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# FRUIT PROCESSING PRESERVATION AND DEVELOPMENT OF VALUE ADDED PRODUCTS (SQUASH, JAM, AND CANDY) TO CONTROL WASTAGES OF FRUITS IN GILGIT-BALTISTAN

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## ABSTRACT

Post harvest losses of fruits in Gilgit-Baltistan are more than 50%. Fruits and vegetables are abundantly produced in Gilgit-Baltistan. Due to lack of processing, preservation, dehydration and value added product development knowledge/training, testing facilities, cold storage and improper transportation large amount of fruit, vegetable and other agricultural produce goes wasted and does not reach in market because fruits are highly perishable. The total fruit production in Gilgit-Baltistan is 149769 Metric tons (Apricot 108588, Apple 19054, Grapes 6413, Pear 2579, Peach 3308, Pomegranate 4287, Cherry 2256 Mulberry 9092 Walnut 5992, Almond 1700 and Sea buckthorn 3600) The post harvest losses of fruits and vegetables in Gilgit-Baltistan is 50% [21] [15]. The aim of this work is to develop methods for processing, preservation and development of value added products and provision of trainings to farmers to control these fruit losses which will help to control food security in Gilgit-Baltistan. To carry out this activity Pakistan Science foundation has supported financially. Methods developed for the development of apricot and apple mixed fruit squash, Jam, and Candy/leather, and trainings on processing preservation and value added product given to farmers of Gilgit-Baltistan.

**Keywords:** fruits, gilgit-baltistan, fruit losses, process, preserve, value added products.

## INTRODUCTION

Gilgit-Baltistan is the most important part of the country extends over an area of 27188sq miles. Administratively it is distributed among 10 Districts (Gilgit, Skardu, Diamer, Astore, Ghagchae, Ghizer, Hunza, Nagar, Shigar and Kharmang) with a population of 2 million. The main issue of Gilgit-Baltistan is food security as cultivated lands are less than one kanal per capita. The people of GB totally depend on wheat supplied through Government on subsidized rates form Punjab. Allah almighty has gifted the area with abundant delicious high quality fruits and vegetables, fruits and vegetables are the main source of income generation of the area but unfortunately the pre and post harvest losses of fruits and vegetables are 50-70%. The total fruit production in Gilgit-Baltistan is 149769 Metric tons (Apricot 108588, Apple 19054, Grapes 6413, Pear 2579, Peach 3308, Pomegranate 4287, Cherry 2256 Mulberry 9092 Walnut 5992, Almond 1700 and Sea buckthorn 3600) [21]. Due to lack of processing, preservation, testing, transportation, communication and research large amount of fruit, vegetable goes wasted and does not reach in market because fruits are highly perishable. According to agricultural statistics [21] total wastages of these fruits and vegetables are 50% [15]. To overcome the food security issue of Gilgit-Baltistan and to cope the tremendously increasing demand of food locally without bringing more land under cultivation. Processing, preservation and value addition of fruits and vegetables through training of farming community is milestone.

There is a huge demand for chemically preserved fruit pulp and semi processed fruits in the food industry of country. There is a great scope of dehydrated fruit, pulp and other value added products to the western market as well. A number of importers from Europe have shown their interest in the import of dry apricot from Gilgit-Baltistan. In the year 2014 according to BCDF (Baltistan Culture Development Foundation) Skardu there was an order of 3500 tons dried apricot from a single party from United Kingdom, but unfortunately they even fail to collect 10 tons international standard dehydrated dry apricot. The project aim to address this issue through Processing, preservation, dehydration and value added product development training of selected progressive farmers of all 10 districts of GB on their own districts according to HACCP, WHO and FAO international recommended standards with recommended chemical preservatives and doses to produce quality value added products to enable them to meet the challenges of export requirement. That save the fruit worth billion of rupees being produced in these areas and to protect the national wealth which is being spoiled,

For export of value added fruit products each product must be its nutritional profile amount of preservative, expiry date and testing/analysis certificate from any ISO17025 certified accredited laboratory. The project will address this issue with purchase of the required lab testing equipment through this project. Mostly the hygienically and best quality fruits/value added products rejected during export due to packaging material that is poisonous, large in volume and weight , unattractive, and without required printed information in packaging material. Packaging machine will be procured and farmers will be trained/ demonstrated to use recommended, attractive, and low in volume/size and with full required information's in packaging material.

