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RESEARCH PAPER

Development of apricot (*Prunus armeniaca* L.) powder and its food application

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Key Message: This study concludes that the development of apricot powder by different dehydration techniques is a feasible approach and can be used for other fruits and vegetables. These techniques can be useful in reducing malnutrition and post-harvest losses at large scale production.

Abstract: Apricot (*Prunus armeniaca* L.) is a delicious fruit grown in Pakistan. It is known as temperate gold in the northern areas of Pakistan. Apricot is rich in nutrients like vitamins, minerals, phytochemicals, antioxidants, carotenoids and xanthophylls but the fruit is highly perishable and has a short shelf life. This study was carried out to study the acceptability of apricot powder as a functional instant drink and to determine the effect of dehydration on the physicochemical properties of the apricot powder. Apricots were dried in a cabinet dryer to produce their powder that afterward was utilized in the formulation of a drink. The apricot powder was stored for 45 days with 0, 15, 30 and 45 days intervals for its shelf life study. The dehydrated apricots powder was subjected to different physical and chemical analysis e.g. moisture, ash, fiber, bulk density, rehydration capacity, organic acid, antioxidant activity and total phenolic compounds. The results revealed that the moisture content ranged from 3.38 to 7.35 and the bulk density of the powder was increased from 34.37 to 46.88 during the storage, while the rehydration capacity decreased from 4.38 to 3.98 and the ascorbic acid contents decreased from 6.52 to 2.02 mg/100g gradually from 0 to 45 days of storage. Total phenolic contents decreased from 109.91 to 64.53 mg/100g GAE (Gallic Acid Equivalent) and the antioxidant activity of the powder was also decreased from 65.83 to 28.54% during the storage of 45 days at ambient temperature. Sensory characteristics of apricot powder drink depicted acceptable scores for color, taste, flavor and mouthfeel attributes. This study concludes that the apricot powder with a long shelf life is quite suitable for the development of instant drink to harvest functional and nutraceutical benefits of apricot and to decrease economic losses.

Keywords: Apricot powder, Dehydration, Instant drink, Storage, Value addition

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Introduction

Apricot (*Prunus armeniaca* L.) is a delicious fruit, mainly cultivated in temperate regions of the world and also grown in the Northern Area of Pakistan and is liked for its high nutritional and aesthetic qualities, delicious taste and eye-catching appearance. It belongs to the family Rosaceae closely related to peaches, almonds, plums, and cherries and known as the King of dry fruits due to very high nutritional values, stunning fragrance, taste and flavor. In Pakistan, the annual production of apricot was 178,957 tons in 2018 which stands 6th in global apricot production (Food and Agriculture Organization [FAO], 2018). Pakistan has a negligible share in the country's export of apricot. Mostly fresh apricot is exported without putting it in any value addition. The production and marketing of dried apricot are on the decline in the country as it was exported 413 thousand tons in 2018 that is too low from the previous year. Hunza, Skardu and Chitral valley is the major apricot producing area in the Himalayan region of Pakistan. The share of Gilgit-Baltistan in the production of apricot is 67% of the total production of Pakistan (Government of Pakistan [GOP], 2016) and there are almost 60 varieties grown in the northern areas of Pakistan. Its varieties Habi, Alman, Shakanda, Halman, and Khakhas are famous in yield and quality. The environmental conditions are appropriate for the production of apricots, but its shelf life is too low (Mountain Fruit Company [MFC], 2005; Department of Agriculture [DOA], 2008). The nonexistence of sufficient storage and transportation facilities, export of fresh fruits is a great challenge for Pakistan (Naseer et al., 2019). Recently, the Belt and Road Initiative manifested an enormous prospect and opened the trade in European and Asian countries. Various factors are hampering the export of apricot and contributing in enhancing postharvest losses like cleaning, sub-standard packing, processing (mostly sun-drying), traditional techniques of harvesting, lack of awareness, etc. Resultantly, minor returns are fetched by the farmers and the situation is further aggravated in the absence of a proper marketing system and infrastructure (Naseer et al., 2019).

