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Effect of Different Blanching Temperature on Some Physicochemical Properties, Color, Antioxidant Activity and Total Phenolic Contents of Apricot Chutney Produced from Sun Dried Apricots

Okan LEVENT[1*]
[1]Department of Food Engineering, Faculty of Engineering, Inonu University, Malatya
(orcid.org/0000-0003-0415-0308)
***e mail:** okan.levent@inonu.edu.tr

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Abstract: In this study, the effects of different blanching temperatures (70°C-80°C-90°C) on some physicochemical, color, antioxidant activity and total phenolic content properties were investigated in apricot chutney production. Dry matter, titration acidity °Brix and *a** values of the apricot chutney samples increased with the increase in the blanching temperatures, while the pH, *L**, *b**, *C** and *h*° values decreased and these changes were statistically ($P<0.05$) has been found. Antioxidant activity and total phenolic content were affected by the blanching temperatures and these values decreased with the increase of blanching temperatures. The highest ABTS, DPPH and total phenolic content values were detected 380.24 mg Trolox/100g dry weight-172.24 mg Trolox/100g dry weight-603.42 mg GAE/100g dry weight, respectively, in the apricot chutney sample blanched at 70°C, while the lowest was 298.71 mg Trolox/100g dry weight-149.13 mg Trolox/100g dry weight-513.76 mg GAE/100g dry weight blanched at 90°C.

Keywords: Antioxidant activity, apricot chutney, different blanching temperatures, physicochemical properties, sun dried apricot

Gün Kurusu Kayısılardan Üretilen Kayısı Chutney Örneklerinin Bazı Fizikokimyasal Özellikler, Renk, Antioksidan Aktivite ve Toplam Fenolik Madde Üzerine Farklı Haşlama Sıcaklığının Etkisi

Öz: Bu çalışmada, kayısı chutney üretiminde farklı haşlama sıcaklıklarının (70°C-80°C-90°C) bazı fizikokimyasal, renk, antioksidan aktivite ve toplam fenolik madde özellikleri üzerine etkisi incelenmiştir. Haşlama sıcaklığının artışı ile birlikte kayısı chutney örneklerinin kuru madde, titrasyon asitliği, °briks ve *a** değerinde artış, pH, *L**, *b**, *C** ve *h*° değerlerinde ise azalma meydana gelmiş ve bu değişimler istatistiksel olarak önemli ($P<0.05$) bulunmuştur. Antioksidan aktivite ve toplam fenolik madde içeriği haşlama sıcaklığından etkilenmiş ve haşlama sıcaklığının artışı ile birlikte bu değerlerde azalma meydana gelmiştir. En yüksek ABTS, DPPH ve toplam fenolik madde değerleri sırası ile 380.24 mg Trolox/100g kuru ağırlık-172.24 mg Trolox/100g kuru ağırlık-603.42 mg GAE/100g kuru ağırlık ile 70°C'de haşlama işlemine tabi tutulan kayısı chutney örneğinde, en düşük ise 298.71 mg Trolox/100g kuru ağırlık-149.13 mg Trolox/100g kuru ağırlık-513.76 mg Trolox/100g kuru ağırlık i ile 90°C'de haşlama işlemine tabi tutulan kayısı chutney örneğinde tespit edilmiştir.

Anahtar Kelimeler: Antioksidan aktivite, farklı haşlama sıcaklığı, fizikokimyasal özellikler, gün kurusu kayısı, kayısı chutney

1. Introduction

The botanical name of apricot, which has an important in the economy of Malatya, is *Prunus armeniaca* L. (*Armeniaca vulgaris Lam.*) and its production is carried out in 5 continents. Turkey is the world's greatest apricot producer and this production is mostly conducted in Malatya province due to its geographic and climatic properties (Anonymous 2009). The most cultivated apricot varieties in Malatya are Hacıhaliloğlu, Hasanbey, Soğancı, Kabaaşı, Çataloğlu and Çöloğlu. However, the most grown apricot variety is Hacıhaliloğlu, constitutes 73% of the apricots produced in Malatya (Asma 2004). Sun dried apricot is an apricot product that is formed as a result of drying fresh apricot

collected during the harvest under the sun without any chemical treatment. Since it does not contain any additives and preservatives, its shelf life is lower than dried apricots treated with sulfur. Since the popularity of natural food consumption has increased especially in European countries in recent years, the importance of sun dried apricots is increasing (Anonymous 2003).

Apricot is very important fruit in terms of nutrition and it is rich in β-carotene and potassium, but poor in sodium (Gorunmezoglu 2008). Fruits are food products that can spoil and require careful harvesting. Due to physical activity, water loss and microbial activity after harvest, the fresh of fruit continues a very short time (Paliyath et al. 2008). Shelf life of apricot, which is a climacteric fruit, is very limited. For this reason, apricots are harvested early and thus cannot reach the desired maturity. In order to prevent this problem, it has been reported that the value-added apricot products can be consumed throughout the year (Igual et al. 2012). For this purpose, while apricots are processed into products such as fruit juice, puree and jam in our country, products such as chutney, which are widely consumed abroad, are not produced. Chutney and various fruit sauce are not only used related industries but also they can be used in the marinated meat products.

