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Research Article

Dehydration of Apricot Under Different Preservation Techniques

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Abstract

Objective: The present study was carried out to investigate the effect of three different preservation techniques and identify the technique which will be better out of these three, to preserve long time, is good in taste and has a good appearance of dehydrated apricot.

Methods: The fresh apricot washed and kernel removed and kept in trays i.e. (1) without soaked in sugar and preservative solution. (2) soaked in 50% sugar solution and preservative for 20 minutes (3) soaked in 50% sugar solution and preservative for 4 hours. After the pretreatment all the three type samples of apricot put in electric dehydrator at 65 centigrade temperatures, after drying analyzed.

Results: The chemical composition showed that the fresh apricots contained moisture 83.3%, ash 0.74%, crude fat 0.04%, crude protein 0.9%, crude fiber 1.05% and carbohydrates 13.97%. The properties of components all three preservative techniques i.e. without soaking in sugar and preservative solution, soaking in 50% sugar solution and preservative for 20 minutes and soaking in 50% sugar solution and preservative for 4 hours substantially decreased which include moisture content (14.61%, 14.52% and 14.43%), crude fat content (1.97%, 1.86 and 1.75%) and crude protein (0.98%, 0.93% and 0.90%) and crude fiber (2.96%, 2.52% and 2.49%) respectively. Proportions of other components were increased, which include ash (3.25%, 3.31 and 3.35%), and carbohydrates (76.23%, 76.88 and 76.97%).

Conclusion: The panel of judges of organoleptic evaluation accepted all the three dehydrated apricot, dehydrated using three different preservation techniques. However highest scores for taste and color given to apricot soaked in solution for 4 hours and secondly socked for 20 minutes. The apricot without preservative and without solution soaked has lowest scores for color and taste as compared to solution socked apricot. Over all the panel of judges accepted all three apricots dehydrated using different preservation techniques for color, taste and overall acceptability.

Keywords: *Apricot; Dehydration; Preservative Techniques; Soaking; Taste*

Introduction

Apricot (*Prunus armeniaca* L.) is one of the most important, attractive, delicious, highly nutritious and major fruit of Gilgit-Baltistan. The fruit tree grows from plain to altitude of 3000 meters. The fruit is having a distinct pleasant aroma and is used for preparing many products including jam, juice and nectars. The dried fruit is available in the market round the year, while the fresh fruit comes in the market by the end of May to September [1]. Due to lack of processing, preservation, testing, transportation, communication and research large amount of fruits and vegetables are wasted and do not reach in distant markets because of their perishability [2]. To overcome the food security issues of Gilgit-Baltistan and to cope the tremendously increasing demand of food locally without bringing more land under cultivation. Dehydration, processing and preservation of fruits through trainings to farming community are milestone [3,4]. Gilgit-Baltistan (GB) is the most important part of the country extends over an area of 27188 sq 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 insecurity as cultivated lands are less than one kanal per capita [5,6]. The people of GB totally depend on wheat supplied through Government on subsidized rates form Punjab [7,8]. The present work was thus under taken to evaluate the chemical and organoleptic characteristics of dehydrated apricot and to compare their quality on the basis of nutritional significance under different drying methods used in Gilgit-Baltistan [9,10].

Materials and Methods

Fresh apricot (habi variety) purchased from Astore valley of Gilgit-Baltistan selected for the study. The fruit packed in 10kg perforated plastic trays and transported in cold storage truck to FBRC (Food and Biotechnology center) PCSIR Laboratories Lahore piolet plant. Apricot washed with tap water, solution prepared dissolving 500-gram sugar and 2-gram potassium metabisulphite in 1 litter tap water [11,12]. Three different techniques used for this study are discussed below.

Technique 1: (Without soaking in sugar and preservative solution)

Figure 1

In technique one the apricot simply washed and cut with knife and removed kernel and kept in trays and put the perforated stainless steel trays in electric dehydrator at 85°C. checked the apricot after one-hour interval and after 6 hours the sample removed from electric dehydrator and put in table under selling fan for 30 minutes to lower down the temperature of over removed apricot and then packed in polyethylene bags and sealed with proper tags for further physicochemical and organoleptic evaluation.

Technique 2: (Socked in 50% sugar solution and preservative for 20 minutes)

Figure 2

In technique two first of all sugar solution developed by dissolving two kg sugar in two-liter water and add 4-gram preservative (potassium metabisulphite $K_2O_5S_2$). Then the apricot fruit washed and kernel removed and put the de-pitted apricot in solution. The apricot keep socked for twenty minutes and after twenty minutes put the socked apricot in trays and put the perforated stainless steel trays in electric dehydrator at 85°C. checked the apricot after one-hour interval and after 9 hours the sample removed from electric dehydrator and put in table under selling fan for 30 minutes after ambient temperature the apricot packed in polyethylene bags and sealed with proper tags for further physicochemical and organoleptic evaluation.