Apricot fruit is rich in nutrients much needed to human beings to maintain good health. It also contains some disease-fighting compounds. The beta-carotene and lycopene activity of apricot can preclude heart diseases. It is a good source of fiber which has the benefit of preventing a digestive disorder called diverticulosis. These fruits have ophthalmic, emetic, antiseptic, and antipyretic effects (Pramer & Kaushal, 1982). It is rich in nutrients such as minerals, vitamins like A, C, thiamine, riboflavin, antioxidants, phytochemicals and fiber. Apricots are low in calories as 50 calories per 100 g weight. Apricots also have phytochemicals that are beneficial against heart diseases and also decrease the concentration of low-density cholesterol (LDL). These fruits are a good source of bioactive components such as anthocyanins, carotenoids, and some antioxidant polyphenols (Vinson & Zubik, 2005; Hooshmand & Arjmandi, 2009).

Perishable life of apricot, minimum market opportunities and limited resources are the main reasons for the post-harvest losses of apricot during the offseason. Total post-harvest losses are almost 44% of the total fresh produce (FAO, 2018). Apricot fruit is consumed fresh as well as used to produce a lot of products like dried apricot, apricot powder, jam, jelly, marmalade, pulp, juice nectar, frozen apricot, and extrusion products. Apricot kernel is also used in the production of oil, perfume, cosmetics, and benzaldehyde (Yildiz, 1994).

Drying is a traditional and largely used technique of food processing that makes certain the extension of shelf life of materials by preventing mold growth (Fernandes & Rodrigues, 2011). The technique of minimally processed fruits and vegetables is also famous along with dehydration (Corato, 2019) and ethylene scavenging system during the packaging of fruits (Sadeghi et al., 2019). The main objective of drying agricultural products is to minimize the moisture content to a level that ensures safe storage for an extended time. Due to lower water activity ranging from 0.03 to 0.7, dehydrated foods are often a great choice of preservation (Chitrakar et al., 2019). Moreover, drying results in a considerable contraction in weight and volume, which in result minimize the cost of storage packaging and transportation (Okos et al., 1992).

Products obtained by common methods of sun-drying have many disadvantages such as high microbial load, dull color and brightness, high shrinkage and objectionable appearance (Krokida et al., 2000). Although sun-drying has some disadvantages, it is still being used due to the reason that it is cheap, environment-friendly, and storage stability due to minimum water activity (Basunia & Abe, 2001). Drying is commonly used by different industries to produce fruit powder (Sablani & Shrestha, 2008). Fruit powders are helpful to minimize the usage of bulk quantities of fruits in food processing and formulations, hence taste and nutrients of fruits are strengthened (Vinson & Zubik, 2005). The present research was designed to develop apricot powder with sun drying and oven dehydration technique, its comparison, storage stability, acceptability and utilization in an instant drink.

Materials and Methods

The proposed research was carried out at the Institute of Food and Nutritional Sciences (IFNS), PMAS-Arid Agriculture University, Rawalpindi during the year 2018-2019.

Procurement and preparation of raw material

Fresh and healthy Apricot fruit was procured from the farmers of Gilgit-Baltistan. The fruit was immediately shifted to the Postharvest Laboratory, IFNS, PMAS Arid Agriculture University Rawalpindi for further studies. The collected samples were washed and blanched followed by destoning and cutting into slices with a thickness of about 0.5 to 1.0 cm.

Treatment of apricots flesh

Before processing of the apricot slices, they were blanched and pre-treated with sodium metabisulfite solution (@ 2ppm) for 5-10 minutes to achieve an acceptable hygiene status.

Development of apricot powder

Apricot powder was obtained by two different methods i.e. sun drying and hot air drying by a dehydrator.

Sun drying

Chopped apricot fruits were placed in cleaned trays under good sunlight for five days until constant weight. Then dried fruits were ground and stored.

Hot air drying

The powder was obtained by drying of apricots slices at 58± 2 °C for 10-12 hours in a cabinet dryer until constant weight (to reach a moisture content value of 6-8% by following the method given by Kumar et al. (2006).

Physicochemical analysis of apricots powder

The dried apricot slices obtained after sun and cabinet drying subsequently ground to a fine powder and stored at ambient temperature for 6 weeks in a dark place after packing in plastic zip bags of 75 µm thickness for further analyses for different physicochemical parameters i.e. bulk density, rehydration capacity, moisture, ash, fiber content, organic acids, total phenolic content, antioxidant activity at 0, 15, 25, 35 and 45 days of storage intervals.