To realize the need of processing of fruits and vegetables KIU (Karakoram International University) also started B.Sc (Hons) and M.Sc (Hons) Degree programs at KIU "Department of Agriculture and Food Technology" Gilgit. PCSIR Skardu has given processing preservation of fruits and vegetables training in collaboration with line departments and NGOs in Gilgit-Baltistan only limited farmers. The processing training for majority of farmers needs to be given in future to control the existing losses/wastages of fruits though skill development in processing. To address these issues PCSIR Skardu financially supported by Pakistan Science Foundation to conduct processing, preservation, dehydration and value addition of fruits and vegetables trainings throughout the Gilgit-Baltistan (all 10 Districts) and procurement of some testing lab equipments.

**Preservation**

Preservation of fruits is milestone for better utilization and to control losses of fruits and vegetables. In order to avoid glut and utilize the surplus fruits in the season, it is necessary to use preservation methods to prolong the life, to utilize them in off season and for safe transportation to distance places[5], [33], [36], [37].

## MATERIALS AND METHODS

The study was carried out at PCSIR Laboratories Skardu. Fruits apple, mulberry, apricot, seabuckthorn and commercial grade preservatives Potassium metabisulphite ($K_2O_5S_2$) and Sodium benzoate ($NaC_6H_5CO_2$) purchased from Skardu local market.

**Selection and washing of fruits**

The fruit Apple and Apricot for pulp extraction to develop value-added product was selected that is de shaped, small in size unattractive, wounded and pest attacked etc. The best quality, large in size and attractive was kept for fresh sale. The wounded and diseased infected portion was removed before washing. After removal of infected portion and diseased portion fruits were washed in automatic fruit washer

**Pulp extraction, packaging and storage**

The fruits apple and apricot after washing (apples were cooked in pressure cooker for 8 minutes after pressure) passed through pulpier for pulp extraction. The pulp was obtained in stainless steel pans weighed and add preservatives and filled in 30 liter plastic cans. Plastic cans before filling washed with hot water and rinsed with potassium metabisulphite solution for sterilization this is common practice of PCSIR Demonstration Cum Training Center (PCSIR-DCTC) Skardu [16], [17], [19], [26].

**Proximate/Chemical/ analyses of the fruit pulp**

The chemical composition of fruits determined from obtained pulp using the following methods (Anon., 2000) were used to determine protein, fat and ash content in stored fruit pulp samples: micro Kjeldahl for protein (N x 5.7) (method 960.52) (Glass Model Pyrex-1); incineration at 550°C for ash (method 923.03)(PCSIR-Lhr); de fatting in a Soxhlet apparatus[4], [5] (J.P.Selecta–Spain) with 2:1 (v/v) chloroform/methanol for lipids (method 920.39C). Total soluble solids (TSS) were determined directly in each sample by using refractometer (Atago 3810-Japan) and expressed as Brix. Acidity and pH determination (Jenway 3510-UK) was carried out by the same methods (Anon., 2000). The experiment was repeated twice and the values are presented as means (SD±) [4], [5].

**Table-1.** Chemical composition of fresh Apricot (Halman) of Gilgit-Baltistan (gm/100gram).

| S. No. | Parameter | Result |
|---|---|---|
| 1 | Moisture | 83.3 |
| 2 | Protein | 0.9 |
| 3 | Ash | 0.72 |
| 4 | Fiber | 1.02 |
| 5 | Fat | .035 |
| 6 | Carbohydrate | 14.025 |
| 7 | Total soluble solids TSS /°Brix | 15 |
| 8 | pH | 4.5 |
| 9 | Acidity | 0.38 |

**Table-2.** Mineral composition of fresh Apricot (Halman) of Gilgit-Baltistan (mg/100gram).

| S. No. | Parameter | Result |
|---|---|---|
| 1 | Vitamin C | 10 |
| 2 | Calcium | 33 |
| 3 | Phosphorus | 26 |
| 4 | Iron | 0.9 |
| 5 | Thiamin | 0.05 |
| 6 | Riboflavin Niacin | 0. .07 |

**Table-3.** Chemical composition of fresh Apple (Five Star) of Gilgit-Baltistan (gm/100gm).

| S. No. | Parameter | Result |
|---|---|---|
| 1 | Moisture | 82.3 |
| 2 | Protein | 0.4 |
| 3 | Ash | 0.56 |
| 4 | Fiber | 0.8 |
| 5 | Fat | 0.3 |
| 6 | Carbohydrate | 15.64 |
| 7 | Total soluble solids TSS /°Brix | 11.7 |
| 8 | pH | 4.0 |
| 9 | Acidity | 0.35% |

