

The Impact of Chemical Preservatives and Antioxidant on Pear Glucose Bar

Tariq Kamal^{1*} and Muhammad Usman Khan²

¹Department of Food Science and Technology, Dalian Polytechnic University, P.R, China

²Department of Agricultural Extension Education and Communication, The University of Agriculture, Peshawar, Pakistan

*Corresponding author: Tariq Kamal, Department of Food Science and Technology, Dalian Polytechnic University, P.R, China, E-mail: tariqkamal10@gmail.com

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Abstract

The effect of those substance additives and antioxidant agents were examined on the quality attributes of Pear-glucose bar kept at room temperature amid 90 days period. Distinctive brix proportions of fluid glucose were utilized. The medications AP0 (Pear mash), AP1 (Pear mash with glucose (20 Obrix) + Pectin 2% + 0.1% citrus extract + 0.1% KMS), AP2 (Pear mash with glucose (30 Obrix) + Pectin 2% + 0.1% citrus extract + 0.1% KMS), AP3 (Pear mash with glucose (35 Obrix) + Pectin 2% + 0.1% citrus extract + 0.1% KMS), AP4 (Pear mash with glucose (20 Obrix) + Pectin 2% + 0.1% ascorbic corrosive + 0.1% KMS), AP5 (Pear mash with glucose (30 Obrix) + Pectin 2% + 0.1% ascorbic corrosive + 0.1% KMS), AP6 (Pear mash with glucose (35 Obrix) + Pectin 2% + 0.1% ascorbic corrosive + 0.1% KMS). Every one of the medications were dissected physicochemical (ascorbic corrosive titratable corrosiveness, dampness, TS, pH,) and tangible (flavor, surface shading, general agreeableness). Results uncovered that dampness (from 16.95 to 15.07), pH (from 3.65 to 3.45), TS (from 81.99 to 82.21), ascorbic corrosive (from 2.20 to 0.930), titratable acidity (from 1.08 to 1.12), shading (from 8.28 to 5.4), flavor (from 7.85 to 4.92), composition (From 7.88 to 4.35) and general worthiness (from 8.1 to 5.2) were diminished. The most astounding mean quality in dampness in AP0 (17.52), pH in AP3 (3.57), TS in AP6 (83.77), Ascorbic corrosive in AP3 (2.98), titratable corrosiveness in AP3 (1.40), shading in AP3 (7.97), Flavor in AP3 (8.0), Texture in AP3 (7.5) and general worthiness in AP3 (8.0). Henceforth it was inferred that AP3 and AP6 was recorded the best in physicochemical and additionally in tangible assessment.

Keywords: Chemical preservatives; Antioxidant; Pear glucose bar; Physicochemical; Sensory evaluation

Introduction

The pear (*Pyrus Communis*) belongs to Family Rosaceae, is an important fruit which is grown in temperate zone throughout the world. Out of several species in European pear (*Pyrus Communis*) is most widely grown. The European pear is considered by many to be among the most delicious of all species [1].

Pears contain 86.2% moisture, 0.7% protein, 0.2% lipids, 11.15% sugar, 1.5% fiber, 16 mg calcium, 20 mg phosphorus, 0.6 mg iron and 10 mg/100 g Vitamin-C [2].

It contains a better juicy texture with a delicate flavor and aroma. The common varieties of pear are *Pyrus pyrifolia*, *pyrus bretschneideri*, *pyrus pashia* and *pyrus communis* [3].

Scientific evidence has been provided about the benefits from fruit ingestion *in vivo* (decrease of body oxidative stress and cardiovascular protective effects in humans, antiulcer and hepatoprotective effects in rats) with special consideration for non-nutritive components as potentially active antioxidant Phytochemicals [4].

The nutritional importance of cactus pear fruit is mainly due to the content of ascorbic acid, fibres and free amino acids particularly proline, glutamine and taurine [5].

Peach and pear pulp can be preserved in different ways; chemical preservation is one of these methods. Chemical preservatives are those substances, which are added to the food products to increase their shelf life. These preservatives are always food graded and these are used in

the amount which is not harmful for human health. There are a number of chemical preservatives used in food for the extension of their shelf life. Some important chemical preservatives are; sodium benzoate, potassium metabisulphite, sodium sorbate, sorbic acid, sulphur dioxide, sodium propionate etc. The choice of chemical preservative depends upon several factors. These include properties, safety and cost of the compound, as well as the properties of the food and possible effect of the chemical on its quality. In addition, type and level of microorganism present, post-processing and storage conditions. The food laws must also be taken into consideration while selecting a chemical preservative. Sodium benzoate may be used as a preservative (if declared on the label). Benzoic acid and sodium benzoate are generally regarded as safe up to a maximum permitted level of 0.1%. In most countries, the maximum permissible quantities generally range between 0.15-0.25%. Sorbic acid and its salts are some of the most widely used food preservatives in the world. As food preservatives, sorbates have found wide application in various foods, especially as yeast and mold inhibitors. Effective antimicrobial concentrations of sorbates in most foods are in the range of 0.05%-0.30%. In high sugar products (e.g. jams, jellies) smaller quantities of sorbic acid are adequate for preservation, because of synergistic action of sorbat with sugar [6].

