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Effect of different treatments on quality and sensory attributes of osmo-dehydrated wild apricot

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ABSTRACT

The fruit of wild apricot have very short life and usually goes waste. Hence, studies were conducted with the objective to develop value-added product and assess the quality parameters of osmo-dried wild apricots. The blanched and lye dipped fruits of wild apricot were dipped in sugar syrup of concentration 50 and 70°Brix for 24 h prior to mechanical dehydration. After drying, the fruits were packed in polyethylene pouches and stored at ambient conditions for six months to observe the effect of storage on quality and shelf-life. In case of osmo-dehydrated apricot, the maximum total sugars content (31.77%) and ascorbic acid content (10.66 mg/100 g) were observed in T_6 (lye dipped + 70°Brix syrup), respectively. Sensory evaluation of osmo-dehydrated wild apricot revealed that T_6 (lye dipped + 70°Brix syrup) treatment recorded the highest score for overall acceptability.

Key words: Apricot, osmo-dehydrated, quality attributes, browning, lye peeling.

INTRODUCTION

Apricot is an important stone fruit, which plays an significant role in the economy of the hilly areas of the country. Several varieties having big sized fruits are grown in the temperate regions as they get congenial environmental conditions including optimum chilling hours for the healthy development of the plant and the fruits. In addition to cultivated apricot, the fruits of wild apricot (c*huli*) are quite common in the hills of northern India. The fruits are said to possess medicinal properties such as anti-diarrhea, antisyretic, emetic and allowing thirst. However, the fruits are not put to any profitable use and mostly go waste (Chauhan, 1).

In general, apricot fruit has limited storage life under ambient conditions. Its shelf-life even under low temperature storage condition (0°C) and high relative humidity (90-95%) is only about two to four weeks. Unless handled properly, the fruit is rendered unfit for marketing within short span of four to five days after harvesting. Owing to the perishable nature of the fruit, limited storage life, inadequate transport facility, non-availability of adequate storage space and the production of fruit in plenty during peak season, have resulted into a limited trade of the fresh fruits in the region and thus the orchardists get unsatisfactory income from their produce. Therefore, for best use of apricot fruits at right time with increased income to the orchardists, preservation provides most useful alternative.

For its biochemical structure, apricot is considered a fruit very suitable for drying. Its features such as high content of provitamin A, vitamin C as well as complex of other vitamins makes it beneficial to human beings. The complex of mineral matter in apricot fruits-especially high contents of potassium, phosphorous, magnesium and iron improves blood count, blood circulation and regulates blood pressure in humans (Sharma *et al.*, 2). Conventional drying technologies featuring convective drying as the sole technological drying operation, yield dried apricots of unsatisfactory quality. Using combined drying technology with osmotic drying as one of the fundamental technological operations, rectifies this problem (Riva *et al*., 3). The present studies were, therefore, undertaken to investigate the effect of different treatments on dehydration of wildly grown apricot cultivars.

MATERIALS AND METHODS

Fruits of wild cultivar of apricot (*chuli*) were purchased from the orchardists located in the vicinity of Udhampur district. Only firm, fully mature, medium sized fruits, free from blemishes were selected for the study. Over ripe apricots were sorted out manually and rejected. The fruits were then washed thoroughly in running tap water before giving different pre-drying treatments. The treatments were: water blanching (T_1), water blanching + 50°Brix syrup (T_2), water blanching + 70°Brix syrup (T_3), lye dipping (T_4), lye dipping + 50°Brix syrup (T_5), lye dipping + 70°Brix syrup (T_6) and control (T_7).

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One lot was kept as control. Second lot was blanched in hot water for three minutes, third lot was lye peeled in 1.0 per cent boiling lye for 30 sec followed by immediate cooling under running water and removing of residual lye. Residual lye was neutralized further by dipping the peeled apricots in 1.0 per cent citric acid for two minutes. Two lots each from both blanched and lye dipped treatments were taken further for osmo air-drying. The sugar syrups of concentration 50° and 70°Brix were prepared by hot method, cooled to room temperature and after cooling 0.4 per cent KMS was added. After adding KMS, fruits were steeped for 24 h in both syrups as per the treatments. The steeped fruits were drained and rinsed in water to remove adhering sugar syrup from the surface.

Then all the pre-treated and control lots were spread on trays (tray load 2.0 kg/sq m) for drying in a dehydrator at a temperature of 50 ± 2°C. Drying was completed and the final product was packed in 300 gauge polyethylene pouches and stored under ambient conditions for further studies. Dehydrated samples were drawn periodically for their physico-chemical and organoleptic analysis during six months of storage at an interval of two months. The stored samples were evaluated for titratable acidity by the method of AOAC (4). The ascorbic acid was determined by using 2, 6 dichlorophenol indophenol titration method (AOAC, 4). Reducing sugars, total sugars, rehydration ratio and browning were determined by the method described by Ranganna (5). Water activity was recorded by Aqualab water activity meter (Model series 3TE) and the readings were corrected at 20°C (AOAC, 4).