**Table-4.** Mineral composition of fresh Apple (five star) of Gilgit-Baltistan (mg/100gram).

| S. No. | Parameter | Result |
|---|---|---|
| 1 | Vitamin C | 16 |
| 2 | Calcium | 13 |
| 3 | Phosphorus | 10 |
| 4 | Iron | 0.9 |
| 5 | Thiamin | 0.05 |
| 6 | Riboflavin Niacin | 0.04 |

**Development of Apple Apricot mixed fruit squash**

Apricot apple fruits are used to develop mixed fruit squash (50:50 ratios). The fruits wounded/fallen small size and unattractive shape fruits used for pulp extraction. The infected portion wounded or insect attacked portion removed and remaining healthy fruit washed and used for value-added product development. This is the main objective of project to control losses/wastages of fruits.

**Flow sheet diagram of fruit jam**

Fresh unsold fruit
↓
Removal of effected wounded/diseased portion
↓
Washing/cooking
↓
Pulping
↓
Weighing of 1litter (Apple Apricot 50:50) pulp
↓
Addition of 750gram sugar
↓
Cooking of pulp for 15 minutes
↓
Addition of citric acid 4gram
↓
Addition of pectin 5gram
↓
Addition of chemical preservative (potassium metabisulphite 1gram)
↓
Checking of end point (TSS- 68% digital refractometer)
↓
Bottling/packing of jam
↓
Cooling
↓
Capping and labeling of bottles
↓
Ready for marketing

**Development of Apple Apricot mixed fruit jam**

Fruits (Apricot, apple, seabuckthorn and mulberry) are preserved as jam, jelly, on high solid high acid principal. The developed recipe is used for preparation of fruit jam i.e. apple, apricot, seabuckthorn, cherry, quince and plum jam etc. the wounded small size and diseased fruits do not enter usual fresh market channels and can be made attractive by development of value-added products with pleasing color and good taste removing the effected wounded and diseased portion remaining 80% is utilized.

**Flow sheet diagram of fruit jam**

Fresh unsold fruit
↓
Removal of effected wounded/diseased portion
↓
Washing/cooking
↓
Pulping
↓
Weighing of 1litter (Apple Apricot 50:50) pulp
↓
Addition of 750gram sugar
↓
Cooking of pulp for 15 minutes
↓
Addition of citric acid 4gram
↓
Addition of pectin 5gram
↓
Addition of chemical preservative (potassium metabisulphite 1gram)
↓
Checking of end point (TSS- 68% digital refractometer)
↓
Bottling/packing of jam
↓
Cooling
↓
Capping and labeling of bottles
↓
Ready for marketing

**Development of Apple Apricot mixed fruit candy/leather**

Fruit leather/candy is a concentrated nutritious fruit product has a chewy texture similar to semi dried fruits and is a good source of dietary fiber, vitamins and sugars

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**Flow sheet diagram of fruit candy**

Fruit pulp (same used for jam)
↓
Weighing of pulp 1 litter (Apple Apricot 50:50)
↓
↓Addition of 150gram sugar
↓
Continued Cooking with stirring15 minutes
↓
Addition of citric acid 2gram and 2 gram liquid glucose
↓
Addition of chemical preservative (potassium metabisulphite 0.5gram)
↓
Checking of end point (TSS- 72% digital refractometer)
↓
Poured in greased tray
↓
Kept in solar dryer for 24 hours
↓
Cooling
↓
Cutting into desired shapes
↓
Raping in attractive butter paper
↓
Ready for marketing

**Physico-chemical characteristics of Fruit Squash, Jam and Candy**

The physico-chemical properties Knowledge of food is fundamental in analyzing the characteristics of food during its processing. The study of these food properties and their responses to process conditions are necessary because they influence the treatment received during the processing and also because they are good indicators of other properties and qualities of food (Rao and Das, 2003). In the present investigation certain physico-chemical properties of the developed apple apricot mixed fruit squash, jam and fruit candy were analyzed, to ensure the quality of the products. PCSIR specifies that jam is the product obtained by processing fresh fruits, fruit pulp with water and sugar by boiling to a suitable consistency. The analysis of apple apricot mixed fruit squash, jam and candy for the various properties was done using an aqueous solution of the sample. This was prepared (Jam and candy) by weighing about 25gm of the sample and dissolving it in 200ml of water. The aqueous solution was kept on a boiling water bath for 1 hour. The solution was cooled and diluted to 250ml (squash 25ml directly diluted with 250ml) with distilled water, filtered and used for analysis.