Other components such as lipids, proteins, organic acids and minerals do not differ significantly from other tropical fruits. The fruit is also characterized by a high content of betalain, a widely used natural colorant in the food industry. In some countries cactus pear juice is consumed at home, in vegetarian restaurants or in local health-food stores. Since technological problems are associated with its production, no commercial products are produced at industrial level. The high pH value of the pulp (5.3-7.1) combined to its low acidity

(0.05-0.18% in citric acid) strongly affects its storage life in the fresh state and the processing operations [7].

Cassan et al. [8] studied that the health-promoting capacity of cactus pear fruit is highly attractive for the development of nutraceutical foods. The increasing market demand towards this fruit and products, which combine added value with a fresher taste, has challenged researchers to develop procedures to lengthen storage life. In addition, the possibility to obtain natural colorants from the cactus pear fruit rather than synthetic colorants for drinks and dairy products represents another interesting perspective. In this study the effect of microfiltration (MF) and ultrafiltration (UF) processes on the physico-chemical composition of the cactus pear juice produced from fruits of Italian (Sicily) origin was investigated in order to evaluate the influence of the clarification treatment on the content of main parameters characterising the nutritional and functional properties of the fruit. Effects of operating parameters on the performance of both processes in terms of permeate fluxes were also evaluated.

Barroca et al. [9] observed that the sun-dried pears of the local variety known as S. Bartolomeu, found in the centre of Portugal, are relatively small fruits, characterized by an intense reddish brown colour, that lose their pronounced astringency with drying. However, and since their production has been declining over the past decades, there has been an increasing interest in drying also for other varieties of pears, also with small dimensions, as an alternative to produce the dried pears. The aim of this work is the evaluation of the nutritional properties of fresh and dried pears of the local varieties known as *Ameñdoa*, *Amorim*, *Carapinha Branca* and *S. Bartolomeu*, all original form of the centre of Portugal. The results enable us to conclude that the fresh pear pulp of all varieties has a low content of protein and a high level of total sugars, as is generally true for fruit. However, their values of dietary fiber ranged between 12 and 15% (dry mass) constituting these pears a potential source of dietary fiber.

Piga et al. [10] studied that Cactus pear fruits (*Opuntia ficus indica* Mill, cv. 'Gialla') were manually peeled, then placed in plastic boxes sealed with a film with high permeability to gases, and kept at 41°C for 9 days. After 3, 6 and 9 days, chemical, physical, microbiological and sensorial parameters, total phenols, vitamin C and antioxidant capacity were determined. In-package gas concentrations were measured almost daily. Vitamin C and antioxidant capacity remained unchanged, while polyphenols decreased after 6 days in storage. Of the chemical parameters, only pH and acidity changed significantly, without however, adversely affecting sensorial properties. Microbiological growth was limited and fungal colonies were never visually detected.

Hasan Togrul and Nurhan Arslan [11] studied that Peach and pear were treated with different compositions of emulsions to extend shelf-life of fruits and to preserve the fruit quality. Paraffin wax, beeswax and soybean oil; carboxymethyl cellulose (CMC) with degree of substitution of 0.6670; Emulgin PE, triethanolamine, oleic acid and sodium oleate were used as hydrophobic phases, hydrophilic polymer and emulsifying agents in the coatings of peach and pear, respectively. The CMC obtained by etherification of the sugar beet pulp cellulose was used as a hydrophilic polymer. To investigate the post-harvest water loss of peach and pear, fruits were observed during storage while being subjected to dehydrating conditions in storage chamber at 25°C and 75% relative humidity level. The changes in weight, pH, soluble solids, titratable acidity and ascorbic acid of the coated samples with storage time were measured at regular intervals throughout the storage period to evaluate the effect of storage period on fruit quality. The modified drying models describing the storage time dependence of

weight loss were fitted to the experimental data and the model parameters in equations were determined by multiple regression analysis. Some of the coatings decreased the soluble solids, titratable acidity and ascorbic acid losses in comparison to the uncoated peaches and pears. The coating of peach and pear surfaces with emulsions containing CMC from sugar beet pulp cellulose as a hydrophilic polymer extended the shelf-lives of peach and pear to 12 and 16 days, respectively. It was found that a combination uses beeswax as hydrophobic phase, triethanolamine and oleic acid as emulsifying agent, CMC as hydrophilic polymer and the emulsion containing soybean oil as hydrophobic phase, sodium oleate as emulsifying agent, CMC as hydrophilic polymers were suitable for the coating of peaches and pears, respectively.