Technique 3: (Socked in 50% sugar solution with preservative for 4 hours)

Figure 3

In this technique solution developed by dissolving two kg sugar in two-liter water and add 4-gram preservative (potassium metabisulphite $K_2O_5S_2$). Then the apricot fruit washed and kernel removed and put the de-pitted apricot in solution. The apricot keep socked for twenty minutes and after twenty minutes put the socked apricot in trays and put the perforated stainless steel trays in electric dehydrator at 85°C. checked the apricot after one-hour interval and after 12 hours the sample removed from electric dehydrator and put in table under selling fan for 30 minutes and were packed in polyethylene bags and sealed with proper tags for further physicochemical and organoleptic evaluation [2,16]. Proximate chemical composition of fresh habi variety of apricot a store determined i.e. total moisture, ash content, fat content, fiber and carbohydrates. The test performed according to the AOAC official methods 2012. Total protein content was estimated by Kjeldahl method; Carbohydrates were determined by difference method [17,21] (Table 1-3).

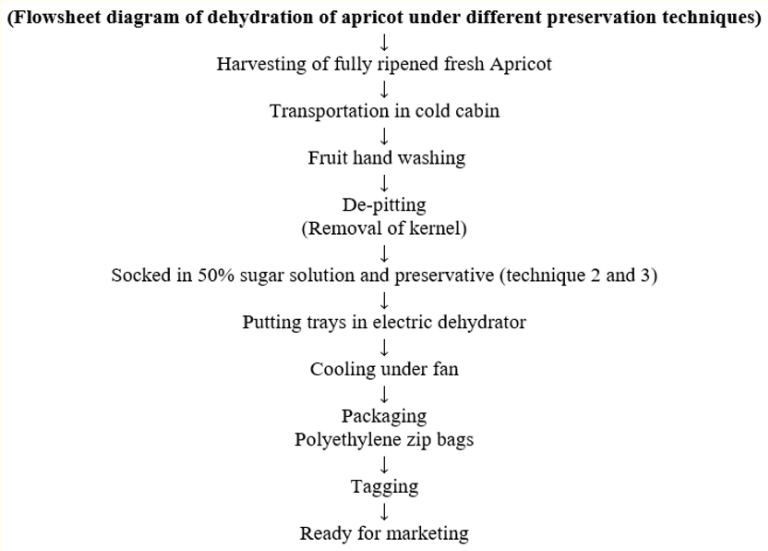

Figure 4

S #	Parameter	Result
1	Total moisture	82.8
2	Total ash content	0.76
3	Carbohydrate	14.43
4	Crude Protein	0.88
5	Crude Fat	0.05
6	Fiber	1.08
7	Energy k cal	58.08

Table 1: *Chemical analysis and nutritional value of fresh apricot habi (g/100g).*

Treatments	Total Moisture	Total Ash Content	Carbohydrate	Crude Protein	Crude Fat	Fiber	Energy k Cal
T0	14.61 ± 0.09a	3.25 ± 0.07c	76.23 ± 0.15c	0.98 ± 0.01a	1.97 ± 0.07a	2.96 ± 0.08a	307.51 ± 0.19c
T1	14.52 ± 0.10b	3.31 ± 0.04b	76.88 ± 0.17b	0.93 ± 0.03b	1.86 ± 0.05b	2.52 ± 0.01b	308.76 ± 0.17a
T2	14.43 ± 0.07c	3.35 ± 0.03a	76.97 ± 0.11a	0.9 ± 0.02c	1.75 ± 0.02c	2.49 ± 0.04c	307.98 ± 0.14b

Table 2: *Chemical analysis and nutritional value of dehydrated apricot habi (g/100g) under different preservation techniques.*

Values with different letters in the same column (a-c) are significantly different (P < 0.05) from each other. T0: without soaking and preservative, T1: Soaked in 5% Sugar and preservative for 20 minutes T2: Socked in 50% sugar solution and preservative for 4 hours.

Sensory evaluation of apricots dehydrated under different preservation techniques

The apricots dehydrated using different preservation techniques are sensory evaluated for color, appearance, taste, texture, and overall acceptability using nine-point hedonic scale, the larmond [22,26] described method used for sensory evaluation. The Food and Biotechnology research center experienced scientist selected for evaluation panel they have ability to discriminate dry fruit attributes. The objectives of techniques briefed the panel during an orientation session. All the three samples were provided to the members for sensory analysis. Prescribed questionnaires were provided to the panel members to note the attributes of products. Lamard hedonic scale of nine points contained on the Proforma i.e. 1=Disliked extremely, 2=Disliked very much; 3=Disliked moderately; 4=Disliked slightly; 5=Neither liked nor disliked; 6=Liked slightly; 7=Liked moderately; 8=Liked very much; 9=Liked extremely. The members of the panel expectorated the dry apricots and rinsed mouth between the samples using distiller. The evaluation done twice and mean values were taken [27].