Bulk density

Bulk density of apricots powder was determined by adopting the method given by Subramanian & Viswanathan (2007). A circular steel container of known volume (1.482 x10^{-3} m^3) was filled with a sample of the powder and gently tapped. The excess powder was leveled off and the content was weighed. The bulk density was calculated as the ratio of the mass of contents to the volume of the container.

Rehydration capacity

Rehydration capacity was measured by the method of Luanda et al. (2009). Apricots powder was rehydrated in a beaker by immersing it in a water bath at room temperature (25 ± 1 ºC). The samples were obtained from the bath at different immersion intervals and weighed after blotted to remove the excess water. Rehydration was stopped after 6 hours. The dry matter of the rehydrated samples was estimated gravimetrically by the oven-drying method at 105 ± 3 ºC for 24 hours.

Total soluble solids (˚Brix)

The determination of total soluble solids (˚Brix) was done using a hand refractometer (Atago-Japan) as already prescribed in (Association of Official Analysis Chemists [AOAC], 1990) Method no. 983.17. Homogenous samples of drink were placed on the prism of a calibrated refractometer and direct readings (˚Brix) were noted on scales.

Titratable acidity

Determination of titratable acidity was done using the procedure of titration as already elaborated in the AOAC (1990) Method no. 942.15. The acidity of drink was determined by taking the sample with the total amount of 8mL from every individual sample and later distilled water used for its dilution in a beaker. Phenolphthalein was added (2-3 drops) as an indicator and the samples were titrated against the NaOH solution of 0.1N up to the pinkish light color endpoint.

$$\text{Titratable acidity (\%)} = \frac{0.1\ \text{N used} \times 0.64}{\text{The volume of sample used}}$$

pH value

The pH value of drink was determined by digital pH meter (HI 2211 HANNA-USA) as elaborated in AOAC (1990) Method no. 981.12.

Ascorbic acid (mg/100g)

The ascorbic acid in powder was evaluated by the method according to Hans (1992). Spectrophotometer (CE-2021, CECIL Instruments, England) was used to record the absorbance at 243 nm.

Total phenolic contents

The method of Folin-Ciocaltue reagent was used for determining the total phenolic substances as prescribed by Rekha et al. (2012). 2.5 ml distilled water was added to 0.5 g powder and Folin-Ciocaltue reagent added (1: 1) and it was incubated for three minutes at 25^{o}C temperature. 2ml of 20% of the sodium carbonate (99%, Sigma, England) was added in a tube and all the tubes were kept in the water bath at boiling point for about 1 minute. These tubes were later cooled with their level of absorbance and were noted at 650 nm using spectrophotometer by using the Gallic acid as a standard gradient curve.

Antioxidant activity (Free radical scavenging activity)

The method of DPPH with the free scavenging activity of radical was used for the determination of antioxidant activity with its slight modification as already described by Shah et al. (2015). 1 mL (0.5 mM) DPPH (99.9%, Sigma Aldrich, Germany) added into 2g fruit powder. Furthermore, 2 ml of the distilled water was added and kept for about 30 minutes at room temperature. Measurement of absorbance was done at 517 nm after every 1 minute and it continued for 3 minutes using a UV-Vis spectrophotometer (CE-2021, CECIL Instruments, England). The absorbance of control treatment with DPPH was recorded as well. The activity of antioxidant was determined as the percent change in absorbance compared to control for 3 minutes corresponds to percent DPPH scavenged:

$$\text{Antioxidant activity (\%)} = \frac{\text{Test sample absorbance} \times 100}{\text{Control absorbance}}$$

Preparation of apricots power drink

Apricots powder drink was prepared by adding 10g of the apricots powder in 100 mL of water with other ingredients i.e. sugar @15g, citric acid @ 5mg, CMC @0.5% and food-grade color and flavor at permissible limits. All the ingredients were mixed and filled in 250 mL bottles and pasteurized in a water tub. The bottles finally prepared were cooled to room temperature for sensory analysis.

Sensory evaluation

A nine-point Hedonic scale, 9 (excellent) to 1 (very poor) as defined by Meilgaard et al. (2007) was used for the sensory evaluation of prepared drinks in terms of color, flavor, taste, and overall acceptability. Written instructions were given to semi trained panelists recruited from the IFNS for the marks of practical drinks. Developed drinks were filled in the polystyrene cups marked with casual codes at room temperature to improve the accuracy.