Membre et al. [12] studied the effects of pH and preservatives such as sorbic acid (E 200), propionic acid (E 280) and sodium benzoate (E 211), on *Penicillium brevicompactum* growth or growth-no-growth interfaces. Experiments were carried out on solid media maintained at a water activity of 0.9, and incubated at 20°C. Fungal growth was established by diameter measurements for up to 75 days and kinetics were fitted to Baranyi's primary predictive model. The no-growth phenomena were determined by no visible mycelium development after 75 days. A set of 198 experimental data was generated using two experimental designs. Firstly, pH effect on growth rate was analysed by a secondary predictive model including the inhibitory pH value, pH (min), as a parameter. This pH limit value, which depended on the nature of the preservative agent, was estimated to be 5 in the presence of sorbic acid at maximal authorized values in the European Community (2000 mg/l (-1)). Secondly, sorbic acid and sodium benzoate inhibitory concentrations were evaluated at pH 5, by developing a predictive model taking both growth and growth-no-growth data into account. The sorbic acid had a greater inhibitory effect than sodium benzoate, however the limit value of growth of *Penicillium brevicompactum* depended on both sorbic and sodium benzoate. Finally, a model built with the laboratory medium data was tested on bakery products made at pH 5, a water activity of 0.9 with various concentrations of sorbic and sodium benzoate, and incubated at 20°C. Results were fairly satisfactory even if wide variability was observed for food products.

Andres et al. [13] analyzed microbial flora of refrigerated orange juice during storage at 10°C and effects of the different levels of the added preservatives (citric acid, ascorbic acid, potassium sorbate, sodium benzoate), and the gaseous permeabilities of the packaging film. Gompertz equation was applied to model the growth of molds and yeasts for the different treatments and packaging conditions. The use of organic acids and potassium sorbate or sodium benzoate (1.66-6.94 mM) led to storage life values is greater than 11 days in polyethylene and greater than 20 days in the low gaseous permeability film, maintaining good sanitary conditions.

Omonigho and Ikenebomeh [14] investigated the effects of different preservative treatments on the chemical changes of pounded white yam (*D. rotundata*) upon storage. Preservative treatments adopted include steaming at 100°C for 30 min, addition of 0.1% sodium benzoate, treating with 0.1% sodium benzoate plus heating at 85°C for 30 min or left untreated at room temperature (28 ± 2°C). Changes occurred in the chemical composition of stored untreated pounded yam samples with the product becoming stale. Titratable acidity, moisture content and reducing sugar content of fresh samples initially decreased but subsequently increased. Samples treated with 0.1%

sodium benzoate plus heating at 85°C for 30 min had stable chemical compositions over 8-day periods of storage and possibly longer.

Buedo and Urbicain [15] studied storage of peach pulp at room temperature. The peach pulp leads to rapid spoilage due to the browning effect of Maillard reactions, which also provoke the consumption of reducing sugars and the formation of 5-hydroxymethylfurfural and sucrose hydrolysis. Amino acids play an essential role in browning reactions as they react directly with the reducing sugars, triggering a chain of complex reactions producing brown pigments known as melanoidins.

Narayanan et al. [16] preserved mango squash with 0.062 or 0.125% potassium meta-bisulphite or with 0.062 or 0.047%+5% leaf extract of *Aegle Masr-melos* of 0.062 or 0.047%+3% leaf extract of *Ocimum sanctum*. Samples were stored for upto 180 days at room temperature. The percentage reduction of ascorbic acid was lower in mango squash preserved with potassium meta bisulphite+natural leaf extract additive than in mango squash with 0.125 or 0.062% potassium meta-bisulphite alone.

Rusul and Ang [17] investigated the effects of different concentrations of sodium sorbate, sodium benzoate and sodium bisulfite on the microbiological and chemical quality, and the colour of star fruit juice during storage at ambient temperature. Aerobic mesophiles, moulds, yeasts and lactic acid bacteria were determined together with titratable acidity, pH, ascorbic acid, total soluble solids and colour. The juice was stored at 26-28°C for 12 weeks. Pasteurization at 75°C for 20 minutes at pH 3.5 reduced initial browning. The juice did not undergo microbial spoilage during storage at room temperature. However, despite the presence of antimicrobial agents, browning was developed.

Ahmad et al. [18] prepared orange and mango squashes with different sugar and acid combinations (50% sugar with 0.5-1.5% citric acid; 1% citric acid with 33-50% sugar) the samples were evaluated for their physico-chemical and organoleptic characteristics, during storage (for upto 12 months at room temperature (10-33°C). Variation in total soluble solids, acidity and their ratio during storage was studied. Total soluble solids and total soluble solids/acid ratio increased in all formulations.

Kalra and Tandon [19] stated that guava nectars containing 15 percent pulp, 12 and 14 percent soluble solids and 0.20 to 0.35 percent acidity prepared from sulphite preserved guava pulp and then fortified with 100 mg vitamin C and stored for 10 months in glass bottles, showed a decrease in vitamin C contents by 2 to 40 percent and increase in acidity by 0.02-0.04%.

