Research Article *http://www.alliedacademies.org/food-technology-and-preservation/*
ISSN: 2591-796X

Evaluation of moisture sweetened intermediate *Prunus persica* L. cubes.

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Abstract

This research was carried out on peach cubes preserved in sweeteners (sucrose and glucose) with different concentration followed by oven dehydration. Samples with different sweeteners solution i.e. sucrose, glucose individual and in combination with different concentration such as sucrose (40, 50, 60) °brix and sucrose+glucose (40, 60) °brix were prepared. The peach cubes were kept in sweeteners solution for 24 hours and stored at 20-25°C. The treatments were PC_0 (peach cubes+distilled water), PC_1 (peach cubes+40 °brix sucrose solution+0.1% citric acid+0.067% potassium metabisulphite), PC_2 (peach cubes+50 °brix+0.1% citric acid+0.067% potassium metabisulphite), PC_3 (peach cubes+60 °brix+0.1% citric acid+0.067% potassium metabisulphite), PC_4 (peach cubes+40 °brix sucrose and glucose+0.1% citric acid+0.067% potassium metabisulphite), PC_5 (peach cubes+60 °brix sucrose and glucose+0.1% citric acid+0.067% potassium metabisulphite. All the samples were analyzed physic chemically i.e. for total soluble solid (°brix), acidity (%), ascorbic acid (mg/100g), sugar acid ratio, reducing sugar (%), non-reducing sugar (%) and pH. During this research work increased was observed in TSS (total soluble solid) from 10.89 to 16.78 °brix, acidity from 0.61 to 0.71%, reducing sugars from 9.75 to 11.83, similarly decreased was observed in pH from 3.47 to 3.30 sugar acid ratio from 23.56 to 17.69, ascorbic acid from 9.93 to 4.09, non-reducing sugar from 15.23 to 14.01. During sensory evaluation treatments PC_3, PC_2 was found best during storage period. Statistical analysis demonstrated that applied treatments and storage intervals had significant ($P<0.05$) consequences on physicochemical analysis of intermediate moisture *Prunus persica* L. cubes.

Keywords: *Prunus persica* L. Cubes, Osmotic dehydration, Sucrose, Glucose, Citric acid, Potassium metabisulphite.

Accepted on 30 July, 2018

Introduction

Peach (*Prunus persica* L.) widely grown throughout the world in temperate regions and belong to family of rosaceae. About 2000 B.C. the peach initiated as wild form in China. About the time of Christ the Romans were cultivating peach, they spread it throughout their empire in Europe, from where it was scattered in all over the world [1]. Peach is famous among consumers because of its good flavour, taste and its attractive qualities. Their shelf life reduces, changing in its color occurred because of some oxidation process [2].

Peach fruit is grown in Pakistan at about 14016 hectares area with annual production 55621 tones according to the statistical data [3]. Peach is well known fruit because of its juicy quality and persica species name because of it spread from Persia to Europe. It also grouped among almond within the subgenus Amygladus, formed as additional subgenera via grooved seed shell [4]. Peach fruit is an excellent source of minerals (Potassium, Phosphorus and Iron) and a good source of vitamins [5]. Peach has important role in human health. Major phenolic compounds in peach are catechinprocyanid in B3, chlorogenicacid, neochlorogenic acid and caffeic acid [6]. Oligomeric flavan-3-ol metabolites (procyanidin) present in peach are a potent antioxidant and possess protective cardiovascular effects [7]. The main reason of increased in the demand of fruits are the health payback of fruits and vegetables. Peach are excellence of useful compounds regarding to health such as vitamin C, iron, fiber, potassium, antioxidants, polyphenolics and carotenoids [8,9].

Polyphenolics compound play important role in fruits color and taste because these are widely distributed in plant tissue. Catechin, epicatechin and chlorogenic acid are major polyphenolics compound that present in stone fruit. Carotenoids are responsible for colors ranging from yellow to red and regarded as the most widespread natural pigments.β-carotene, α-carotene, zeaxanthin and lutein are predominant carotenoids in these fruits. Antioxidant content present in peaches is most important factor for health benefits, also act as anti-aging agent. Antioxidants are most effective compounds against free radical species that can damage DNA, proteins and lipids. Antioxidants are those compounds that play important role against the incidence of cardiovascular diseases, cancers and aging. Antioxidant capacity in these fruits is derived from both phenolic and carotenoid compounds. For instance, chlorogenic and neochlorogenic acids have been found more effective chemo preventive against breast cancer, while β-carotene has been suggested to have preventive benefits against lung and colorectal cancer [10,11].

Peach fruit are also sources of vitamin-A precursors, namely carotenoids β-carotene (primarily), α-carotene and β-cryptoxanthin, Xerophthalmia, blindness and premature death cause because of deficiency of vitamin A and it also play important role in vision, in developing countries vitamin A

remain a leading cause of child mortality. Zeaxanthin and lutein, although lacking provitamin, abilities, accumulate in the macular tissue of the eye and protect against age-related macular degeneration [10].

Nutritive and non-nutritive sweeteners are two types of sweeteners that are used in food [12]. Ayub et al. [13] investigated the individual and combine effect of caloric sweeteners (sucrose, glucose and fructose) and non-caloric sweeteners (saccharine, cyclamate and aspartame) on apple, guava and carrot slices during storage. The effect of mixed caloric and non-caloric sweeteners was found excellent compare to individual sweeteners. These sugars provide sweet taste and flavor to the product they also provide freshness contributes to the product quality [13]. Sugar which provide 4 kcal of energy per gram, which is most important fuel for our brain and supply energy to our body that is necessary for body function. Sugar play important role in the quality maintenance of various product. The simplest sugar solution addition to juice and jellies holds growth of microorganism and later on spoilage. Sugar has long lasting connection for water, decrease moisture loss in backed products and the life of these products is increased. Just like sorbitol and corn syrup the fructose content of honey and invert sugar aid in hold the moisture content. Retaining of soundness and diminution of oxidation in canned fruits and vegetables is achieved by addition of sugar. When the cans opened it may cause oxidation by rendering texture, flavor and color by breakdown of coloring substance.

Antioxidant attributes may lower millard reactions. The free aldehyde or ketonic group of reducing sugar allows them to easily react with oxygen. The defining characteristic permits to come together with nitrogen at heating to cause browning to reduce spoilage of food and to maintain shiny colors in food [14].

The technology which is used to eliminate water from fruits and vegetables by dipping in concentrated solution of salts, sugars and other substances are called osmotic dehydration. Now a days of highly perishable fruits which can`t supplied to market with its fresh form became possible by the utilization of this preservation method to ensure its stability. More preservation is needed to osmotically dehydrated food because it is a pre-treatment. Dewatering or impregnation by dipping in concentrated solution or syrup of soluble solids with no change in phase [15]. The project has been planned to evaluate the following objectives:

- To determine the effect of various sweeteners solution on the shelf life of intermediate moisture peach cubes.
- To examine physicochemical and sensory characteristics of the intermediate moisture peach cubes during storage.
- To study the effect of treatments and storage on the overall quality of intermediate moisture sweetened peach cubes.

Material and Methods

Peach fruits were purchased from local market of Peshawar and were brought to the laboratories of Food Science and Technology, The University of Agriculture Peshawar in the year 2015. After all preparatory operations peach cubes preserved in sweeteners (sucrose and glucose) with different concentration followed by oven dehydration than pack in polythene pouches for further analysis i.e. physicochemical, microbial and sensory evaluation during storage period.

Statistical Analysis

All the data were analyzed statistically by using Complete Randomized Design (CRD) two factorial experiments and means were separated by LSD test as recommended by Steel et al. [16].

Results and Discussion

pH

Colour loss in fruits and vegetables because of change in pH, in aqueous solution pH has significant effect colours expression and anthocyanin stability. Analysis of variance pertaining to pH of sweetened intermediate moisture *Prunus persica* L. cubes has been presented in Table 1 storage interval and applied treatments had significant influence on pH of sweetened intermediate moisture *Prunus persica* L. Cubes. Highest mean value recorded in PC2 (3.41) and lowest mean value noted in PC_0 (3.34). These results have been shown in Table 1. Above results were also compare with Imtaiz et al. [17]. He also reported that solution effect of sucrose and glucose became a reason of fall down of pH in banana slice during storage.

Total soluble solids

Total soluble solid content in *Prunus persica* L. cubes increased during study because of degradation of sucrose into glucose and fructose into acidic compound because of elevated temperature. The mean value of TSS increased from 10.89 to 16.78 significantly ($P<0.05$) as in Table 1. Highest mean value was observed in PC_1 (15.44) °brix and next to PC_3 (14.66) °brix. Minimum value was reported in PC_0 (11.49) °brix and next to PC_4 (13.30) °brix, the present results are in complete accordance with Sandhu et al. [18].

Titratable acidity

Acidity increased during storage interval because of conversion of disaccharides into mono saccharides, oxidation of reducing sugar into acidic compounds. The mean value of titratable acidity increased significantly from (0.61 to 0.71%). Highest mean value were reported in PC_2 (0.68) then next to PC_4 (0.67). Lowest mean value was found in PC_5 (0.64) followed by PC_0 and PC_1 (0.65).

Statistical analysis demonstrated that storage interval and applied treatment had significantly effect on titratble acidity of intermediate moisture *Prunus persica* L. cubes as in Table 1. The inclined may occurred because of increment happened in acidic compound due to conversion of pectinic compound of reducing sugar into substances having acidic nature because of raised hotness [19].