Statistical analysis

The data obtained were analyzed by statistical tools using a completely randomized design (CRD) using the Minitab 18 statistical program and interpreted by Steel et al. (1997). All measurements were performed threefold and findings are stated as mean ± standard deviations. For the measurement of the level of consequence, statistical analysis was conducted using variance analysis (ANOVA).

Results and Discussion

Moisture contents

The mean values for moisture content in sun-drying apricot powder varied from 3.381 to 7.349 % during the storage interval of 45 days (Table 1). The moisture content increased gradually during the storage period of 45 days. Maximum moisture was observed at 45th day i.e. 7.349 and minimum moisture content was observed at zero-day i.e. 3.38%. Whereas in apricot powder obtained by cabinet dehydrator, the moisture content varied from 2.72 to 6.85%. Maximum moisture was found at 45th day i.e. 6.858 and minimum moisture content was noted at the start of the experiment (2.72%). It was observed that moisture content of apricot powder obtained by cabinet dehydrator method was lower than the traditional sun-drying method because of the advantages of proper hot air flow and controlled preserved atmosphere of dehydration and it can be recommended for the better drying results for the apricot powder. The results of the moisture content were similar to those presented by Luanda et al. (2009) in their experiments on dehydration of pineapple, mango, guava, acerola cherry and papaya.

Table 1 Mean values for moisture contents of apricot powder during storage

Storage days	Drying method		Means
	Sun drying	Oven drying	
0	3.381±0.05^{e}	2.723±0.04^{e}	3.055^{e}
15	4.561±0.04^{d}	3.751±0.06^{d}	4.156^{d}
25	5.709±0.14^{c}	4.788±0.19^{c}	5.259^{c}
35	6.722±0.05^{b}	5.827±0.06^{b}	6.224^{b}
45	7.349±0.09^{a}	6.887±0.10^{a}	7.143^{a}
Mean	5.544^{a}	4.783^{b}	

All the values are means of three replications; Values in a column not sharing letters are significantly different at $p<0.05$

Rehydration capacity

The rehydration capacity of the apricot powder obtained by the sun drying method was 4.186 during 45 days of storage interval (Table 2). There was a decreasing trend in rehydration capacity during storage. Rehydration capacity decreased from 4.38 to 3.98 during 45 days of storage interval. Maximum rehydration capacity was observed at zero-day i.e. 4.38 and the minimum was at 45 days i.e. 3.98. On the other hand, the mean values for the rehydration capacity of the apricot powder obtained by the hot air cabinet dehydrator method were 4.27 during 45 days of storage interval. Maximum rehydration capacity was observed at zero-day i.e. 4.48 and the minimum was at 45 days i.e. 4.07. These results were in harmony with the observations of Luanda et al. (2009) that show that there was a decreasing trend in the rehydration capacity of fruit powders during storage. It might be due to the increase in moisture content during storage.

Table 2 Mean values for rehydration capacity of apricot powder during storage

Storage days	Drying method		Means
	Sun drying	Oven drying	
0	4.384±0.05^{b}	4.68±0.014^{a}	4.432^{a}
15	4.294±0.029^{c}	4.79±0.036^{b}	4.337^{a}
25	4.187±0.026^{d}	4.78±0.032^{b}	4.238^{ab}
35	4.083±0.038^{f}	4.66±0.043^{bc}	4.127^{b}
45	3.982±0.067^{g}	4.77±0.075^{c}	4.028^{c}
Mean	4.188^{a}	4.76^{b}	

All the values are means of three replications; Values in a column not sharing letters are significantly different at $p<0.05$

Bulk density

It is clear from Table 3 that the mean values for bulk density of apricot powder obtained by sun-drying were 46.88 for 45 days interval of storage. Bulk density increased from 0 to 45 days of storage interval. The bulk density was increased from 34.37 to 46.88 during 45 days of storage period. Maximum bulk density was observed at 45 days and the minimum was at zero-day storage interval. Whereas the mean values for bulk density of apricot powder obtained by hot air cabinet dehydrator were 39.17 for 45 days interval of storage period. The bulk density was increased from 33.74 to 45.53 during 45 days of storage period. Maximum bulk density was observed at 45 days and the minimum was at zero-day storage interval. There was a difference between mean values of bulk density of apricot powders obtained by two different methods because of controlled hot airflow in hot air cabinet dehydrator while in sun-drying there are uncontrolled environmental effects. Results were similar with Joshi et al. (1993) in which he found the increasing effects of moisture contents on fruits powders bulk density.