Harnanan et al. [20] have reported that guava pulp obtained from red and white fleshed guavas, treated to 85°C and then preserved by canning, or with potassium metabisulphite (equivalent to 700 ppm SO₂) or by potassium metabisulphite+sodium benzoate (350 ppm each) retained 74-77% of their ascorbic acid in case of canned pulps while chemically preserved pulps in glass containers retained 50 to 62 percent after 27 weeks of storage. They further stated that beverages prepared from the stored pulps showed that 700 ppm SO₂ contributed greatly to retention of flavour and colour of the product.

Wolfrom et al. [21] studied browning mixtures constituted by different ascorbic acid and glucose in a 1:1 molar ratio, simulating orange juice stored at 65°C, and reported that aminobutanic acid and arginine were the main contributors to browning.

Huang and Draudt [22] studied the formation of intermediate products of browning reactions during the storage of lyophilized peaches at different humidity levels, and observed the formation of fructose-asparagine, fructose-aspartic acid and a product of the reaction between ammonia and glucose.

Objectives

1. To develop new confectionary product from pear fruit such as pear bar.
2. To develop pear bar with adjusted brix by addition of glucose.
3. To study the effect of pectin stabilizer and different antioxidants on the overall quality of pear bar.
4. To study the effect of potassium metabisulfite on the shelf life extension of pear bar.

Materials and Methods

The research work was performed in the laboratory of Food Science and Technology, Dalian Polytechnic University, China. Pear and glucose were obtained from fruit market in Dalian and was taken to the laboratory for preparation of pear bar. Other chemicals are available at the Department laboratory.

Proposed plan of study

Pear bars was prepared from pear pulp with addition of sucrose, citric acid, ascorbic acid, pectin and KMS (Table 1). The brix of all the samples was adjusted with addition of glucose in selected amount and then the samples were acidified with addition of citric and ascorbic acid with certain modification. All the prepared samples were packed safely in transparent polyethylene bags and were kept at room temperature for 90 days storage period. The samples were studied for physicochemical and sensory attributes with an interval of 15 days.

Treatment s	Pear pulp	Glucose ('Brix)	Pectin (g/Kg)	Antioxidant (%)	KMS (g/Kg)
T0	500 ml	13	0	0	0
T1	500 ml	20	2	0.1 CA	1
T2	500 ml	30	2	0.1 CA	1
T3	500 ml	35	2	0.1 CA	1
T4	500 ml	20	2	0.1 AA	1
T5	500 ml	30	2	0.1 AA	1
T6	500 ml	35	2	0.1 AA	1

Table 1: Proposed plan of study. CA=Citric acid, AA=Ascorbic acid

Preparation of apple bar

The pear was procured from the local market of Dalian and was sorted to remove the diseases, damages, bruises and immature pear fruits from the sound ones. The healthy and sound pear was washed with tap water; peel was removed from the pear and was cut into slices with the help of stainless steel knife. Pulp was prepared by using pulping machine and bars were prepared as mentioned in Table 1. The prepared bars were packed in a transparent polyethylene packaging bags and were studied for physicochemical and sensory attributes.

Physicochemical analysis

The samples were analyzed for % moisture, pH, % acidity, TSS, and ascorbic acid.

pH: The pH of the samples was determined by using INOLAB DIGITAL pH meter according to the instructions given in the manual of the apparatus.

Procedure: The pH meter was first calibrated by using the buffer solutions having pH 4 and pH 7. Then the electrode was washed with distilled water and dried with tissues paper. After that the pH of the samples were analyzed.

Total solids

The total solids of the samples were determined by the standard method of AOAC [23] method no 920.151. The samples were analyzed by drying the sample in oven at 105-110°C for 4-6 hours. After oven drying, the samples were weighed and total solids were determined.

Procedure: 2-5 grams of samples were taken in a clean dried china dish. The dish was placed in and electric oven at 105-110°C for 4 to 6 hours. After drying the china dish along with lid was kept in desiccators for 30 minutes. After that, the weight of the sample was taken and percent total solids were calculated by the formula.

Percent acidity (%)

The percent acidity of the samples was analyzed by following the standard method of AOAC (2000).

Standardization of 0.1N NaOH solution: First of all, 6.3 g of oxalic acid were dissolved in distilled water and made the volume up to 1000 ml. Then 0.1 N NaOH solutions were filled in a burette. 0.1 to 10 ml of oxalic acid solution was taken in a beaker. Few drops of phenolphthalein were added in to the solution as an indicator. The NaOH solution was treated against oxalic acid until the development of light pink color. The readings were repeated three times and the normality of NaOH was calculated using the formula;

$$N_1V_1 = N_2V_2$$

Where

N₁=Normality of NaOH solution

V₁=Volume of NaOH solution

N₂=Normality of oxalic acid solutions

V₂=Volume of oxalic acid

After that accurate 0.1 N NaOH was prepared by adding the required distilled water.

