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Studies on processing and preparation of peach squash

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Abstract: Present study belongs to the processing and preservation of fruit in order to overcome its wastage and to improve its availability throughout several months despite the fruit's short harvesting period. Keeping in view the nutritional and medicinal importance of peach fruit, a process has been formulated with a unique formulation, following blanching of fruit at 55-60 ºC for 2-3 minutes to inhibit enzymatic browning. The fruit was pulped and then subjected to addition and mixing of sugar syrup, preservatives and stabilizer in order to optimize the product in form of squash. The product was bottled and pasteurized at 75-80ºC for 10-15 minutes in water bath and cooled to 10ºC. The product is acceptable in terms of color, flavor, and consistency with increased shelf life in a suitable packing when stored under favorable storage conditions. Sensory evaluation, chemical and microbiological studies show that the squash can be utilized for several months in form of nourishing and delightful product with all nutritional and medicinal values of a raw fruit.

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INTRODUCTION

Peach (*prunus persica*) belongs to the family *Rosaceae*, the most delicious stone fruit, temperate in nature and considered as the native of China. It is one of the traditional crops of Pakistan especially Quetta, Kalat, Peshawar, Swat valley and certain parts of Kohistan hills are the main growing areas of peach[1]. It has delicious taste, attractive flavor and aroma. Peaches contain 10-14% sugar, 2% fiber and 2% protein along with vitamins of B group, ascorbic acid, folic acid, calcium, potassium and zinc. A medium peach contains 465 IU of vitamin A to combat the effects of aging and its ß-carotene also helps to build a strong immune system to prevent damage from free radicals, as well as to avert many skin diseases[2].

Peaches are also rich in potassium, which is helpful for the maintenance of good heart health and prevention or treatment of high blood pressure. In addition, it also strengthens heart muscles[3]. Due to its alkaline content peach juice helps in soothing the digestive system and used in treatment of gastritis; also having gentle laxative effect and prevents nephritis as well as dissolves bladder and kidney stones. Raw peach juice is widely used in various healthy weight loss programs[4].

Peaches have a short shelf life, so these can be preserved in the peak season into value added product. Keeping in view the importance of peach fruit from nutritional and medicinal point of view and for its maximum utilization; a process for preparation of Peach Squash has been developed. Sensory and nutritional evaluation of the product was also conducted. The processing of fruit as squash enhances the raw edible quality of fruit as well as its shelf life by the selection of appropriate fruit drink processing conditions.

MATERIALS AND METHODS

Fresh peach fruit was purchased from a local market of Karachi city and after selection of raw material, peaches were washed under tap water to remove dust and dirt and as well as to reduce the miscible load. The fruit was peeled off and cut into slices with slicer and depitted.

Preparation for peach squash

The ripen, firm, undamaged, healthy and depitted peeled peach slices were blanched in water bath containing preservatives (potassium metabisulfite and citric acid) at 55-60 ºC for 2-3 minutes, then the fruit was subjected to cooling for another 2-3 minutes in order to nullify the cooking effect. In the second phase of the process, sugar syrup was prepared with the addition of water sugar, citric acid, ascorbic acid, sodium benzoate and potassium sorbate according to formulation.

The blanched fruit slices were then subjected to blending/pulping process. The slices were blended or pulped with a little amount of prepared sugar syrup containing preservatives and stabilizers. This suspension was then mixed by continuous agitation with the remaining amount of sugar syrup in order to form a homogenous mixture of uniform consistency. Finally, peach flavor (food grade artificial flavor) and food grade color additives were added for the enhancement and preservation of natural color and flavor of the final product.

The peach squash was filled in clean pre-sterilized bottles and sealed. The bottles were pasteurized at 75-80 ºC for 10-15 minutes in water-bath and cooled to 10 ºC. The squash was then stored under favorable storage conditions and was subjected to sensory, chemical and microbiological evaluations.