Table 3 Mean values for bulk density (Kg/m^{3}) of apricot powder during storage

Storage days	Drying method		Means
	Sun drying	Oven drying	
0	6.52±0.14^{a}	10.22±0.12^{a}	8.37^{a}
15	4.49±0.03^{b}	9.51±0.05^{b}	7.03^{b}
25	3.40±0.07^{c}	8.33±0.06^{c}	5.86^{c}
35	2.93±0.03^{d}	7.57±0.03^{d}	5.23^{d}
45	2.02±0.08^{d}	6.63±0.057^{e}	4.32^{e}
Mean	3.87^{b}	8.46^{a}	

All the values are means of three replications; Values in a column not sharing letters are significantly different at $p<0.05$

Ascorbic acids (mg/100g)

Ascorbic acid decreased during storage of 45 days. Ascorbic acid values decrease from 6.52 to 2.02 mg/100g from 0 to 45 days of storage intervals (Table 4). It was observed that higher ascorbic acid was founded at zero-day and lowest at 45 days of storage. The ascorbic acid of the apricot powder obtained from the sun-drying method was 3.87 mg/100 gram during 45 days of storage period. While in the case of cabinet dehydrator dried apricot powder mean values for ascorbic acid was 8.44 mg/100g. Ascorbic acid decreased during the storage period of 45 days. It was observed that maximum ascorbic acid was founded at 0 days i.e. 10.22 and lowest at 45 days of storage i.e. 6.63 mg/100g. There was a significant difference between the mean values of ascorbic acids obtained by sun-drying and hot air cabinet dehydrator method. It was because in sun-drying there is direct exposure of apricot slices to sunlight which affects the levels of ascorbic acid in apricot. In a cabinet dehydrator, there is no exposure to direct sunlight. Hot air is used to dry the fruit. So, in the cabinet dehydrator, better results were obtained as compared to the sun drying method. These results are in harmony with the work of Mahendran (2010) whose studies show a decrease in ascorbic acid with storage of guava powder.

Table 4 Mean values for ascorbic acid (mg/100gm) of apricot powder during storage

Storage days	Drying method		Means
	Sun drying	Oven drying	
0	6.52±0.14[a]	10.22±0.12[a]	8.37[a]
15	4.49±0.03[b]	9.51±0.05[b]	7.03[b]
25	3.40±0.07[c]	8.33±0.06[c]	5.86[c]
35	2.93±0.03[d]	7.57±0.03[d]	5.23[d]
45	2.02±0.08[d]	6.63±0.057[e]	4.32[e]
Mean	3.87[b]	8.46[a]	

All the values are means of three replications; Values in a column not sharing letters are significantly different at $p<0.05$

Total phenolic contents (mg/100g GAE)

The total phenolic contents of the apricot powder obtained by the sun-drying method ranged from 64.53 to 109.91 mg/100g GAE during 45 days of storage. Total phenolic contents showed a decreasing trend during the storage interval. Total phenolic contents decreased from 109.91-64.53 in apricot powder during 45 days of storage (Table 5). The maximum decrease in total phenolic contents was observed at last days of storage that was 64.53 (mg/100g GAE) and higher value was observed at 45 days that was 109.91 (mg/100g GAE). On the other hand, the mean values for total phenolic contents of the apricot powder obtained by hot air cabinet dehydrator method varied between 143.25 to 158.75 (mg/100g GAE) during 45 days of storage period. Similarly, there was a decreasing trend during storage intervals of 45 days but the maximum value observed at zero day was 158.75 (mg/100g GAE) and the minimum was 143.25 (mg/100g GAE) on the 45th day. This decrease during storage might be due to the increase in moisture during storage. There was a significant difference between the mean values of total phenolic contents of the apricot powder obtained by sun-drying and hot air cabinet dehydrator methods. Similar results were founded by Brenes et al. (2003) who estimated a decrease in total phenolic contents during the storage of fruit powders. It was because in sun-drying there is an exposure of apricot slices to sunlight which affects the levels of total phenolic contents of apricot. In a cabinet dehydrator, there is no exposure to direct sunlight. Hot air is used to dry the fruit. So in the cabinet dehydrator, better results were obtained as compared to the sun drying method, which is also in conformity to Olga et al. (2019) who reported while working on dehydration of fig fruit.