Titration of samples: 10 ml of sample was taken in a flask. Then put two drops of phenolphthalein as an indicator. It was titrated with 0.1 N NaOH solution until light pink color appeared. Three continuous readings were taken and acidity was calculated by using this following formula.

$$\%Acidity = \frac{T \times 0.1N \times 0.067 \times 100 \times 100}{L \times M}$$

T=ml of NaOH used

L=sample taken in g for dilution

M=ml of diluted sample taken for dilution

Ascorbic acid: The ascorbic acid (mg/100 gm) content of the sample was determined by the standard method of AOAC (2000).

Preparation of dye solution:

50 mg 2, 6-dichlorophenol indophenol dye and 42 mg sodium bicarbonate were taken in a beaker, which was then dissolved with distilled water. The volume was made up to 250 ml. The solution was filtered and kept in a clean bottle for future use.

Preparation of standard Ascorbic acid solution: Standard ascorbic acid (50 mg) was taken in 50 ml volumetric flask volume having 0.4% oxalic acid solution. The solution was kept in a cool and dark place for one day before use.

Preparation of oxalic acid solution: 0.4 g Oxalic acid was taken in a volumetric flask with a volume that was made up to 1.0 liter with the addition of distilled water.

Standardization of dye: 5 ml standard ascorbic acid solution was taken in a conical flask and titrated against with dye solution till light pink color continued for 15 seconds.

$$Dye\ factor(f) = \frac{ml\ of\ ascorbic\ acid\ solution\ taken}{Volume\ of\ dye\ used}$$

Dye factor was determined separately for each determination.

Preparation of sample: 10 ml of sample was taken in a volumetric flask containing 0.4% oxalic acid solution and the volume was made up to 100 ml by the addition of distilled water.

Titration of sample: 10 ml of the sample solution was accurately taken in a conical flask and titrated against with dye solution until the appearance of light pink color. Each sample was titrated three times and a blank titration was also carried out.

Calculation

Ascorbic acid content was calculated by using the following formula:

$$Ascorbic\ acid(mg/100g) = \frac{L \times F \times 100 \times 100}{D \times P}$$

L = Volume of dye (ml) used

F = Dye factor

D = Wt. (g) of jam taken for dilution

P = Volume (ml) of sample taken for titration

Moisture (%)

Moisture content of the pear bar samples was analyzed using the standard method of AOAC (2000) by the modification of vacuum drying.

$$\% Moisture = \frac{Difference\ in\ weight \times 100}{Weight\ of\ sample}$$

Procedure

Clean glass petri dish was taken and weighed. Then 5 gm sample was taken and was put in that petri dish. Then the petri dish containing sample was places in dehydrator for 24 hours at 70°C. After 24 h the weighed was taken again and the moisture content was determined by using the formula.

Sensory evaluation

The sensory analysis of the samples was performed for flavor, texture, color and overall acceptability by following the method of Larmond [24]. The samples were presented to qualified judges for their sensory analysis and having scores between 1-9, where 1 represent extremely dislike and 9 represent extremely like from printed Performa.

Statistical analysis

The data were analyzed statistically using Complete Randomized design (CRD) with two factorial methods (storage, treatment) and means were separated by LSD test as mentioned by Steel and Torrie et al. [25].

Results and Discussions

Total acidity (%)

The initial acidity of pear bar of PP0 to PP6 was 1.01, 1.03, 1.05, 1.04, 1.06, 1.08 and 1.09 which was gradually increased to 1.37, 1.39, 1.45, 1.45, 1.40, 1.42 and 1.44 similarly for the period of storage. The significantly values for mean ($P < 0.05$) increased from 1.08 to 1.12 for the period of storage. Maximum mean values for treatments were recorded in PP3 (1.40) followed by PP6 (1.37) but in difference the lowest mean values were listed in PP0 (0.22) followed by PP1 (1.07) and PP4 (1.05). During storage period, the maximum value of acidity was listed in PP3 (28.27%) followed by PP2 (27.58%) while decreased value was observed in PP5 (23.94%) followed by PP6 (24.30%) (Table 1).

These results are in agreement with the findings of Kinh et al. [26], who reported an increase in titratable acidity of apple pulp during storage. This increase might be due to the breakdown of pectin in to pectenic acid. The results are confirmed by the findings of Riaz et al. [27].

Total solids

Analysis of data showed that higher total solids were observed at PP6 (83.77) of pear leather followed by AP3 (82.96). Whereas lower total solids were observed at PP5 of (80.93) of pear leather. Similarly, total solids increased with increase of storage interval. So that the pears leathers with storage interval the total solids was increased with the increase of storage duration. During the storage period the highest increase in total solid was observed in PP5 (1.43%), which is followed by PP4 (0.67%), while lowest increase was observed in PP3 and PP0 (0.18%).

Similar results of total solids were recorded by by Sharma et al. [28] who observed that during storage of apicot-soy toffees, the total solids showed an increasing trend. The present findings are also in accordance with the results of Thakur et al., Sandhu et al. and Sreemathi et al. [29-31].