The samples were evaluated for overall acceptability by semi-trained panel of 7-8 judges by using 9 point hedonic scale assigning scores (9- like extremely to 1- dislike extremely). A score of 5.5 and above was considered acceptable (Amerine *et al.*, 6). The results obtained were statistically analyzed using Factorial Completely Randomized Design (CRD) for interpretation of results through analysis of variance.

RESULTS AND DISCUSSION

The maximum rehydration ratio were recorded in T_4 (lye dipping), while the lowest were recorded in T_6 (lye dipping + 70°B syrup) at zero month storage (Table 1). However, after six months of storage the highest rehydration ratio were noticed in treatment T_4 (lye dipping) and lowest in T_6 (lye dipping + 70°B syrup). The lower rehydration ratio in treatment T_6 (lye dipping + 70°B syrup) might be due to low hygroscopicity of osmotically dried products (Chauhan, 1). However, the blanched samples rehydrated better than unblanched samples, which may be attributed to the increased permeability as a result of blanching (Banga and Bawa, 7). With the advancement of storage period, the rehydration ratio increased. The loss of moisture during storage might be one of the reasons for increase in rehydration ratio of dried apricot fruits. These findings are in conformity with the findings of Chauhan (1).

Water activity showed a decreasing trend during storage period. T_7 (control) recorded the maximum (0.68) water activity, however the minimum water activity content of 0.61 for wild apricot were noticed in T_6 (lye dipping + 70°B syrup) at the beginning of the storage period (Table 1). After six months of storage a highest water activity content of 0.65 was recorded by T_7 (control), whereas, a minimum water activity (0.59) was observed in treatment T_6 (lye dipping +

Table 1. Effect of treatments and storage period on rehydration ratio and water activity (a_w) of osmo-dehydrated wild apricot.

Treatment	Rehydration ratio Storage period (months)					Water activity Storage period (months)				
	0	2	4	6	Mean	0	2	4	6	Mean
Water blanching (T_1)	4.33	4.63	4.92	5.22	4.78	0.67	0.66	0.65	0.64	0.66
Water blanching + 50°B syrup (T_2)	3.90	4.20	4.49	4.79	4.35	0.64	0.63	0.62	0.61	0.63
Water blanching + 70°B syrup (T_3)	3.50	3.70	3.85	3.97	3.76	0.63	0.62	0.61	0.61	0.62
Lye dipping (T_4)	4.40	4.80	5.20	5.49	4.97	0.65	0.64	0.63	0.62	0.64
Lye dipping + 50°B syrup (T_5)	3.26	3.41	3.62	3.70	3.50	0.62	0.61	0.60	0.60	0.61
Lye dipping + 70°B syrup (T_6)	3.20	3.33	3.44	3.56	3.38	0.61	0.60	0.60	0.59	0.60
Control (T_7)	4.10	4.39	4.68	4.99	4.54	0.68	0.67	0.66	0.65	0.67
Mean	3.81	4.07	4.31	4.53		0.64	0.63	0.62	0.62	
Treatment			0.05						0.01	
Storage			0.04						0.01	
Treatment × storage			NS						NS	

70°B syrup). Similar findings have been reported by Rodrigues *et al*. (8) in osmo-dehydrated papaya.

At the beginning of storage period, the highest titratable acidity was recorded by treatment T_7 (control), whereas T_6 (lye dipping + 70°B syrup) recorded the lowest titratable acidity (Table 2). After six months of storage T_7 (control) recorded the highest titratable acidity. Reduction of titratable acidity could be assumed due to leaching of acids during osmosis. The per cent titratable acidity of dehydrated apricot decreased significantly with increase in the storage period. This might be due to bio-conversion of acids into sugars. Sharma *et al.* (9) also reported that conversion of acids into sugars resulted in lowering the acidity during storage and this decrease might be due to chemical interaction between the organic constituents of the fruit induced by the action of enzymes and storage temperature.

The total sugars of osmo-dehydrated apricot showed an increasing trend during six months of storage (Table 2). These findings are in consonance with Sharma *et al.* (10) and Rashmi *et al.* (11). The possible reason for gradual increase in total sugars during storage period could be explained by the fact that the polysaccharides might have converted into monosaccharide. The increase might also be attributed to hydrolysis of starch into sugars (Roy and Singh, 12). Sharma *et al*. (10) also observed significant increase in total sugars in osmo-dehydrated apricot during storage. T_6 (lye dipping + 70°B syrup) recorded the highest values, while T_1 (water blanching) recorded the lowest values at zero month storage. After six months storage, treatment T_1 (water blanching) recorded the lowest total sugars content. Hydrolysis of acid might have resulted in degradation into monosaccharide (Devraj *et al*., 13).

Ascorbic acid showed a decreasing trend in all the treatments over a storage period of six months at ambient conditions (Table 3). The mean ascorbic acid content during six months of storage declined significantly. The decreasing trend in ascorbic acid during storage has also been reported by Rashmi *et al.* (11) in osmo-dehydrated pineapple. It is well documented that ascorbic acid is most sensitive to heat so oxidized quickly in the presence of oxygen and it might have been destroyed during processing and subsequently during storage. At the beginning the highest values of ascorbic acid were recorded by T_1 (water blanching), whereas T_7 (control) recorded the lowest value. There was a considerable reduction of ascorbic acid during storage. Ascorbic acid after oxidation and degradation to furfural enters browning reaction directly or *via* Maillard reactions (Reynolds, 14).