Statistical analysis

Data obtained in the study were represented as mean value ± standard deviation (SD). Completely Randomized Design (CRD) was used with One-Way ANOVA at a significance level of $P < 0.05$, significant differences between mean values were performed by LSD pair-wise comparison test. Statistical analyses were determined by using Statistix 9.0 software (Analytical Software, Tallahassee, FL, USA).

Results

Proximate chemical composition of fresh apricot and dehydrated apricot habi analyzed. The fresh apricot habi variety has highest total moisture content i.e. (82.2%), followed by the without soaking in sugar and preservative solution dehydrated apricot sample (14.61%) followed by socked in 50% sugar and preservative solution for 20 minutes (14.52%) 4 hours dehydrated apricot was found to be (16.3%) followed by the socked in sugar and preservative solution for 20 minutes dehydrated apricot was found to be (15.1%) whereas, the socked in 50% sugar and preservative solution for 4 hours has lowest values (14.43%) was recorded and the results are highly significant ($p < 0.01$) among the different techniques. The crude fat highest (%) determined in without soaking in sugar and preservative solution dehydrated apricot i.e. (1.97%) followed by socked in sugar and preservative solution for 20 minutes dehydrated apricot (1.86%) followed by socked in sugar and preservative solution for 4 hours dehydrated apricot (1.75%). The lowest value of crude fat (%) in habi apricot (0.05%) was determined in fresh habi apricot and the results were highly significant. The highest total ash content (3.35%) was determined in technique 3 (socked in 50% sugar and preservative solution for 4 hours), followed by socked in 50% sugar and preservative solution for 20 minutes dehydrated apricot (3.31%), followed by without socking in sugar and preservative solution dehydrated apricot (3.25%). whereas the lowest (0.76%) total ash content determined in the fresh apricot which were significantly different from each other. The highest (%) of total protein was determined in without soaking in sugar and preservative solution dehydrated apricot i.e. (0.98%) followed by socked in sugar and preservative solution for 20 minutes dehydrated apricot (0.93%). followed by socked in sugar and preservative solution for 4 hours dehydrated apricot (0.90%). The lowest value of total (%) of apricot (0.88%) was recorded in fresh apricot samples and the results

were highly significant. The highest (%) of fiber was observed in without soaking in sugar and preservative solution dehydrated apricot i.e. (2.96%) followed by socked in 50% sugar and preservative solution for 20 minutes dehydrated apricot (2.52%). followed by socked in 50% sugar and preservative solution for 4 hours dehydrated apricot (2.49%). The lowest value of (%) fiber of apricot (1.08%) was recorded in fresh apricot habi and the results were highly significant.

The results show that the highest mean values (76.97%) carbohydrate was determined in socked in 50% sugar and preservative solution for 4 hours dehydrated apricot, while in the socked in 50% sugar and preservative solution for 20 minutes dehydrated apricot ranked 2nd which was observed (76.88%), while without soaking in sugar and preservative solution dehydrated apricot ranked 3rd which was observed (76.23%), whereas the lowest mean values (14.43%) analyzed in fresh apricot habi.

Treatments	Appearance	Color	Texture	Taste	Overall Acceptability
T0	7.9 ± 0.07c	8.0 ± 0.05c	7.9 ± 0.05c	8.7 ± 0.02a	7.6 ± 0.04c
T1	8.7 ± 0.09b	8.5 ± 0.04b	8.8 ± 0.07b	8.5 ± 0.03b	8.7 ± 0.06b
T2	8.9 ± 0.06a	8.7 ± 0.03a	9.0 ± 0.01a	8.6 ± 0.04c	8.8 ± 0.03a

Table 3: *The average acceptability ratings for samples of dried apricots.*

Values with different letters in the same column (a-c) are significantly different (P < 0.05) from each other. T0: without soaking and preservative, T1: Soaked in 5% Sugar and preservative for 20 minutes T2: Socked in 50% sugar solution and preservative for 4 hours.

Discussion

The high level of total moisture in apricot habi fruit makes it more attractive for fresh eating and maintaining body water requirement. The elevated total moisture also makes it more perishable and tends to promote microbiological contamination and chemical degradation. The dehydration of fruit increases the shelf life and also less chances of microbial attack and chemical degradation.

The results obtain from dehydrated sample was statistically different as compared to fresh samples (Values with different letters in the same column (a-c) are significantly different (P < 0.05) from each other). We come to know through this analysis that apricot habi has an abundant amount of moisture (82.8%). Food processing industry and for analysis of food items %moisture greatly effecting parameter. Given that bacteria that cause spoiling flourish in foods with high moisture content and are also indicative of low total solids, the observed value suggests that cauliflower may have a limited shelf life. The report [29] in which a high moisture value for fruits like white mulberry (82.50%) and black mulberry (78.03%) was reported, is compatible with the high moisture content of apricots.