Sensory evaluation

The pear bar was analyzed for color, texture, flavor and overall acceptability at an interval of 15 days for period of three months. The analysis was conducted by using Larmond scale (9 point hedonic scale) by 15 judge's panel which has knowledge about sensory evaluation. The following parameters were as under (Table 2).

Treatments	Storage Interval (Days)								Mean
	0	15	30	45	60	75	90	% Increase	
PP0	80.89	80.92	80.95	81.98	81	81.02	81.04	0.18	81.11E
PP1	81.62	81.65	81.69	81.7	81.72	81.75	81.78	0.2	81.70D
PP2	81.41	81.43	81.45	81.48	81.52	81.54	81.58	0.21	81.49D
PP3	82.89	82.91	82.94	82.96	83	83.01	83.04	0.18	82.96B
PP4	82.46	82.49	82.52	82.54	82.57	82.59	83.02	0.67	82.60C
PP5	80.99	80.02	81.04	81.07	81.09	81.12	81.15	1.43	80.93E
PP6	83.69	83.71	83.73	83.76	83.79	83.83	83.87	0.21	83.77A
Mean	81.99Ab	81.88B	82.05Ab	82.21A	82.10Ab	82.12A	82.21A		

Table 2: Effect of treatments and storage intervals on % total solids of pear glucose samples.

Color

The mean scores of judges for pear bar of PP0 to PP6 was 7, 8, 9, 9, 8, 8 and 9 initially, which was gradually decreased to 3, 5, 3, 6, 7, 4.5, 5.5, and 6.5.

Treatments	Storage Interval (Days)								Mean
	0	15	30	45	60	75	90	% Decrease	
PP0	7	6	5	4.5	4	3.7	3	57.14%	4.742G
PP1	8	7.7	7.5	7	6.3	5.7	5.3	33.75%	6.7857E
PP2	9	8.3	8	7.5	6.9	6.3	6	33.33%	7.4285C
PP3	9	8.5	8.3	8	7.7	7.3	7	22.22%	7.9714A
PP4	8	7.7	7.3	7	6	5.3	4.5	43.75%	6.5428F
PP5	8	8.3	7.9	7.5	6.9	6	5.5	31.25%	7.1571D
PP6	9	8.5	8	7.7	7.3	6.9	6.5	27.78%	7.7B
Mean	8.2857a	7.8571b	7.4285c	7.0285d	6.4428e	5.8857f	5.4g		

Table 3: Effect of storage period and treatments on Color of pear glucose bar sample.

Similarly, during storage, the mean values for storage intervals were reduced significantly ($P < 0.05$) from 8.28 to 5.4 for the period of storage. The maximum mean values for samples were observed in PP3 (7.9714), followed by PP6 (7.7).

In contrast, the minimum mean values were found in PP0 (4.742) followed by PP4 (6.542), for the period of storage the highest decrease in color was noted in PP0 (57.14%) followed by PP4 (43.75%), while lowest fall was observed in PP3 (22.22%) followed by PP6 (27.78%) (Table 3).

The statistical analysis ($P < 0.05$) showed that the color of pear bar during storage was effected substantially due to storage and treatments. The present finding were supported by the works of Jain and Nema, Naz and Babalola et al. [32-34] who found the sensory scores in guava leather in the range of (7.10-6.16), (6-5) and (6.8-5.2) respectively.

Overall acceptability

Initially, the panelist scores for the value of the overall acceptability of pear bar of PP0 to PP6 was 6, 8, 8.5, 9, 8, 8, and 9 which was gradually decreased to 2.5, 5, 5.7, 7, 4.3, 5.3 and 6.5 similarly during storage. The mean values for storage intervals were reduced significantly ($P < 0.05$) from 8.1 to 5.2 during storage interval. The maximum mean values for treatments were recorded in PP3 (8.0) which is followed by PP6 (7.7), and PP2 (7.0). In contrast the minimum mean values were categorized in PP0 (4.1) followed by PP4 (6.1). During storage, the highest increase in the overall acceptability of the pear leather was recorded in PP0 (58.33%) followed by PP4 (46.25%), while the lowest fall was observed in PP3 (22.22%) followed by PP6 (27.77%) (Table 4).

Treatments	Storage Interval (Days)								Mean
	0	15	30	45	60	75	90	% Decrease	
PP0	6.0	5.3	4.5	4.1	3.5	3.1	2.5	58.33%	4.1G
PP1	8.0	7.4	6.8	6.4	5.8	5.4	5.0	37.5%	6.4E
PP2	8.5	7.9	7.4	6.9	6.5	6.0	5.7	32.94%	7.0C
PP3	9.0	8.5	8.3	8.0	7.7	7.4	7.0	22.22%	8.0A
PP4	8.0	7.4	6.7	6.3	5.5	4.9	4.3	46.25%	6.1F
PP5	8.0	7.7	7.3	6.8	6.3	5.7	5.3	33.75%	6.7D
PP6	9.0	8.5	8.0	7.8	7.3	6.9	6.5	27.77%	7.7B
Mean	8.1 a	7.5 b	7.0 0c	6.6 d	6.17 e	5.6 f	5.2 g		

Table 4: Effect Of storage period and treatments on overall acceptability of pear glucose bar sample.