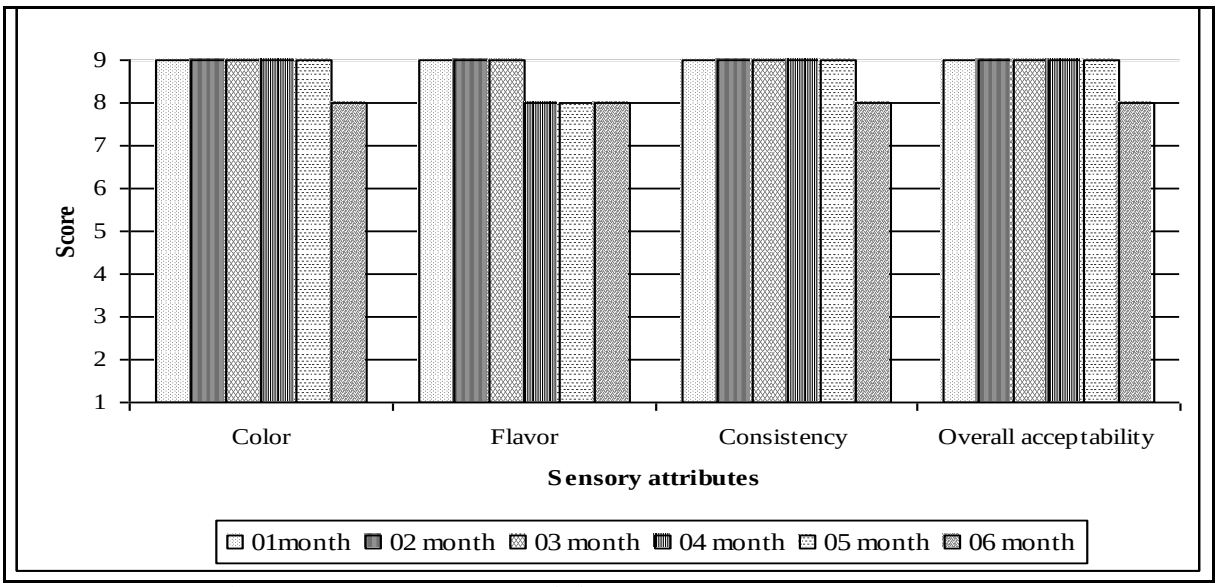

Figure 1: Sensory score of peach squash during six months shelf life

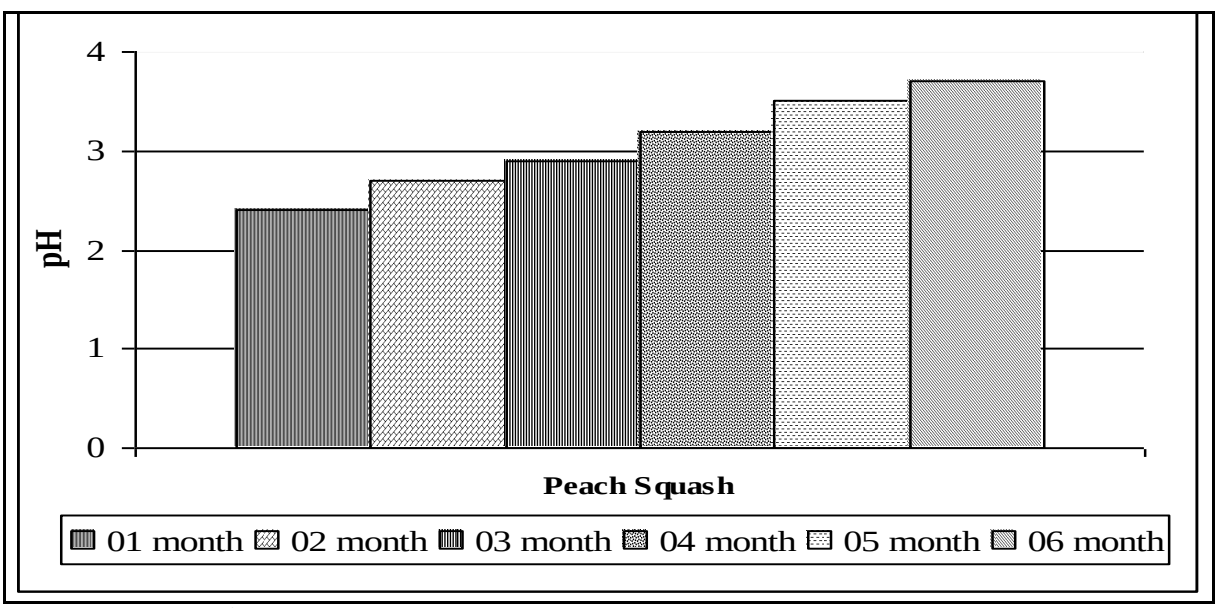

Figure 2: Change in pH of peach squash during six months storage

Sensory evaluation

Sensory evaluation was performed by trained panelists consisting of 10 assessors ranging from 30 to 45 years of age. Panelists were provided with evaluation performa to evaluate the selected attributes, i.e. color, flavor, consistency and overall acceptability at 9 points hedonic scale[5]. The score for each parameter was calculated as an average score awarded by the panel members. An overall quality score was also calculated. The product was evaluated on monthly basis up to six months (Figure 1).

Chemical analysis

Acidity

Titrable acidity was determined following titration method against 0.1 N sodium hydroxide solution and expressed in gram acid (citric acid) per 100 g product[6].