In this study, fresh apricot fruit had a low carbohydrate content (14.03%), but it was higher than that of the closely related mulberry fruit (13.83%). Similarly, the amount of protein in an apricot (0.88%) is modest and comparable to the amounts of protein found in other fruits, such as "mulberry" (1.73%), according to studies. Apricot fat (%) is lower (0.03%) than kale fat (0.26%) [30]. Individuals can utilize fresh and dried apricot fruit as part of a low-calorie diet to lose weight because it has a low fat content (%). Fresh apricots have a lesser percentage of fiber (1.08%) than certain other fruits, like "mulberries," which had 11.1%. By eliminating potential carcinogens from the body and preventing the body from absorbing too much cholesterol, fiber helps to cleanse the digestive system. Additionally, fiber gives food bulk and deters overindulgence in starchy foods, which may protect against metabolic disorders including hypercholesterolemia and diabetes mellitus. Additionally, fiber can support healthy blood sugar management [31,32]. Due to the reduction of moisture, apricot samples that were moved to electric dehydrator exhibited higher proximate analysis values.

Organoleptic evaluation of dehydrated apricot under different preservation techniques

Organoleptic evaluations were performed on samples of dried apricots that had been preserved without soaking sugar solution and preservative, socked in 50% sugar solution and preservative for 20 minutes, and socked in 50% sugar solution and preservative for 4 hours.

On a nine-point hedonic scale, the samples were scored numerically to determine their grade. The results of organoleptic evaluation were reported in table 3. During the organoleptic evaluation the highest scores were given to the apricot socked with preservative and sugar solution for 4 hours for appearance and overall acceptability followed by socked with preservative and sugar solution for 20 minutes. While slightly reduction in the mean score for appearance and overall acceptability of the apricot without socking and preservative have as compared to the other two. The taste texture and color scores also given highest for apricot socked with preservative and sugar solution for 4 hours followed by apricot socked with preservative and sugar solution for 20 minutes. While slightly reduction in the mean score for apricot dehydrated without preservative and soaking in sugar solution. However, the panel accepted all the three type dehydrated apricots that were dried by three different techniques. There was a clear difference shown in mean scores of taste, texture, color, appearance and overall acceptability of apricot dehydrated by different techniques. The apricot dehydrated without soaking in sugar solution and without preservative has a less attractive color, appearance and overall acceptability as compared to the apricot socked in 50% sugar solution and preservative for 20 minutes and 4houre. Although the panel accepted all the three type dehydrated apricots that was dried by three different preservation techniques.

The highest color, taste, appearance and texture is due to more time exposing to socked sugar and preservative solution. Chemical preservative potassium metabisulphite have active ingredient Sulphur (SO_2) along its preservative effect also have bleaching of color effect the color of apricot looks attractive due to bleaching effect. The socking in 50% sugar solution adds sugar to apricot that shows the increase in taste and also high scores in carbohydrates. The slightly increase in ash content also due to addition of sugar during socking. The slightly difference and fewer score in sensory evaluation in color taste, texture and overall acceptability in preservation technique 1 (without socking in sugar solution and preservative) dehydrated apricot non bleach of color and non-addition of sugar in dehydration [29]. However, the apricot dehydrated by socking in sugar and preservative solution for 20 minutes and 4 hours was liked very much by the panel of judges and apricot dehydrated without preservative and sugar solution was declared acceptable.

Conclusion

The results of this study demonstrate that dehydration of apricot fruit under different preservation techniques i.e. without socked in sugar solution and preservative, socked in 50% sugar solution and preservative for 20 minutes and socked in 50% sugar solution and preservative for 4 hours are successful in maintaining the fruit's chemical makeup and preventing deterioration by lowering moisture [33]. The all three preservation techniques are examined, and the organoleptic properties of without socking and preservative, have a little less favorable for color, texture, taste than socked in 50% sugar solution and preservative for 20 minutes and socked in 50% sugar solution and preservative for 4 hours. Therefor the techniques socked with preservative and 50%sugar solution for 20 minutes and socked with preservative and sugar solution for 4 hours are well-suited in terms of color, texture, appearance, and general appeal. When compared to dehydrated apricot with without socking and preservative technique the fruits dried using electric dryer were more hygienically acceptable.

However, the apricot habi dehydrated after treated with three different techniques without socking and preservative, socked with preservative and 50% sugar solution for 20 minutes and socked with preservative and 50% sugar solution for 4 hours were declared acceptable by the panel of judges for color, taste and overall acceptability.

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Institutional Review Board Statement

This study was approved by the institutional review board (IRB) of PCSIR Lahore and the protocols used in this study were approved by the committee.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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