In this study, apricot chutney was produced and the effect of blanching temperatures on some physicochemical, color, antioxidant activity and total phenolic content properties were characterized.

2. Material and method

The sun dried apricots used in this study are a variety of Hacıhaliloğlu and were obtained local markets. Other ingredients used in the production of apricot chutney (apple, sugar, black pepper, ginger, cinnamon, salt and garlic) were purchased from a local market in Malatya.

The production flow chart of chutney samples produced at different blanching temperatures is shown in Figure 1. Sun dried apricot (25%) and apple fruits (37.5%) were washed and mashed using a kitchen type blender (Braun, MR 570, Klonberg, Germany). Water (22.5%), black pepper (0.5%), ginger (0.5%), cinnamon (0.5%) and garlic (0.5%) were added into mash. Then the resulting mixture was blanched at different temperatures. After the blanching process, vinegar (5%), sugar (7.5%) and salt (0.5%) added into the samples and mixed for 3 minute. Chutney samples placed in bottle and stored at +4°C in refrigerator.

Total soluble solids (°Brix) were measured according to method described by Cemeroglu (Cemeroglu 1992) using an abbe refractometer (Bellingham and Stanley Ltd., Kent, UK). AOAC (1980) analyses method was used for the determination of dry matter contents (%) by drying the apricot chutney samples at 102 C° for 6 h in a conventional oven (Şimşek Laborteknik, Turkey). Titration acidity and pH analyses were carried out using the method of Serradilla at al. (Serradilla et al. 2011). 5 g of apricot chutney sample was diluted with 50 mL of deionized water and titrated with 0.1 N NaOH until pH 8.1. The results were calculated as g citric acid per 100 g of the apricot chutney. The pH values of the samples were measured by immersion of the pH-meter (Mettler-Toledo, S220, Switzerland) probe into the samples.

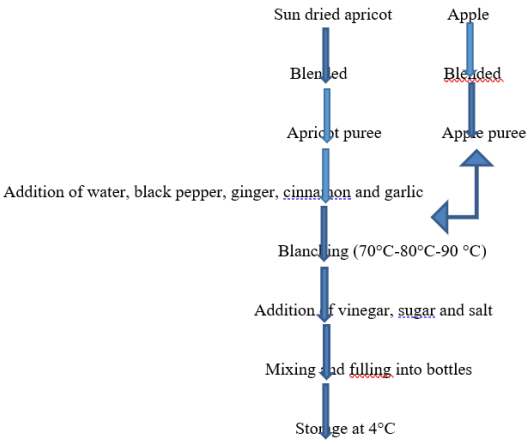

Figure 1. Flow chart for production of apricot chutney

Şekil 1. *Kayısı chutney üretim akış şeması*

An electronic display colorimeter (Minolta CR-10, Osaka, Japan) was used for color measurement. The tip of the color reading device

was pressed on the sample and *L* * (brightness), *a* * (redness), *b* * (yellowness), *C* * (color saturation) ve *h* ° (tone angle) values were recorded. The readings were carried out in six parallel and the results were given as average.

A 10 mL volume of 7 mM (ABTS) solution was prepared using 2.45 mM potassium persulfate prior to analyses. The solution was kept in the dark for 16 h and at the end of the period, it was diluted using ethyl alcohol so that its absorbance at 734 nm was 0.70±0.02. Trolox standard solutions were prepared for calibration and trolox concentration range was studied as 5-100 ppm. Then 0.1 g of the prepared sample was weighed and diluted with 50 times absolute ethanol. 100 µL of this mixture was taken and 2.4 mL of ABTS solution previously adjusted to 0.70 nm was added. After mixing on vortex (Heidolph, Reax Top, Schwabach, Germany) the absorbance values at 734 nm against ethanol were read and at the end of the time of the samples kept in the dark for ten minutes (Shimadzu uv-1800, Kyoto, Japan). Results were expressed in mg Trolox per 100 g dry weight (Xu et al. 2010).

The 2,2-diphenyl-1-picrylhy-drazyl (DPPH) method was used to determine the radical scavenging power. DPPH solution used in the analysis; it was prepared by dissolving 2.5 mg of DPPH reagent in 100 mL of methanol. 0.1 g was taken from the apricot chutney samples and diluted with 50 times methanol. Later, 100 µL of the diluted sample was taken and 3.9 mL of DPPH solution was added. Then, after mixing the tubes in vortex (Heidolph, Reax Top, Schwabach, Germany) they were kept in the dark for 45 minutes and at the end of the time, the absorbance values against methanol at 517 nm were read (Shimadzu uv-1800, Kyoto, Japan). Results are expressed in mg Trolox per 100 g dry weight (Lucena et al. 2010).