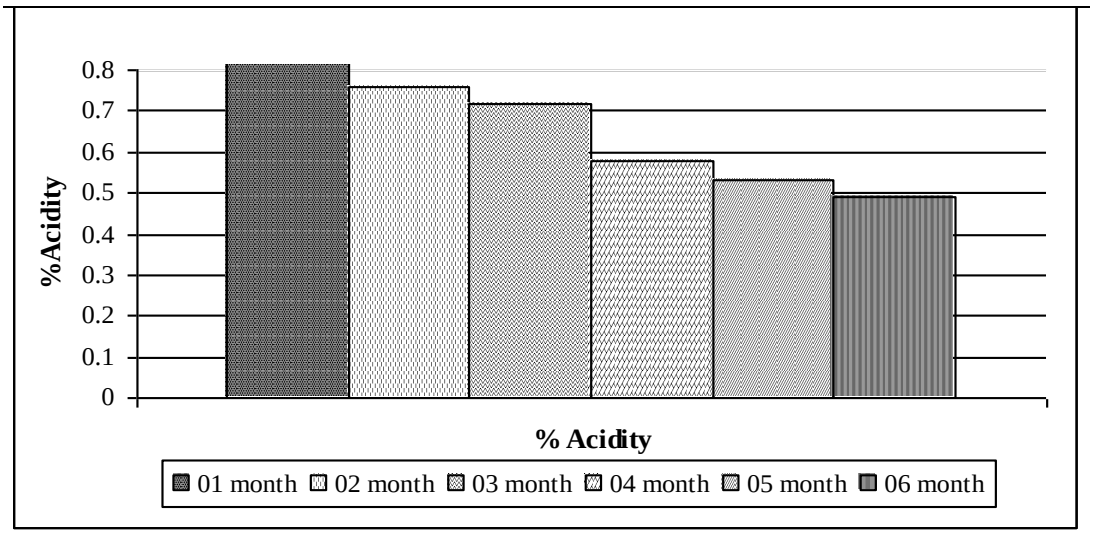

Figure 3: Change in % acidity of peach squash during six months of shelf life

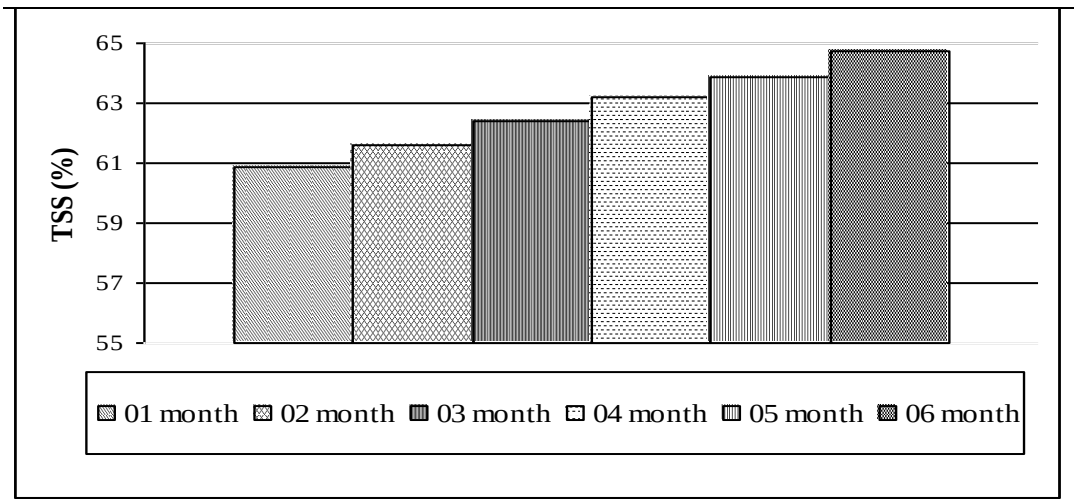

Figure 4: Effect of storage on % TSS of peach squash

pH

pH of product was directly recorded by using a pH meter[7] (HANNA Model No. 8314).

Total soluble solids

Total soluble solids of product were directly recorded by Abbe's refractometer[8]and results were expressed as percent soluble solids (Brix^{o}).

Total sugar

A homogenized solution (10%) of peach squash was prepared for determination of total sugar. At first, 25 ml of mixed soxhlet solution [12.5 ml of Fehling A (copper sulfate solution)+12.5 ml of Fehling B (alkaline tartrate solution)] was taken into 300-400 ml conical flask (method used was consistent in standardization and determination). Both the reagents i.e., A and B were pre-standardized with 1% standard invert sugar solution. 10% homogenized solution of product was titrated against mixed soxhlet solution by placing 25 ml of soxhlet solution on a hot plate with continuous heating and stirring commenced to titrate adding 0.5 ml quantities every two seconds without went-off the boiling. A distinct reddening occurred near the end-point. At this stage the addition of a titer reduced to the rate of 0.1 ml. The end-point was taken as the appearance of the bright red color of copper-oxide in the solution. Titration was repeated by adding whole of the initial test titer less 0.5 cm^3. The end-point was arranged so as it falls within a three to four minutes of boiling period. For inversion, 40 ml of 10%

clarified solution of peach squash was taken in 50 ml conical flask and 05 ml of concentrated hydrochloric acid was added and the content was incubated at 55-60˚C for exactly 10 minutes. After incubation, the sample contents were cooled and titerred same as mentioned above the process before inversion.

Microbiological analysis

The product was microbiologically evaluated for its shelf life at 15°C (refrigerated), 35°C and at room temperature which run as control (without addition of food grade preservatives) to check its efficacy within the allowed concentration in maintaining the microbiological criteria which includes *Listerla* spp. *Coliforms*, *faecal coliforms* and total aerobic plate count; according to multiple microbiological Guidelines for ready-to-eat foods which includes ICMSF[10], PHLS[11] and Gulf Standards[12].