The statistical analysis showed significant ($P < 0.05$) results which is influenced due to the storage intervals and treatments on the overall acceptability of the pear bar during storage. The mean values were

separated by applying LSD test at 5% probability level in (Table 4). These results are in agreement with the finding of Kinh et al. [26] who reported that apple pulp preserved with chemical preservatives retain maximum overall acceptability during storage. The overall results showed that samples T2 (potassium metabisulphite+citric acid) retain maximum overall acceptability during storage.

Texture

Initially, the mean scores of judges for texture of apple bar of PP0 to PP6 was 6.5, 7.3, 7.5, 9.0, 7.7, 7.0 and 8.0, which was gradually decreased to 2.0, 5.0, 5.0, 7.0, 5.0, 4.5 and 6.2 respectively during storage. The intervals for mean values were significantly ($P < 0.05$) decreased from 7.88 to 4.35 during storage. Maximum mean values for treatments were observed in PP3 (7.528) followed by PP6 (7.057), but in contrast the lowest mean values were listed in PP0 (4.957) followed by PP4 (5.414).

Treatment	Storage Intervals (Days)								Mean
	0	15	30	45	60	75	90	% decrease	
PP0	6.5	6.0	5.5	4.0	3.5	3.0	2.0	69.23%	4.957 F
PP1	7.3	7.0	6.5	6.0	5.8	5.5	5.0	31.50%	5.77D
PP2	7.5	7.0	6.4	6.0	5.7	5.2	5.0	33.33%	6.600 C
PP3	9.0	8.5	8.0	7.7	7.6	7.4	7.0	22.22%	7.528 A
PP4	7.7	6.6	6.5	6.0	5.8	5.5	5.0	35.00%	5.414 E
PP5	7.0	6.5	6.3	6.0	5.5	5.0	4.5	35.71%	6.071 D
PP6	8.0	7.5	7.0	6.8	6.5	6.3	6.2	22.50%	7.057 B
Mean	4.35 f	6.15 c	6.11 c	7.88 a	6.15 c	5.82 d	6.90 b		

Table 5: Effect of storage period and treatments on texture of pear glucose bar sample.

The maximum reduction in texture was recorded in PP0 (69.23%) followed by PP5 (35.71%), while minimum reduction was observed in PP3 (22.22%) followed by PP6 (22.50%) during storage (Table 5).

The texture of fruit leathers are significantly influenced by the drying temperature and the moisture content (Che-man et al.). The extended drying times and high temperatures are associated with the reduction of moisture content and firm texture. The variation in genetic makeup of the fruit, rate of water uptake from the surrounding environments and protein content of the fruit caused variation in the texture of the leather (Babalola et al.) [34]. The texture of the fruit leather is substantially influenced by the incorporation of sugar, which is done to enhance the flavor of the leather (Jain and Nema) [32]. Similar result for texture was also reported by Naz [33] (from 7-6).

Conclusion and Recommendations

In present study Pear Bar was set up by utilizing diverse level of fluid glucose with cell reinforcements and additive. The examples were broke down physicochemically and organoleptically. Physicochemically, the examples PP3 arranged by glucose, citrus extract (35) trailed by PP6 arranged by glucose. Ascorbic corrosive (35) demonstrated best result, while PP0 arranged by Apple mash indicated least result. If there should arise an occurrence of tangible investigation, PP3 took after by PP6 indicated great result, while PP0 took after by PP4 and PP1 demonstrated most minimal result.

Recommendations

1. Further Study ought to be completed to examine the impact of various Packaging materials on the general nature of Apple-glucose bar saved with the same cell reinforcements and synthetic additives.
2. To study the impact of various drying methods on the general nature of apple-glucose bar.
3. In our study the shade of the apple-glucose bar was discovered un alluring further research is expected to enhance the shading shine amid capacity.

References

1. Chaudhary MI (1994) Fruit crops in Horticulture. Malik MN (editor) 1st Edn. National Book Foundation, Islamabad pp 471-473.
2. Hussain T (2001) Food composition table for Pakistan. Govt. of Pakistan, ministry of P & D Islamabad.
3. Pallat PL (1970) Food composition for use in middle east. (2nd eds.) American University (Birtwt) 36-39.
4. Livrea MA, Tesoriere L (2006) Health benefits and bioactive components of the fruits from *Opuntia ficus-indica* [L.] Mill. Journal of the Professional Association for Cactus Development 8: 73-90.
5. Stintzing FC, Schieber A, Carle R (2001) Phytochemical and nutritional significance of cactus pear. European Food Research and Technology 212: 396-407.
6. Lueck E (1980) Antimicrobial Food Additives, Springer-Verlog. New York.
7. Saenz C (2000) Processing technologies: an alternative for cactus pear (*Opuntia* spp.) fruits and cladodes. Journal of Arid Environments 46: 209-225.
8. Yadava CS, Kumar R, Saxena SK (2009) Development of nutraceutical foods. Scientia Horticulture 220-225.
9. Barroca GW, Walter RH, Oakenful DG (2006) Jams, jellies, and preserves. In The Chemistry and Technology of Pectin (R.H. Walter, ed.) pp. 23-50, Academic Press, Inc., San Diego, CA. Press, California, USA. pp: 163-183.
10. Piga A, Del Caro A, Pinna I, Agabbio M (2003) Changes in ascorbic acid, polyphenol content and antioxidant activity in minimally processed cactus pear fruits. Lebensm Wiss U Technol 36: 257-262.
11. Hassan T, Nurhan A (2003) Preservation of peach and pear with different composition of emulsion. Asian Food J 9: 100-104.
12. Membre JM, Kubaczka M, Chene C (2001) Growth rate and growth-no-growth interface of *Penicillium brevicompactum* as functions of pH and preservative acids. Food Microbiology 18: 531-538.
13. Andres SC, Giannuzzi L, Zaritzky NE (2001) Mathematical modeling of microbial growth in packaged refrigerated orange juice treated with chemical preservatives. Journal of Food Science 66: 724-728.
14. Omonigho SE, Ikenebomeh MJ (2000) Effects of different preservative treatments on the chemical changes of pounded white yam (*Dioscorea rotundata*) in storage at $28 \pm 2^\circ\text{C}$. Food Chemistry 68: 201-209.
15. Wolfrom AP, Elustondo MP, Urbicain MJ (2000) Non enzymatic browning of peach juice concentrate during storage. Nutritionists meet Food 1: 255-260.
16. Narayanan KR, Shree CN, Baghirathi S (1998) Nutritional stability of mango squash in presence of chemical preservative and natural additive. Journal of Dairying, Foods Home Sciences 17: 173-179.
17. Rusul G, Ang PY (1994) Keeping quality of pasteurized bottled apple fruit juice preserved by sodium benzoate, sodium sorbate and sodium bisulfite. ASEAN Food J 9: 77-82.
18. Ahmad M, Chaudhry MA, Khan I (1986) Studies on the standardization and storage stability of citrus and mango squashes. Nucleus 23: 45-48.
19. Kalra SK, Tandon DK (1984) Guava nectars from sulphited pulp and their blends with mango nectar. Indian Food Packer 38: 74-77.
20. Harnanan SW, Bains GS, Kirpal SK (1980) Studies on the processing of pink and white fleshed guava varieties for pulp. Hort J 20: 179-189.
21. Wolfrom AP, Elustondo MP, Urbicain MJ (2000) Non enzymatic browning of peach juice concentrate during storage. Nutritionists meet Food 1: 255-260.
22. Huang PK, Draudt JL (1964) Effect of different humidity level on storage of peach. J Food Prot 28: 111-114.
23. AOAC (2000) Official method of analysis. Association of official Analytical Chemists 13th Ed. Washington, DC. U.S.A.
24. Larmond E (1977) Laboratory method of sensory evaluation of food publication, Department of Agriculture, Ottawa, Canada.
25. Torrie JH, Steel RG, Dickey DA (1980) Principles and procedures of statistics McGraw Hill Co. New York, USA.
26. Kinh, Shearer AEH, Dunne CP, Hoover DG (2001) Preparation and preservation of apple pulp with chemical preservatives and mild heat. J Food Prot 28: 111-114.
27. Riaz RA, Ali A, Saleem M (1988) Studies on the preparation and storage stability of comminuted knows fruit beverage bees. Pak J Sci Ind Res 32: 574-578.
28. Sharma SK, Chaudhary SP, Rao VK, Yadav VK, Bisht TS (2013) Standardization of technology for preparation and storage of wild apricot fruit bar. J Food Sci Technol 50: 784-790.
29. Thakur N, Thakur NS, Suman M, Kaushal BBL, Sharma M (2007) Apricot soya toffees - a protein enriched product. Indian Food Packer 61: 77-81.
30. Sandhu KS, Chander R, Bajwa U, Mahajan BVC (2008) Effect of papaya ripening incorporation of sucrose liquid glucose and citric acid on papaya leather quality formulations. Journal of Food Science and Technology 45: 133-138.
31. Sreemathi M, Sankaranarayanan R, Balasubramanyan S (2008) Sapota papaya bar. Madras Agriculture Journal 95: 170-173.
32. Nema JPK (2007) Processing of pulp of various cultivators of Guava (*Psidiumguajaval*) for Leather production. Agri Engg Int 9: 1-9.
33. Naz R (2012) Physical properties, sensory attributes and consumer preference of fruit leather. Pak J Food Sci 22: 188-190.
34. Babalola SO, Ashaye OA, Babalola AO, Aina JO (2002) Effect of cold temperature storage on the quality attributes of pawpaw and guava leathers. African Journal of Biotechnology 1: 61-63.