Table 5 Mean values for total phenolic contents (mg/100g GAE) of apricot powder during storage

Storage days	Drying method		Means
	Sun drying	Oven drying	
0	109.91±0.67[f]	158.75±0.59[a]	134.33[a]
15	101.33±0.11[g]	156.80±0.13[b]	129.06[b]
25	89.57±0.37[h]	154.05±0.29[c]	121.81[c]
35	68.38± 0.16[i]	151.75±0.13[d]	110.07[d]
45	64.53±0.11[j]	143.25±0.09[e]	103.89[e]
Mean	86.74[b]	152.92[a]	

All the values are means of three replications; Values in a column not sharing letters are significantly different at $p<0.05$

Antioxidants activity (%)

The mean values for antioxidants in apricot powder obtained by the sun-drying method decreased from 65.83 to 28.54% during 45 days of storage (Table 6). Antioxidants decreased from 28.54 to 65.83% during 45 days of storage. Higher antioxidants were founded at zero-day and minimum were founded at 45 days of storage. At the start of the experiment, the highest value i.e. 65.83% while the lowest was observed at the termination of the experiment i.e. 28.54%. Whereas, antioxidants in apricot powder obtained by the sun-drying method varied from 64.66 to 89.17% during 45 days of storage. A significant difference was observed between the mean values for antioxidants of the apricot powder obtained by two different methods. Hot air cabinet dehydrator was found to be more satisfactory than sun-drying because of controlled hot air flow, proper hygiene conditions and less exposure to direct sunlight, antioxidants were found comparatively much better than sun drying. Results were found in close agreement to the studies of Pardo et al. (2011); Olga et al. (2019) who observed changes in antioxidant activity of fruits during exposure to high temperature. Michalczyk and Macura (2010) determined DPPH radical-scavenging activity of serviceberry fruit and found a slight decrease in the antioxidant activity of stored fruits.

Table 6 Mean values for antioxidants activity (%) of apricot powder during storage

Storage days	Drying method		Means
	Sun drying	Oven drying	
0	65.83±2.87^{e}	89.17±3.67^{a}	77.50^{a}
15	54.22±1.23^{g}	76.86±1.81^{b}	65.54^{b}
25	46.82±1.21^{h}	70.11±1.06^{c}	58.47c
35	32.37±1.29^{i}	66.88±1.13^{d}	49.62^{d}
45	28.54±0.56^{j}	64.66±0.47^{f}	46.60^{e}
Mean	45.57^{b}	73.53^{a}	

All the values are means of three replications; Values in a column not sharing letters are significantly different at $p<0.05$

Sensory evaluation

A panel of judges evaluated apricot powder drink for the color, flavor, taste, appearance and overall acceptability as presented in Fig 1. The results for sensory evaluation of apricots powder drink during storage of 45 days have been given below. The color of the apricot powder drink was affected significantly due to variation in storage intervals. The data revealed that the mean scores of color decreased from 8.33 to 5.66 in 45 days. The significantly lowest scores for color were observed on the 45th day i.e. 5.66 and significantly highest scores for color were observed on zero-day i.e. 8.33. The results showed a considerable change in color of apricot powder drink samples during the storage period. During storage at ambient temperature, there might be the effect of storage conditions on the color of the apricot powder drink. The change in color during storage can be correlated to change in phenolic content about which several studies are available in literature. Similar results were reported by Klaibera et al. (2005) who observed the change of fruit color in their study.

The mean scores for the taste of apricot powder drink in all the storage intervals during 45 days have been depicted in Fig.1. There was a significant difference between storage time and scores for taste. The scores of the average taste of apricot powder declined from 8.66 to 5.33 during storage of 45 days. The maximum scores were observed at zero-day i.e. 8.66 and the minimum was at 45th day i.e. 5.33. The change in taste would be due to the increase in titratable acidity and decrease in pH of drink. Results obtained were in harmony with the work of Ozbas et al. (2014) who studied the change in taste of fiber rich fruits powders during storage. The mean scores for flavor were ranged from 5.66 to 8.66 during storage of 45 days. The highest flavor scores observed at zero-day to be 8.66 and the lowest was at 45th day i.e. 5.66. The decrease in flavor scores might be due to a decrease in pH of apricot powder drink and storage conditions. These scores for flavor were similar to Ashraf et al. (2018) who studied storage for peach samples. Wang et al. (2017) also reported a similar trend while studying the storage changes in the flavor of sun-dried raisin.