Concentration of total phenolic was measured by using the Folin-Ciocalteu assay. After taking 5 g from the sample with methanolic extraction, 25 mL of methanol containing 0.1% HCl was added and kept in the freezer at -18 ° C for 24 hours. Then, 40 µL of sample was taken from the prepared mixture, 3.16 mL of water and 200 µL of Folin reagent were added. After mixing for 1 minute on the vortex, it was kept in the dark for 5 minutes. Later, 600 µL of 2% Na2CO3 was added and the samples kept in the dark for 120 minutes at room temperature were read at 765 nm in a UV-1800 spectrophotometer (Shimadzu, Kyoto, Japan). The calibration curve was formed by preparing gallic acid solutions at different concentrations (50-1000 ppm) and the results were given as mg GAE per 100g dry weight (Singleton et al. 1999).

Statistical analyses were performed using SPSS (version 16) program. In order to determine the effect of blanching temperatures, variance analysis (one way ANOVA) was performed. Significant differences between the data were tested using Duncan multiple range test at the significance level of 95%.

3. Results and Discussion

Physicochemical properties of apricot chutney samples produced at different blanching temperatures are given in Table 1. Titration acidity values were ranged from 0.29 to 0.34 g citric acid/100 g in apricot chutney sample, which was blanched at 70°C and in apricot chutney sample, which was blanched at 90°C, respectively. There was a negative correlation between pH values and titration acidity levels of the apricot chutney samples, which was in accordance with the previous literature (Touati et al. 2014). With the increase in blanching temperatures dry matter and °brix values increased and these changes were found to be statistically significant (P<0.05).

Color properties of the apricot chutney samples produced different blanching temperatures are presented in Table 2. *L**, *b**, *C** ve *h*° values of the samples decreased and a* value increased with increasing blanching temperature and these changes were found to be statistically significant (P<0.05). Maximum Lightness (L*), redness (a*) and yellowness (b*) values of samples were 43.28, 26.41 and 18.41 while minimum lightness (L*), redness (a*) and yellowness (b*) values of samples were 36.51, 23.85 and 12.58, respectively.

Table 1. Some physicochemical properties of apricot chutney samples
Çizelge 1. *Kayısı chutney örneklerinin bazı fizikokimyasal özellikleri*

Parameters	Acidity (g citric acid/100 g)	pH	°Brix	Dry matter (%)
70 °C	0,29±0,02[a]	4,67±0,05[a]	20,85±0,28[a]	22,29±0,48[a]
80 °C	0,31±0,01[a]	4,52±0,07[ab]	21,10±0,42[a]	22,61±0,64[ab]
90 °C	0,34±0,02[b]	4,43±0,03[b]	21,55±0,30[ab]	23,24±0,27[c]

Means with different letters in the column for each blanching temperatures are significantly different (P<0.05).

Table 2. Color properties of apricot chutney samples
Çizelge 2. *Kayısı chutney örneklerinin renk değerleri*

Parameters	*L**	*a**	*b**	*C**	*h°*
70 °C	43,28±2,12[b]	23,85±1,13[a]	18,41±0,64[c]	30,13±2,03[a]	37,66±1,86[a]
80 °C	40,17±1,49[ab]	25,18±0,89[ab]	16,13±1,02[b]	29,90±0,96[ab]	32,64±1,28[b]
90 °C	36,51±1,75[a]	26,41±1,38[c]	12,58±0,59[b]	29,25±1,47[b]	25,47±0,95[c]

Means with different letters in the column for each blanching temperatures are significantly different (P<0.05).

Table 3 shows the results of the change in the antioxidant and total phenolic contents of apricot chutney samples. Antioxidant activity and total phenolic contents of the samples decreased with increasing blanching temperature and these changes were found to be statistically significant (P<0.05). The highest ABTS, DPPH and total phenolic contents values were 380.24 mg Trolox/100g dry weight-172.24 mg Trolox/100g dry weight-603.42 mg GAE/100g dry weight, respectively, in the apricot chutney sample blanched at 70°C, while the lowest were 298.71 mg Trolox/100g dry weight-149.13 mg Trolox/100g dry weight-513.76 mg GAE/100g dry weight in the apricot chutney sample blanched at 90°C. It has been reported that due to increase of enzymatic activity with the increase of the blanching temperatures, more loss occurs in the total phenolic contents and thus more reduction in antioxidant activity (Mazzeo et al. 2011).

Table 3. ABTS, DPPH and total phenolic contents of apricot chutney samples
Çizelge 3. *Kayısı chutney örneklerinin ABTS, DPPH ve toplam fenolik içerikleri*

Parameters	**ABTS (**mg Trolox/100g dry weight)	**DPPH (**mg Trolox/100g dry weight	**Total phenolic (**mg GAE/100g dry weight)
70 °C	380,24±14,22[a]	172,24±6,17[a]	603,42±20,71[c]
80 °C	353,29±11,76[b]	161,38±3,87[ab]	539,71±10,56[bc]
90 °C	298,71±10,85[c]	149,13±2,59[b]	513,76±12,43[a]

Means with different letters in the column for each blanching temperatures are significantly different (P<0.05).

4. