International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(6): 2737-2741

Received: 18-09-2019
Accepted: 23-10-2019

Prabhakar Singh Maurya
M. Sc. (Dairy Technology) Scholar, Warner College of Dairy Technology, Shuats, Prayagraj Uttar Pradesh, India

HP Simon
Lecturer, Warner College of Dairy Technology, Shuats, Prayagraj Uttar Pradesh, India

Rekha Rani
Assistant Professor (Dairy Technology), Warner College of Dairy Technology, Shuats, Prayagraj Uttar Pradesh, India

Binod Kumar Bharti
Assistant Professor cum Jr. Scientist, SGIDT (Bihar Animal Sciences University), Patna, Bihar, India

Corresponding Author:
Rekha Rani
Assistant Professor (Dairy Technology), Warner College of Dairy Technology, Shuats, Prayagraj, Uttar Pradesh, India

Antioxidant rich shrikhand using apricot pulp

Prabhakar Singh Maurya, HP Simon, Rekha Rani and Binod Kumar Bharti

Abstract
Shrikand is a traditional Indian sweet dish prepared from curd. An effort was done to produce novel fermented milk. Further, were made to standardize to optimum level of Apricot fruit in the preparation of Shrikhand by sensory evaluation and to study its economics. Shrikhand was prepared from standardize milk Fat 4.5 %, SNF 8.5% chakka with content level of sugar 35 percent blended with Apricot fruit pulp at the rate of quantity Treatment T1, T2 and T3 of Apricot fruit pulp @ 5%, 10% and 15%. Studied for its sensory properties such as color and appearance, flavour and taste, consistency and overall acceptability by trained panelist using 9 points hedonic scale. Among all these combinations the best sensory attributes like colour and appearance score (7.70), flavor and texture score (7.20), body and texture (7.20) and overall acceptability (7.68) were scored by panelist with shrikhand containing 10% apricot pulp and found antioxidant activity 96.36% (Radical scavenging activity). The physico-chemical analysis results shows that titratable acidity, moisture and antioxidant activity was increases with increases levels of Apricot pulp while fat, carbohydrate, protein, ash, total solid decreases with increases levels of Apricot pulp. As per FSSAI guidelines, all the nutrients were in prescribed range. There was significant difference between and within the treatments.

Keywords: Sensory quality, Apricots pulp, shrikhand, microbial analysis, chemical, curd

1. Introduction
Shrikhand is one of the important fermented milk products prepared with added sugar, flavouring agents such as cardamom and Saffron, fruits and nuts. It is highly popular in western part especially in Maharashtra, Gujarat and Karnataka states. Shrikhand is known for its high nutritive value, characteristic flavour, taste, palatable nature and possible therapeutic value. Shrikhand is very refreshing particularly during summer months. It can be recommended as healthy food for specific patients suffering from obesity and cardiovascular disease due to its low fat and also sugar contents. (Ramprasad More *et al*., 2017) [10]. India has a very rich variety of fermented foods prepared from milk, cereals, pulses vegetables, fruits fish and meat. Milk and dairy products mainly curd, buttermilk, lassi and shrikhand is inseparable dish in a regular diet of Indians people. Shrikhand is a very popular and delicious dairy product liked by many Indian and it is consumed regularly during various occasions due to its pleasant taste and aroma. Shrikhand is made with chakka (strained dahi/ curd) which is finely mixed with sugar and flavouring agents. Like Indian dahi is very refreshing particularly during summer season. Shrikhand contains appreciable milk protein and phospholipids and is obtained by lactic acid fermentation through the action of *Lactobacillus bulgaricus, Streptococcus lactis, Streptococcus diactylactis, Lactobacillus citrovoroum* and *Streptococcus thermophilus.* Fermented milk products have been well recognized to have therapeutic, anticholesterolemic, anticarcigenic properties (Boghra and Mathur, 2000) [2]. Shrikhand is a most popular Indian dessert prepared by fermentation of milk. It has a semi-soft consistency body and also sweetish sour in taste. Preparation of herbal Shrikhand was carried out by incorporating aqueous basil extract at different level (David, 2015) [3].
Adition of Malta orange juice in evaporated milk shrikhand increased vitamin C content as well as enriched natural flavour (Kumar, 2019) [6].
Apricot is a fruit that bears the fruit, of several species in the genus Prunus as stone fruits. Apricots are drupes like peaches, plums, cherries and mangoes in which the outer fleshy part (exocarp and mesocarp) surrounds a hard stone (endocarp) with a seed inside. Fruit colour ranges between orange to orange red and some cultivars are cream white to greenish white

(Ruiz *et al.*, 2008; Riu-Aumatell *et al.*, 2005) [12], [11]. This fruit has also been grown in mountainous slopes of Asia and Europe for thousands of years. Presently, the main apricot cultivation regions include a strip stretching from Turkey through Iran, the Himalayas, Hindukush to China and Japan. However, the largest production of world apricot is supplied from the Mediterranean countries (Leccese *et al.* 2007) [7]. According to FAO (2010), the world's largest producers are Turkey and Iran accounting for 21.6% and 14.7% of world apricot production respectively, followed by Algeria, Pakistan, Uzbekistan, Italy, Japan, Morocco, Egypt and Spain. In India it is mainly cultivated in North West Hills Region, Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh and also in North Eastern Hills Region comprising the state of Arunachal Pradesh, Nagaland, Meghalaya, Manipur and Sikkim.

Apricot possess an antioxidant capacity, due to production of reactive oxygen species and free radicals cause damage to macromolecules like protein, lipids and nucleic acids. These conditions further lead to pathogenesis and chronic disorders like cancer, inflammations, ulcers, diabetes and cardiovascular diseases (Halliwell and Aruoma, 1991; Halliwell and Gutteridge, 1989) [4], [5]. The antioxidant properties of apricot fruit and are its rich phytochemical composition. It also plays important role in degenerative diseases Cancer. Immune system plays an important role in cancer incidence and inflammation, eventually causing the aggregation of cells due to disturbances in signaling pathways (Noonan *et al.*, 2007) [9]. Apricot is benefitted to cardiovascular diseases. Cardiovascular diseases are among the main causes of deaths all over the world. Associated risk factors include high cholesterol, high homocysteine level, atherosclerosis (Schieber *et al.*, 2001; Agarwal and Rao, 1998) [13], [1]. Antioxidants have been found effective in combating coronary heart diseases. A diet rich in these compounds is assumed to offer protection against cardiovascular diseases and age-related degenerative transformations, as suggested by epidemiological studies (Agarwal and Rao, 1998) [1].

2. Materials and Mathods

2.1 Experimental site

The experiment "Development of Shrikhand from a blend of milk and Apricot pulp" was carried out in research lab, Warner College of Dairy Technology, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj-211007, U.P. (India).

2.2 Procurement and collection of ingredients

Standardized milk used for manufacturing of Shrikhand was procured from "Aggies Dairy", WCDT, SHUATS, Prayagraj. Fresh standardized milk, was strained through a muslin cloth and chemical analysis of milk was done. It was free from any objectionable flavor and contained on an average fat 4.5%, SNF 8.5%. Good quality sugar, granular form of sugar, free from impurities was purchased from local market of Prayagraj. Dahi culture was procured from NCDC, NDRI Karnal. Apricot pulp was collected from market of Prayagraj.

2.3 Development of product

Fresh sweet good quality Standardized milk (4.5% fat and 8.5% SNF) was heated to 63 ºC for 30 minutes. It was cooled at 35 ºC and then inoculated by *S. lactis* starter culture @ 2% and incubated at 35-40 ºC for 8-10 hours until a film coagulum (Dahi) was formed. The Dahi, so formed was broken and transferred to muslin cloth and hanger for 10-12 hours, for draining of whey the coagulum so obtained is called chakka, as per the treatment 5%, 10% and 15% to obtain the final product Apricot fruit pulp Shrikhand.

