خوراکی آلوئه ورا در غلظت های متفاوت از ژل (۲۵،۵۰،۷۵،۱۰۰ درصد) طی ۳۶ روز انبارداری در دمای ٤ درجه سانتی گراد استفاده شد. پایداری میکروب ها (تعدادکپک ها)، خصوصیات فیزیکو شیمیایی (کاهش وزن، سفتی بافت، pH، مواد جامد محلول) و ویژگی حسی رنگ گلابی پوشش داده شده با ژل آلوئه ورا پس از ۳٦ روز انباداری در مقایسه با شاهد ارزیابی شد و همچنین تاثیر عصاره آبی و اتانولی گیاه آلوئه ورا بر روی دو گونه قارچ پنی سیلیوم اکسپانسوم و آسپرژیلوس نایجر مورد بررسی قرارگرفت. نتایج نشان داد که پوشش آلوئه ورا به صورت معنی داری رشد میکروارگانیسم ها را به تاخیرانداخته وافت وزن را نسبت به شاهد کاهش داده است و این پوشش سبب حفظ بهتر سفتی وکاهش مواد جامد محلول واثرمعنی دار برpH تیمارها داشت وبر ویژگی حسی رنگ در تیمارهای مختلف نسبت به شاهداثرمعنی داری نداشت و نیز عصاره آبی و اتانولی آلوئه ورا اثر ممانعت کنندگی رشد برروی قارچ ها ی مذکور داشته است در نتیجه پوشش ژل آلوئه ورا برروی میوه گلابی باعث افزایش عمرنگهداری آن می شود.