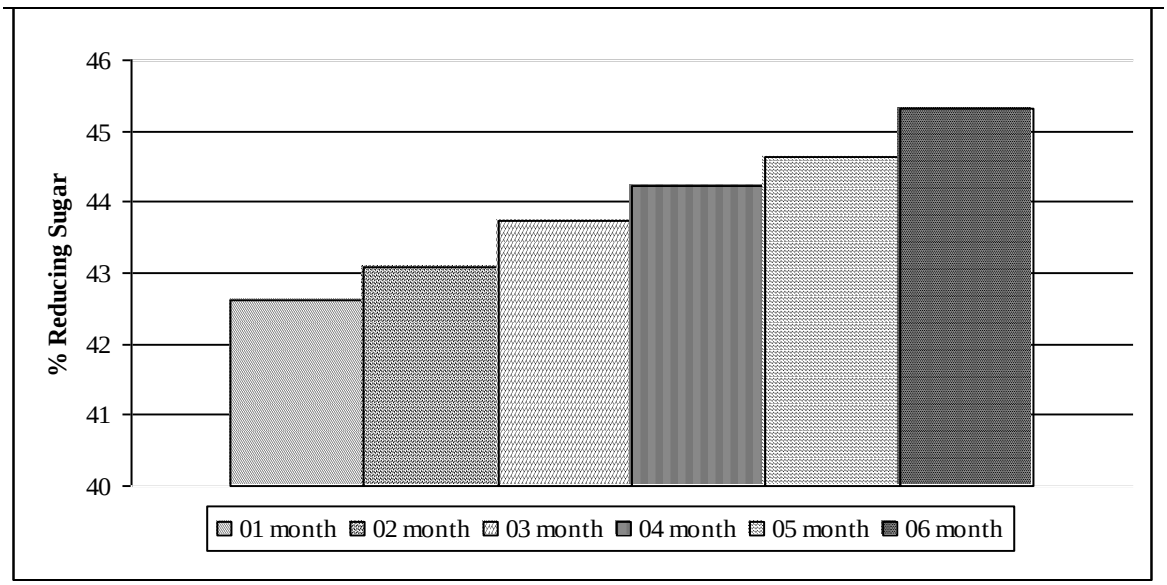

Figure 5: Effect of storage on % reducing sugar content of peach squash

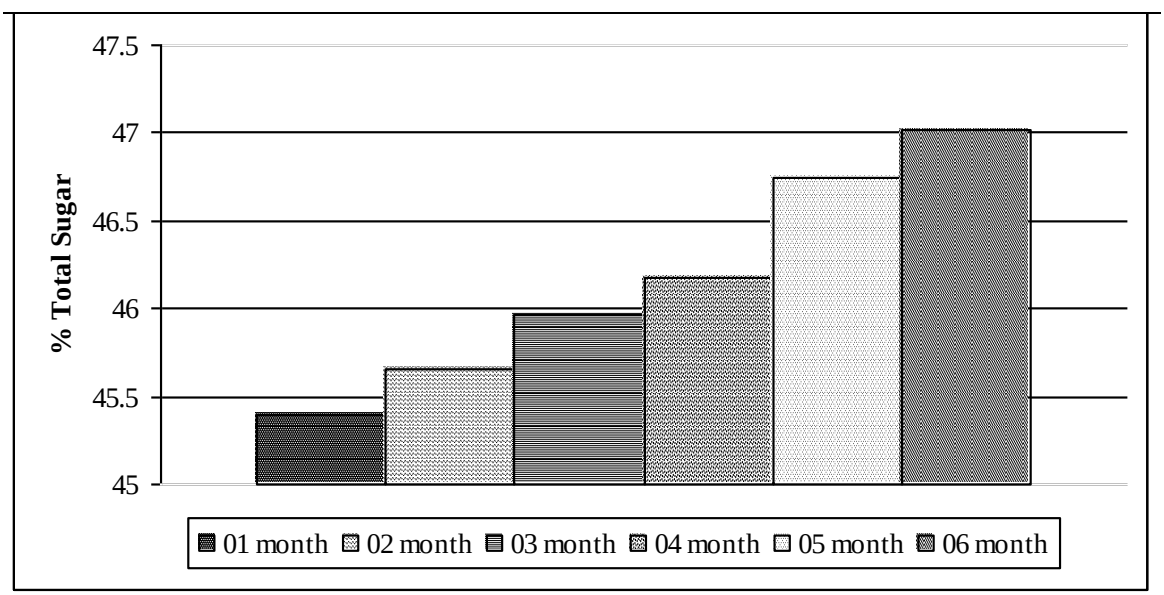

Figure 6: Effect of storage on % total sugar content of peach squash

RESULTS AND DISCUSSION

The physicochemical results of the product are shown in figure 1. No progressive deterioration was found in color, flavor, consistency and overall acceptability during storage period of four to six months. The sensory evaluation was excellent, whereas enzymatic browning was controlled in fruit by blanching so as to inactivate the enzyme activity[13-15]. The pH remains constant within 2.4 to 3.7 (Figure 2). This is mainly due to the addition of antioxidants and preservatives during processing. Low pH is also one of the factors that increase the shelf life of the product[16]. The acidity of the formulation ranged from 0.82% to 0.49% (Figure 3). As a fruit ripens, it softens, its acidity declines and it produces certain volatile compounds that give its characteristics aroma[17]. So, the control of pH in a low value and the addition of preservatives and antioxidants were the hurdles to formulate the preserved product[18-21]. The choice of acidulant in the product depends mainly on the type of fruit, cost, balance sugar/acidity, etc. Mostly acids are added to adjust the acidity of fruit products are citric and phosphoric acids due to their low price and sensory compatibility[19], whereas, citric acid is also used to prevent enzymatic browning because it inhibits polyphenol oxidase by reducing the pH by chelating the copper at enzyme-active site. Data shows significant effect of storage and treatment on the total soluble solids (Brix^o) of the product (Figure 4). Total soluble solids (TSS) increased at consistent level as the storage period proceeded. Brix^o of canned peaches increased gradually during storage and the increase might be due to the formation of water soluble pectin from protopectin during storage. Pectin is often added to the products as stabilizer which could contribute towards the increase in TSS, whereas, the addition of thickeners or stabilizers can cause an increase in TSS[22].