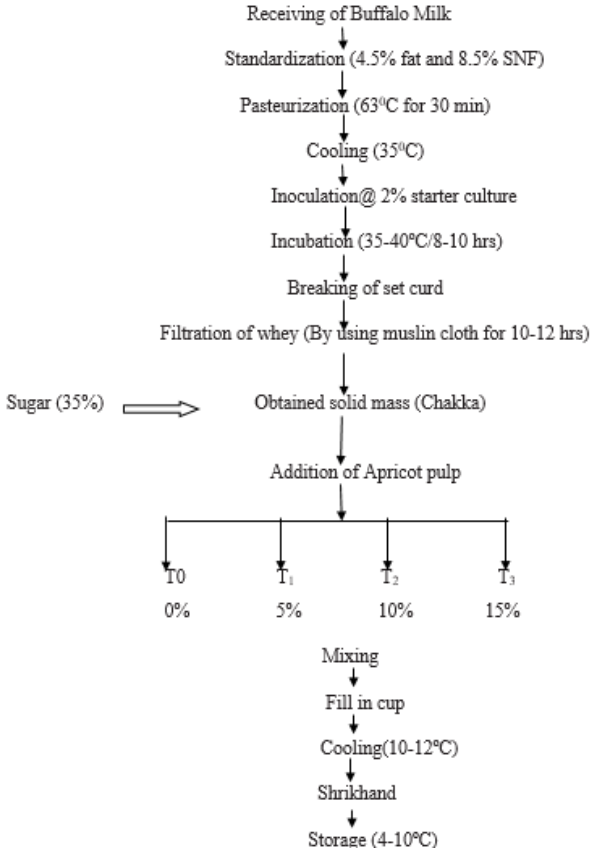

Fig 1: Flow diagram for manufacturing of shrikhand using Apricots pulp

Treatment combination

Treatment	Chakka	Apricot Pulp (%)	Sugar (%)
T_0	65	-	35
T_1	60	5	35
T_2	55	10	35
T_3	50	15	35

2.4 Sensory Attributes

Colour and appearance, Flavour and taste, Body and Texture and Overall acceptability was determined by (Lim, 2011)

2.5 Physico- Chemical analysis

Moisture was determined by technique described in IS: 1010 (1968). Fat was determined as per the procedure defined in IS: 2311 (1963). Protein was determined by Semi Micro Kjeldahl Method. Ash content of all the samples was determined by procedure described in IS:1547 (1985). Total solid was determined by IS: 1479, 1961. The acidity of Shrikhand was obtained by method described in BIS (IS: 1166 1968). Carbohydrate content was calculated by differential method (AOAC, 1980). Carbohydrates (AOAC, 1980). Antioxidant activity (%) was determined by (DPPH Method).

2.6 Microbiological analysis

The yeast and mold count (YMC) was determined as per the technique defined in IS: 5403 (1969) by Potato Dextrose Agar

(PDA) and coliform count by the methods as defined in IS: 5550 (2005) and (FSSAI 2017) correspondingly.

3. Result and Discussion

3.1 Physico-Chemical and microbial analysis of Apricot pulp enriched Shrikhand

Table 1: Physico-Chemical and microbial analysis of Apricot fruit pulp Shrikhand

Parameters %	Scores/ Value Based on Mean Value on Different Parameters of Treatments				F(Cal) Value
	T0	T1	T2	T3	
Carbohydrate	34.87^{a}±0.22	34.17^{b}±0.34	34.12^{c}±0.23	33.96^{d}±0.34	171.4523
Protein	10.14^{a}±0.07	9.91^{b}±0.08	9.68^{c}±0.07	9.46^{d}±0.07	382.084
Fat	9.89^{a}±0.12	9.51^{b}±0.14	8.98^{c}±0.12	8.39^{d}±0.12	3286.082
Ash	1.25^{a}±0.03	$1.21^{a,b}$±0.02	$1.18^{a,b,c}$±0.03	$1.14^{a,b,c,d}$±0.03	43.83179
Total Solid	55.99^{a}±0.07	54.68^{b}±0.06	53.85^{c}±0.04	52.69^{d}±0.04	5043.083
Moisture	44.01^{a}±0.07	45.32^{b}±0.05	46.15^{c}±0.04	47.04^{d}±0.04	5292.4.64
Acidity (%LA)	0.94^{a}±0.03	1.10^{b}±0.02	1.24^{c}±0.01	1.34^{d}±0.02	371.928
Antioxidant activity (%Radical scavenging activity)	00.00^{a}±0.00	88.45^{b}±0.51	92.11^{c}±0.06	96.36^{d}±0.39	132249.85
Microbial analysis					
Yeast & mould (cfu/gm)	6.20^{a}±1.67	$7.00^{a,b}$±0.97	$7.20^{a,b,c}$±1.48	$8.20^{b,c,d}$±1.72	3.577011
Coliform count (10^{1}/ml)	NIL	NIL	NIL	NIL	

*Data are presented as Mean± S.D.