Sugar acid ratio

Key characteristic determining the taste, texture and feel of fruit segments. Which contributes towards giving many fruits their characteristic flavour also an indicator of commercial and sensory ripeness, decreased in sugar acid ratio because of increment of total soluble solid? The mean value of sugar acid ratio was decrease (23.56) to (17.69) significantly ($P<0.05$). Highest mean value was reported in PC_2 (23.47 followed by PC_5 (22.57). Lowest mean value was recorded in PC_0 (17.36) and then next to PC_4 (19.58).

The statistical analysis demonstrated that storage interval and applied treatment of intermediate moisture peach cubes had significant ($P<0.05$) as in Table 1, consequence on sugar acid ratio of IMF peach cubes. Our result is accordance with the finding of author they concluded that diminution in sugar acid ratio occurred. Diminution in sugar acid ratio (14.31to 13.81) furthermore knowledge in apple pulp preservation via diverse chemical preservatives in 2010 by Durrani et al. [20].

Ascorbic acid

Also known as vitamin C and used as dietary supplement, ascorbic acid content during study decrease because of its less stability less tolerance to temperature fluctuation. The mean value of ascorbic acid was reduced (9.93 to 4.09) significantly as in Table 2. Highest mean value was recorded in PC_1 (7.87) followed by PC5 (7.33). Lowest mean value was found in PC_0 (6.05) and then by PC_4 (6.70). These all results are good compliance to the investigation of Kumar et al. [21]. they investigated the somatically dehydrated slices of mango`s quality influenced because of temperature storage and covering material.

Non reducing sugar

Non reducing sugar content of *Prunus persica* L. cubes decrease because of conversion of sucrose into glucose and fructose. The mean value of non-reducing sugar content decreased (15.23 to 14.01) significantly ($P<0.05$) Highest mean value was reported in PC_1 (17.68) followed by PC_4 (17.215). Lowest mean value was recorded in PC_0 (4.61) and then next to PC_2 (15.84).

The statistical analysis demonstrated that applied treatment and storage intervals of *Prunus persica* L. cubes had significant ($P<0.05$) consequence on non-reducing sugar content as in Table 2. The turn down in non-reducing sugar contents is because of acidity increment in peach cubes. This result is comparable in the company with results of Ayub et al. [13]. They investigated the same results in the fruit of guava slices.

Reducing sugar

Reducing sugar increase during storage interval of study because of conversion of non-reducing sugar into reducing sugar i.e., sucrose into glucose and fructose, mean value of reducing sugar content of peach cubes increased (9.75 to 11.83) significantly ($P<0.05$). Highest mean value assessment in PC_3 (12.77) were celebrated and followed by PC_2 (11.93). Smallest mean value was reported in PC_0 (6.88) and then next to PC_4 (10.64).

Table 1: *Mean Values for Intermediate Moisture Sweetened Intermediate Prunus persica L. Cubes.*

Treatments	pH	Total soluble solid	Titrable Acidity	Sugar acid ratio
PC_0	3.34	11.49	0.65	17.36
PC_1	3.40	15.44	0.65	20.90
PC_2	3.41	14.38	0.68	23.47
PC_3	3.40	14.66	0.66	21.87
PC_4	3.38	13.30	0.67	19.58
PC_5	3.39	14.58	0.64	22.57

The statistical analysis demonstrated that applied treatment and storage interval of peach cubes had significant ($P<0.05$) consequence on reducing sugar content, as in Table 2. Acidic component that present in peach cubes increase reducing sugar content it could be due to the alteration source content. These results are alike the results that account by Kumar et al. [22] in pineapple analysis.

Table 2: *Mean Values for Intermediate Moisture Sweetened Intermediate Prunus persica L. Cubes.*

Treatments	Ascorbic Acid	Non reducing Sugar	Reducing sugar
PC_0	6.05	4.61	6.88
PC_1	7.87	17.68	10.83
PC_2	6.82	15.84	11.93
PC_3	7.09	16.62	12.77
PC_4	6.70	17.215	10.64
PC_5	7.33	16.08	11.44

Conclusion

This study was conducted to build and review the quality of intermediate moisture *Prunus persica* L. cubes treated with two different sweetener solutions like sucrose and glucose individual and in combination with different concentration were used in addition of constant amount of citric acid and potassium metabisulphite. Treatment PC_3 had (Peach cubes+60 °brix sucrose solution+0.1% citric acid+0.067% potassium metabisulphite had shown the best result under sensory evaluations during storage, because about 60 °brix addition of sucrose during peach cubes processing create protective layer that prevent the microbial contamination after heat processing.

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