The mean scores for the mouthfeel for apricot powder drink varied from 5.33 to 8.66 during the storage interval of 45 days. The mouthfeel scores were decreased from 8.66 at zero-day of storage to 5.33 at 45 days of storage. This indicates that apricot powder drinks showed a decreasing trend in scores of mouthfeels. These results for mouth feel were similar to the study of Ashraf et al. (2018), who observed the mouthfeel of peach samples. As regarding the overall acceptability of apricots powder, results revealed that the storage intervals differed significantly. The mean scores for the overall acceptability of apricot powder drink have been shown in Fig. 1. The data indicates that the overall acceptability scores ranged from 5.66-8.33 among different storage periods. The significantly highest scores for overall acceptability were exhibited at the start of the experiment (8.33 and significantly lowest scores for overall acceptability was found at the termination of the experiment (5.66). During storage at ambient temperature, there would be the effects of storage conditions and temperature on the overall acceptability of apricot powder. A variable trend was observed throughout the storage period. Similar results were founded by Sudha et al. (2007) who worked on the acceptability of guava powder products.

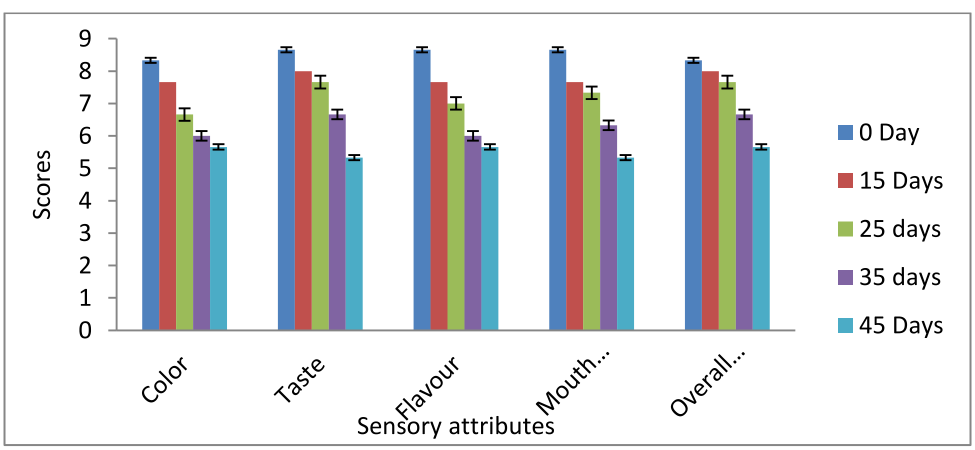

Fig. 1 Sensory scores for apricot powder drink during storage of 45 days

Conclusion

Drying is a useful food processing technique which can be used for the extension of the shelf life of fruits, decreasing their weight and volume to minimize the cost of storage, packaging and transportation. The results manifested that a hot air cabinet dehydration method of apricot is a feasible approach as compared to sun drying to preserve the nutrients and maintain its quality during storage because of controlled hot air flow, proper hygiene conditions and less exposure to direct sunlight. It was observed that moisture content of apricot powder obtained by cabinet dehydrator method was lower than the traditional sun-drying method because of the advantages of proper hot air flow and controlled preserved atmosphere of dehydration and it can be recommended for the better drying results for the apricot powder. The ascorbic acid, phenolics and antioxidants were found comparatively higher in apricots power dehydrated by cabinet dryer than sun drying, and a similar trend was noted during storage at different intervals. The acceptability study manifested a considerable change in color, taste, flavor, mouthfeel and overall acceptability of apricot powder samples during the storage period. Hence, it can be concluded that apricot fruit has the potential to be used in the development of value-added products like apricot powder instant drink to make its availability throughout the year and reduce economic losses during harvesting.

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Conflict of Interest: The authors have no conflict of interest for the study entitled "Development of Apricot (*Prunus armeniaca* L.) Powder and its Food Application".

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