**The superscripts a, b, c and d in each column indicated significant difference (P<0.05).

Carbohydrate Percentage

The present study reported that the carbohydrates percentage of apricot fruit pulp shrikhand in the range as 33.96 to 34.17. The highest mean value for carbohydrates percentage in Apricot fruit pulp Shrikhand (34.87) was obtained from the treatment T0 (control) followed by T1 (34.17), T2 (34.12). The minimum score (33.96) was obtained in T3. It indicated that increase the percentage of apricot, decrease the mean value of carbohydrate. There were significant differences found among the treatments (P<0.05).

Protein Percentage

The highest mean value for protein percentage in Apricot fruit pulp Shrikhand (10.14) was obtained from the treatment T0 (control) followed by T1 (9.91), T2 (9.68) and the minimum score (9.46) was obtained in T3. There were significant differences found among the treatments.

Fat Percentage

Table 1 shows that the fat percentage in the range as 9.89, 9.51, 8.98, 8.39 of different treatments as T1, T2, T3 and T4 respectively. The highest mean value for fat percentage in Apricot fruit pulp Shrikhand (9.89) was obtained from the treatment T0 (control) followed by T1 (9.51), T2 (8.98). The minimum score (8.39) was obtained in T3. There were significant differences found among the treatments (P<0.05).

Ash Percentage

The highest mean value for ash percentage in Apricot fruit Shrikhand (1.25) was obtained from the treatment T0 (control) followed by T1 (1.21), T2 (1.18). The minimum score (1.14) was obtained in T3. There were significant differences found among the treatments. F (Cal) Value was 43.83179, indicating significant effect of treatment on ash percentage.

Total Solids Percentage

The highest mean value for total solids percentage in Apricot fruit Shrikhand (55.99) was obtained from the treatment T0 (control) followed by T1 (54.68), T2 (53.85). The minimum score (52.69) was obtained in T3. It indicated that increase the percentage of apricot with sugar, then decrease the mean value of Total Solid percentage from T1 to T3. There were significant differences found among the treatments (P<0.05).

Moisture Percentage

The highest mean value for moisture percentage in Apricot fruit pulp Shrikhand (47.04) was obtained from the treatment T3 followed by T2 (46.15), T1 (40.32). The minimum score (44.01) was obtained in T0 (control). There were significant differences found among the treatments. The addition of 15% apricot had higher (47.04%) moisture of apricot fruit pulp shrikhand.

Titrable Acidity Percentage

Table 1 shows that the titrable acidity percentage in terms of lactic acid (% LA) was found in as 0.94, 1.10, 1.24 and 1.34 of different treatments as T1, T2, T3 and T4 respectively. The highest mean value for titrable acidity percentage in Apricot fruit Shrikhand (1.34) was obtained from the treatment T3 followed by T2 (1.24), T1 (1.10). The minimum value (0.94) was obtained in T0 (control). There were significant differences found among the treatments (P<0.05). Kumar *et al.* (2019) also found acidity in the range of 0.86-1.19 % LA in malta orange juice incorporated evaporated milk shrikhand.

Antioxidant Activity

The highest mean value for antioxidant activity in Apricot fruit Shrikhand (96.36) was obtained from the treatment T3 followed by T2 (92.11) and T1 (88.45). No antioxidant activity was observed in T0 (control) sample. There were significant differences found among the treatments. Mahmood *et al.* (2017) [8] also prepared antioxidant enriched sauce by using bottle gourd and tomato in the ratio of 50:50 and found 78.32±0.18 % anti-oxidant inhibition activity (% DPPH).

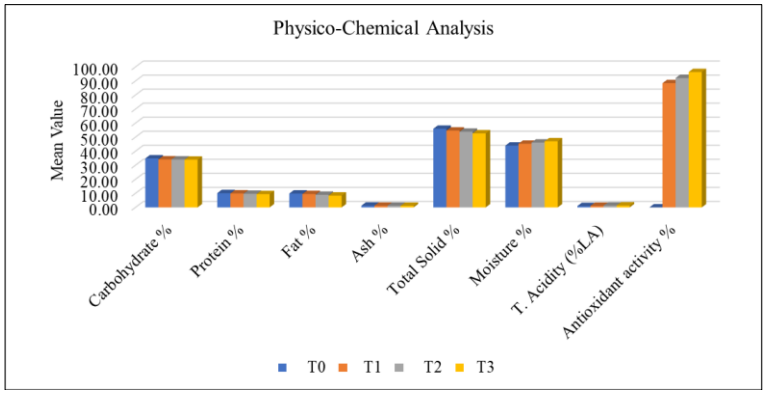

Fig 2: Graphical representation of Physico-chemical analysis of Apricot fruit pulp shrikhand