**Titrable acidity**

Acidity value is a measure of stability and shelf life of squash, jam and candy. It is due to the organic acids in fruits and those which are added while making the products. The setting quality of jam and candy are improved by adequate pH maintenance.

**Ash value**

The ash value is mainly due to potassium and phosphorous and the composition of it. It is the measure of fruits and fruit juice content. A low value indicates deficiency of fruit or excess of sugar.

**Reducing sugar**

During squash, jam and candy making, sugar (sucrose) is added. During boiling, the sucrose partly gets converted into invert sugar which prevents crystallization.

**Total soluble solids TSS/°Brix**

For squash, jam and candy brix/total soluble solids are calculated. The figure for soluble solids help in accessing the fruit content of jam and fruit bar and also helps to prevent the growth of mould and yeast.

**Vitamin C**

Apricot and apple are important sources of ascorbic acid. The ascorbic acid content decreased during storage due to oxidation of ascorbic acid to dehydro ascorbic acid.

**Organoleptic evaluation of Squash, Jam and Candy/leather**

Sensory evaluation offers the opportunity to obtain a complete analysis of the various properties of food as perceived by human sense. Sensory evaluation is an important and best method for evaluating new products developed which provide quality measure and production control. The organoleptic/sensory evaluation for appearance flavour consistency, taste and overall acceptability conducted using nine point hedonic scale in accordance with the method described by Larmond [25]. The panel members were selected on the basis of their ability to discriminate and scale abroad range of different attributes of developed products apricot apple mixed fruit squash, jam and leather. An orientation program was organized for the panel members to brief them the objective of the study. The samples were served to the panelists for organoleptic/sensory analysis. The judges were provided with prescribed questionnaires to record their observation. The information contained on the performa was Larmond nine point hedonic scale i.e. 9 = Liked extremely; 8 = Liked very much; 7 =Liked moderately; 6 = Liked slightly; 5 = Neither liked nor disliked; 4 = Disliked slightly; 3 =Disliked moderately; 2 = Disliked very much; 1 = Disliked extremely. The panelists expectorated the samples and rinsed mouth using distilled water between samples. Organoleptic/Sensory testing was made in the office of director completely free of food/chemical odor, unnecessary sound and mixing of daylight. The experiment was repeated twice and the values are presented as means (SD±). The panel members evaluated the products at an interval of 30 days for a period of 90 days.

## RESULT AND DISCUSSIONS

### Sensory/Organoleptic evaluation of the Apricot Apple mixed fruit Squash, Jam and Candy/leather

The apricot apple mixed fruit Squash, jam and candy was prepared and bottled/ raped by standard techniques. The samples were evaluated organoleptically once in 30 days. The samples were graded by numerical scoring, on a nine point hedonic scale. The results of organoleptic evaluation were reported in Tables 1, 2 and Table-3 for squash, jam and candy respectively. The organoleptic evaluation shows, gradual reduction in the mean score for over all acceptability after 90 days of storage. Consistency remains same and the taste declined. Flavour change was observed, which showed a correlation with the study result of Ashwah, *et al.*, (1982) in fruit juices. Otto, (1984) has reported a reduction in appearance and taste of fruit products on storage. Hence maximum storage period of 60 days, at room temperature may give a better acceptability. Though there was reduction in the mean scores, statistical tests proved that there were no significant changes in any of the products, over the entire period. Sensory evaluation of fruit bar revealed higher deterioration in colour, appearance and texture on 60th and 90th days of storage at higher temperature (Aruna et al., 1998). A gradual decrease in the scores of sensory parameters was reported in amla Jam by (Tripathi *et al*., 2004).

### Proximate/chemical composition of the Apricot Apple mixed fruit Squash, Jam and Candy

### Acidity

Acidity is the measure of shelf-life of the product. Titrable acidity studied to ensure physico-chemical changes during preparation (Sandhu, *et al.*, 1985) and during storage (Kalra and Tandon, 1985). In Apricot, apple mixed fruit squash titrabal acidity increased to 0.45% during 30 days storage 1.35% during 60 days interval and 1.80% in 90 days storage. In apricot apple mixed fruit Jam, titrabal acidity increased to 0.52% at 30 days and 1.58% and 2.11% at 60 and 90 days of storage respectively. In apricot apple mixed fruit candy/leather fruit the titrabal acidity increased upto 0.56%, 1.12% and 1.69% after 30, 60 and 90 days of storage (Table 8, 9, 10). Similar observations was seen by Gowda *et al*., (2005) where the titrabal acidity of guava fruit bar increased while pH decreased during different storage intervals.