Reducing sugar of the product ranged from 42.62% to 45.32 % (Figure: 5) whereas total sugar ranged from 45.4% to 47.02% (Figure 6). It has been reported that during boiling period or pasteurization some breakdown of sugar occurs which depends upon the length of boiling or pasteurization time. Some of the sugars were changed to invert sugars by acid hydrolysis[23,] whereas, the storage duration, chemical reactions and temperature leads to the fall in pH that explain the changes observed in total sugar contents. Godara and Pareek[24] observed an increase in total sugars in date palm juice during storage at room temperature. Rehman[25] found increase in total and reducing sugars while decrease in non reducing sugar with the storage time. It has also been observed that an increase in reducing and total sugar during the storage of twelve months in pulp and squash samples[26]. The product obtained in form of peach squash having pleasant taste, texture, color, flavor and a shelf life of approximately six months when packed and stored under favorable storage conditions. The order of acceptability of product was determined by analysis of overall acceptability characteristics related to flavor, color and texture. The product was most acceptable in terms of color, flavor and consistency with no off color and flavor recorded during its shelf life. The peach squash was found to remain within limits according to multiple guidelines for ready-to-eat food stuff, throughout its four months of shelf life (Table 2).

TAC reflects overall hygienic conditions of the edible items, while *Listeria* spp, though it's presence in the food does not show that it will be a cause of any out breaks within population. According to PHLS[11], <20 cfu/ml is an acceptable limit for it. According to ICMSF[10] that beyond 10^2 is alarming and may cause health related out breaks in populations. According to PHLS[11] 10^3 is the satisfactory range for the TAC 10^4 is an acceptable range for the same parameter beyond which it is not allowed. For mold/yeast count which is just included in Gulf standards for food stuff (2000), the range is from 10^2-1.0×10^3. For *coliforms* maximum count anticipated is 10, and maximum count permitted is 100. For total colony count is 1.0×10^4-$5.0\times10^{5.}$ *Listeria* spp. is not found in any sample either control or in final treated sample at any temperature i.e.15°C, 35°C (ambient storage). C*oliforms* and *faecal coliforms* were also <3 cfu/ml, whereas TAC was very high in control sample. The treated sample was well-controlled (<1 cfu/ml) with yeast/mould count was noticed, i.e. 7-24 cfu/ml which is within allowed range[12].

CONCLUSION

It can be concluded that peach squash can be successfully processed. Sensory evaluation and shelf life studies showed that the product can be utilized for several months despite of fruit's short harvesting period and availability. The processing is simple and biochemical analysis indicates that it is a good source of protein, minerals and energy. The nutritional value of peach squash is quite fulfilling according to health point of view. Microbiological parameters were well-controlled throughout four months of its shelf life.

Table 1: Proximate biochemical analysis/nutritional value/100ml.

Carbohydrate (By diff)	Protein	Fat	Dietary Fibre	Mineral Content	Energy (kcal)
61.7 g	0.3 g	traces	0.5 g	2.7 g	248

Table 2: Microbiological analysis of peach squash.

Tests	**Control (without preservatives) Room Temperature**	**Test Sample**	
		35°C	**15°C**
Listeria spp.	Nil	<1 CFU/ml	<1 CFU/ml
Mold/Yeast Count	28 CFU/ml	<3 CFU/ml	<10 CFU/ml
TAC (Total Aerobic Count)	TNTC $>10^3$ CFU/ml	5.0×10^1 CFU/ml	10 CFU/ml
Coliforms/Fecal Coliforms	Nil	Nil	Nil

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