Microbial analysis of Control and Apricot fruit pulp Shrikhand

Yeast and Mold count

Table 1 shows that, the highest mean count for yeast and mould in Apricot fruit Shrikhand (8.20) was obtained from the treatment T3 followed by T2 (7.20), T1 (7.00) and the minimum score (6.20) was obtained in T0 (control). There were significant differences found among the treatments.

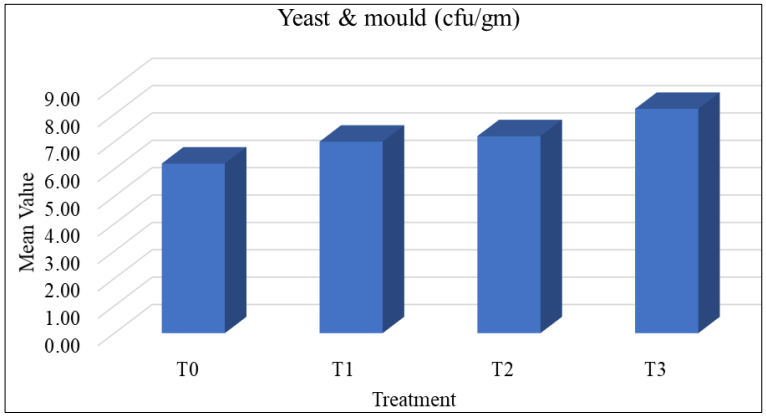

Fig 3: Graphical representation of Yeast & Mould count of Apricot fruit pulp shrikhand

Coliform count (10^1/ml)

None of the samples of Apricot fruit pulp Shrikhand showed presence of the coliforms at 0 day. Which indicates, proper hygienic conditions were maintained during the preparation and storage of the product.

Sensory Analysis

Table 2: Average value of sensory analysis of Apricot fruit pulp Shrikhand

Parameters	Scores/ value based on mean value of different parameters of treatments				F Cal value
	T0	T1	T2	T3	
Colour and appearance	$7.40^{a}\pm0.48$	$7.40^{a,b}\pm0.37$	$7.70^{a,b,c}\pm0.40$	$7.20^{a,b,c,d}\pm0.40$	3.577011
Flavour and Taste	$7.60^{a}\pm0.48$	$7.30^{a,b}\pm0.40$	$8.10^{a,c}\pm0.48$	$7.40^{a,b,d}\pm0.48$	4.405797
Body and texture	$7.40^{a}\pm0.48$	$7.30^{a,b}\pm0.40$	$7.90^{c}\pm0.30$	$7.20^{a,b,d}\pm0.40$	3.723193
Overall acceptability	$6.72^{a}\pm0.51$	$6.46^{a,b}\pm0.88$	$7.68^{a,b,c\pm}0.46$	$7.16^{a,b,c,d}\pm0.34$	3.98419

*Data are presented as Mean± S.D.

**The superscripts a, b, c and d in each column indicated significant difference (P<0.05).

Colour and Appearance

The highest mean score for colour and appearance in Apricot fruit pulp Shrikhand (7.70) was obtained from T2 followed the treatment by T3 (7.20), T1 (7.40). The minimum score (7.30) was obtained in T0. There were significant differences found among the treatments.

Flavour and Taste

The highest mean score for flavour and taste in Apricot fruit pulp Shrikhand (8.10) was obtained from the treatment T2 followed by T1 (7.30), T0 (7.60). The score (7.40) was obtained in T3. There were significant differences found among the treatments. F(Cal) Value was 4.405797, indicating significant effect of treatment on flavour and taste.

Body and Texture

The highest mean score for body and texture in apricot fruit pulp Shrikhand (7.90) was obtained from the treatment T2 followed by T0 (7.40), T1 (7.30). The minimum score (7.20) was obtained in T3. There were significant differences found among the treatments.