### Total soluble solids TSS/°Brix

There are no significant changes observed in total Soluble Solids (TSS) in apricot apple mix jam and candy/leather during the 90 days storage period (Table 8, 9, 10). Similar observation was seen by (Pota *et al*., 1987) during storage of pomegranate fruits. In Apricot apple mixed squash there is no increase in total soluble solids during 30 and 60 days storage but during 60 to 90 days storage there is 1.04% increase shown in TSS. Similar observation was seen by (Tripathi et al., 2004) that here was an increase in TSS of amla jam during storage TSS of the products was the index of sweetness.

### Ash value

The ash value is a measure of the amount of added minerals. Natural ash content is due to the minerals like calcium, phosphorus and iron. Ash content of a foodstuff represents inorganic residue remaining after destruction of organic matter (Ranganna, 1986). There are no significant changes observed in ash value in apricot apple mix squash, jam and candy/leather during 30, 60 and 90 days storage period (Table 8, 9, 10). Similar observation was focused by Saini and Jain (1995) during the storage of pear juice concentrates. Similar observation was found by Narayana and Maini (1989) who found no change in ash content during the storage of turnip pickle.

**Table-5.** Mean acceptability scores for Apricot Apple mixed fruit squash.

| Parameters | 1st day(Initial) | 30th day | 60th day | 90th day |
|---|---|---|---|---|
| Appearance | 8.7 | 8.7 | 8.7 | 8.6 |
| Flavour | 8.5 | 8.4 | 8.4 | 8.2 |
| Consistency | 8.4 | 8.4 | 8.4 | 8.3 |
| Taste | 8.7 | 8.6 | 8.5 | 8.3 |
| Overall acceptability | 8.6 | 8.5 | 8.4 | 8.3 |

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**Table-6.** Mean acceptability scores for Apricot Apple mixed fruit Jam.

| *Parameters* | *1st day(Initial)* | *30th day* | *60th day* | *90th day* |
|---|---|---|---|---|
| Appearance | 8.5 | 8.5 | 8.5 | 8.45 |
| Flavour | 8.5 | 8.4 | 8.4 | 8.3 |
| Consistency | 8.5 | 8.5 | 8.5 | 8.37 |
| Taste | 8.6 | 8.5 | 8.3 | 8.1 |
| Overall acceptability | 8.6 | 8.5 | 8.4 | 4.3 |

**Table-7.** Mean acceptability scores for the Apricot Apple mixed fruit Candy/leather.

| **Parameters** | **1st day(Initial)** | **30th day** | **60th day** | **90th day** |
|---|---|---|---|---|
| Appearance | 8.6 | 8.6 | 8.6 | 8.5 |
| Flavour | 8.6 | 8.6 | 8.4 | 8.4 |
| Consistency | 8.6 | 8.5 | 8.5 | 8.4 |
| Taste | 8.6 | 8.5 | 8.4 | 8.3 |
| Overall acceptability | 8.6 | 8.6 | 8.5 | 8.4 |

**Table-8.** Mean chemical composition of Apricot apple mixed fruit squash.

| **Parameters** | **1st day(Initial)** | **30th day** | **60th day** | **90th day** |
|---|---|---|---|---|
| Total soluble solids/°Brix (%) | 50 | 50 | 50 | 50.52 |
| Ash (%) | 2.8 | 2.8 | 2.8 | 2.8 |
| Titrable Acidity (%) | 2.21 | 2.22 | 2.24 | 2.25 |
| Total sugars (%) | 30.33 | 30.35 | 30.42 | 30.61 |
| Reducing sugar (%) | 15.50 | 15.55 | 15.6 | 15.75 |
| Ascorbic Acid (mg/100g) | 1.5 | 1.2 | 1 | 0.8 |

**Table-9.** Mean chemical composition of Apple apricot mixed fruit Jam.

| **Parameters** | **1st day(Initial)** | **30th day** | **60th day** | **90th day** |
|---|---|---|---|---|
| Total soluble solids/°Brix (%) | 68.5 | 68.5 | 68.5 | 68.5 |
| Ash (%) | 4.6 | 4.6 | 4.6 | 4.6 |
| Titrable Acidity (%) | 1.89 | 1.90 | 1.92 | 1.93 |
| Total sugars (%) | 46.47 | 46.50 | 46.62 | 46.81 |
| Reducing sugar (%) | 30.61 | 30.63 | 30.66 | 30.80 |
| Ascorbic Acid (mg/100g) | 1.9 | 1.6 | 1.4 | 0.9 |