A significant increase in browning had been noticed during storage. The treatment, T_6 (lye dipping + 70°B syrup) recorded the lowest value at zero month storage (Table 3). The highest values of browning were recorded by treatment T_7 (control) after six months storage. The browning of dehydrated apricot increased continuously during storage. This might be due to non-enzymatic browning reaction such as organic acids with sugars or oxidation of phenols which leads to formation of brown pigments. Decline in ascorbic acid content of fruit products may be one of the possible reasons for browning of products. Kumar (15) during storage of date candy noticed an increase in non-enzymatic browning when candy was stored at room temperature for 60 days.

A general decrease in overall acceptability scores was observed with the advancement of storage period (Table 3). At the beginning of storage, the

Table 2. Effect of treatments and storage period (months) on titratable acidity (%) and total sugars (%) of osmo-dehydrated wild apricot.

Treatment	Titratable acidity					Total sugars				
	0	2	4	6	Mean	0	2	4	6	Mean
Water blanching (T_1)	4.33	4.23	4.14	3.98	4.17	17.00	18.10	19.99	21.17	19.07
Water blanching + 50°B syrup (T_2)	1.43	1.35	1.28	1.15	1.30	25.22	25.99	26.97	27.99	26.54
Water blanching + 70°B syrup (T_3)	1.28	1.21	1.18	1.14	1.20	26.23	26.73	28.40	28.99	27.59
Lye dipping (T_4)	2.27	2.15	2.06	1.94	2.11	19.73	20.95	21.96	23.98	21.66
Lye dipping + 50°B syrup (T_5)	1.09	0.93	0.89	0.86	0.94	27.26	28.60	29.93	30.99	29.20
Lye dipping + 70°B syrup (T_6)	0.82	0.78	0.75	0.70	0.76	29.70	30.87	32.76	33.76	31.77
Control (T_7)	4.62	4.46	4.35	4.62	4.51	20.62	22.52	23.98	24.97	23.02
Mean	2.32	2.21	2.15	2.06		23.68	24.82	26.29	27.41	
Treatment			0.03						0.84	
Storage			0.02						0.63	
Treatment × storage			0.01						NS	

Table 3. Effect of treatments and storage period on (months) ascorbic acid (mg/100 g), browning and overall acceptability of osmo-dehydrated wild apricot.

Treatment	Ascorbic acid					Browning					Overall acceptability				
	0	2	4	6	Mean	0	2	4	6	Mean	0	2	4	6	Mean
Water blanching (T_1)	9.45	9.31	9.25	9.18	9.30	2.46	3.28	4.31	5.17	3.81	6.85	6.70	6.50	6.22	6.57
Water blanching + 50°B syrup (T_2)	9.37	9.21	9.16	9.11	9.21	1.95	2.98	3.80	4.93	3.42	6.98	6.80	6.60	6.25	6.66
Water blanching + 70°B syrup (T_3)	9.29	9.18	9.10	9.05	9.16	1.90	2.85	3.70	4.80	3.31	7.17	7.10	6.80	6.28	6.84
Lye dipping (T_4)	8.84	8.71	8.64	8.55	8.69	3.00	3.70	4.80	5.70	4.30	6.70	6.50	6.20	6.10	6.38
Lye dipping + 50°B syrup (T_5)	8.72	8.63	8.54	8.49	8.60	1.78	2.79	3.50	4.51	3.15	7.40	7.20	6.90	6.30	6.95
Lye dipping + 70°B syrup (T_6)	8.43	8.35	8.21	8.10	8.27	1.77	2.55	2.92	3.90	2.79	8.19	7.85	6.35	6.35	7.19
Control (T_7)	7.33	7.25	7.16	7.09	7.21	3.22	4.39	6.19	8.67	5.62	6.10	6.05	6.05	6.00	6.05
Mean	8.78	8.66	8.58	8.51		2.30	3.22	4.17	5.38		7.06	6.89	6.49	6.21	
Treatment			0.09					0.01						0.05	
Storage			0.07					0.01						0.04	
Treatment × storage			0.02					0.02						0.11	

maximum scores were recorded in T_6 (lye dipping + 70°B syrup), whereas, the minimum scores were observed in T_7 (control). After six months of storage, the highest scores for overall acceptability were recorded in T_6 (lye dipping + 70°B syrup). These findings were similar to the findings of Rashmi *et al.* (11) and Sharma *et al.* (10) who also observed a decrease in overall acceptability with increase in the storage period in *ber chuhara* and osmo-dehydrated apricot, respectively.

From the present studies, it is therefore concluded that osmo-dehydrated product could be prepared by conserving wild apricot during period of glut by lye peeling and keeping lye-dipped fruits in 70°B syrup, which otherwise goes waste due to its poor shelf-life and high acidity. Thus, by utilizing these fruits the processing industry can fulfill the dual purposes of better use of apricot fruits and higher returns to the growers successfully.

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