Overall Acceptability

The highest mean score for overall acceptability in Kiwi fruit pulp Shrikhand (7.68) was obtained for the treatment T2 followed by T0 (6.72), T1(6.46) and T3 (6.46). There were significant differences found among the treatments.

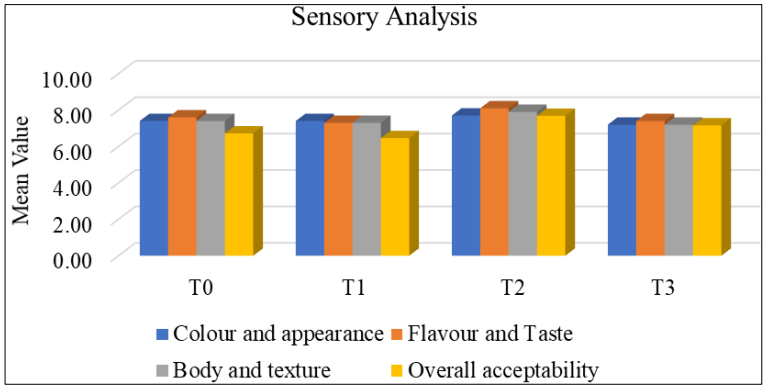

Fig 4: Graphical representation of Sensory analysis of Apricot fruit pulp shrikhand

4. Conclusion

It may be concluded that the blended Shrikhand can be successfully prepared by using whole milk with addition of Apricot pulp. It was found that the experimental Shrikhand in treatment T2 (90:10) was best in organoleptic characteristics and received highest score in organoleptic (colour and body and texture, flavour and taste, overall acceptability).

5. Reference

1. Agarwal S, Rao AV. Tomato lycopene and low-density lipoprotein oxidation: a human dietary intervention study. Lipids. 1998; 33:981-984.
2. Boghra VR and Mathur ON. Physico-chemical status of major milk constituents and minerals at various stages of shrikhand preparation. Journal of Food Science and Technology, Mysore. 2000; 37(2):111-115.
3. David J. Preparation of herbal Shrikhand prepared with basil (Ocimum basilicum) extract, The Pharma Innovation Journal. 2015; 4(8):81-84.
4. Halliwell B, Aruoma OI. DNA damage by oxygen-derived species: its mechanisms and measurement in mammalian systems. FEBS Letters. 1991; 281:9-19.
5. Halliwell B, Gutteridge JMC. Free Radicals in Biology and Medicine. Oxford, UK: Oxford University Press, 1989.
6. Kumar D, Rani R, Wasnik P, David J, Kumar S. Development of evaporated milk *Shrikhand* and vitamin C enrichment by using *Malta* orange juice. International Journal of Chemical Studies. 2019; 7(5):2331-2338.
7. Leccese A, Bartolini S, Viti R. Total antioxidant capacity and phenolics content in apricot fruits International Journal of Fruit Science. 2017; 7(2):3-16.
8. Mahmood R, Thakur S, Rani R, Singh B, Chandra R. Antioxidant vitamin C. enrichment in sauce by admixture of tomato and bottle gourd. The Pharma Innovation Journal. 2017; 6(7):11-19.
9. Noonan DM, Benelli R, Albini A. Angiogenesis cancer prevention. A vision. Recent results. Cancer Research. 2007; 174:219-224.
10. Ramprasad More, Kakasaheb Chavan, Yogesh Patil. Studies on Organoleptic Evaluation of Shrikhand Prepared from soya milk Blended with cow milk Bulletin of Environment, Pharmology and Life Science. 2017; 7(1):355-359.
11. Riu-Aumatell M, Lopez-Tamames E, Buxadera S. Assessment of the volatile composition of juices of apricot, peach, and pear according to two pectolytic treatments. Journal of Agricultural and Food Chemistry. 2005; 53:7837-43.
12. Ruiz D, Reich M, Bureau S, Renard CMGC, Audergon J. Application of reflectance colorimeter measurements and infrared spectroscopy methods to rapid and non-destructive evaluation of carotenoids content in apricot (Prunusarmeniaca L.). Journal of Agricultural and Food Chemistry. 2008; 56:4916-4922.
13. Schieber A, Stintzing FC, Carle R. By-products of plant food processing as source of functional compounds-recent developments. Trends in Food Science and Technology. 2001; 12:401-413.