**Table-10.** Mean chemical composition of Apricot apple mixed fruit Candy/Leather.

| Parameters | 1st day(Initial) | 30th day | 60th day | 90th day |
|---|---|---|---|---|
| Total soluble solids/°Brix (%) | 71.5 | 71.5 | 71.5 | 71.5 |
| Ash (%) | 4.8 | 4.8 | 4.8 | 4.8 |
| Titrable Acidity (%) | 1.77 | 1.78 | 1.79 | 1.80 |
| Total sugars (%) | 45.50 | 45.51 | 45.54 | 45.91 |
| Reducing sugar (%) | 8.37 | 8.38 | 8.42 | 8.48 |
| Ascorbic Acid (mg/100g) | 2.1 | 1.7 | 1.3 | 0.8 |

**Total sugars**

The increase in sugars would be attributed to the conversion of starch and other insoluble carbohydrates into sugars. In Apricot, apple mixed fruit squash total sugars increased to 0.06% during 30 days storage 0.29% during 60 days interval and 0.92% in 90 days storage (Table-8). In apricot apple mixed fruit Jam, total sugars increased to 0.06% at 30 days 0.32% during 60 days and 0.73% during 90 days of storage intervals (Table-9). In fruit candy/leather, there was an increase of about 0.02%, 0.08% and 0.90% on 30th day, 60th day and 90th day respectively (Table-10). The increase in sugar was also observed by (Pota *et al*., 1987) where the increase would be attributed to the conversion of starch and other insoluble carbohydrates into sugars. Significant changes were observed in total sugars by (Aruna *et al.*, 1998) during storage of cereal based papaya powder.

**Reducing sugars**

Sugars with reducing property are called reducing sugars. Estimation of reducing sugar is done to find out the starch material content. Gradual increase of about 0.32%, 0.32% and 1.61% during 30th, 60th and 90th day of storage in squash was observed. (Table-8). In fruit Jam, there was a gain of about 0.06% at 30th day, 0.16% at 60th day and 0.62% at 90th day (Table-9). In fruit Candy/leather, there was a gain of about 0.11% at 30th day, 0.59% at 60th day and 1.31% at 90th day (Table-10). Similar observation was found by Aruna *et al*., (1998) where there was an increase in reducing sugar content during storage of cereal based papaya powder. Changes in the values of reducing sugars were more due to the ambient temperature.

**Ascorbic Acid/Vitamin C**

Fruits and vegetables are important sources of ascorbic acid. The ascorbic acid content decreased during storage due to oxidation of ascorbic acid to dehydro ascorbic acid. Hence vitamin C estimation was carried out during the storage period. This is due to oxidation or exposure to atmosphere oxygen while preparing the jam and Fruit bar (Fennema, 1977). The Vitamin C loss was to the extent of 20%, 33% and 46% after 30th day, 60th day and 90th day respectively for squash (Table-8). In Fruit Jam, there was a loss of 15.7%, 26.31% and 52.61% after 30th day 60th day and 90th day respectively (Table-9). In Fruit Candy/leather here is loss of 19.04%, 38.09% and 61.9% after 30th day 60th day and 90th day respectively (Table-10). Temperature has a major effect on the rate of loss of ascorbic acid. Losses of ascorbic acid were increased with the increase in temperature (Johnson and Hessel, 1982). The ascorbic acid content decreased during storage (1.7 to 0.8). This may be due to oxidation of ascorbic acid to dehydro ascorbic acid. This was observed by Gupta, (2000) in the storage of sweet papaya chutney. The loss of vitamin C in the initial stages of preservation is because of the presence of oxygen in the headspace (Reimer and Karel, (1978).

**CONCLUSIONS**

The findings of this study show that the developed products of apple and apricot mixed squash, jam, and candy is of good quality and has maximum consumer acceptance. The jam and candy/leather developed from apricot alone has less consumer acceptance as compared to apricot apple mixed developed jam and candy. The shelf life study up to 90 days storage study shows therefore apricot apple and other fruit can be utilized and preserved in the form of squash, jam and candy. So that the farmers of Gilgit-Baltistan can get maximum benefits from fruits and can control the losses and wastages of fruits by using these wounded, fallen and diseased infected fruits for product development. The fruit processing preservation and value added product development trainings will help to control food security issue of Gilgit-Baltistan.

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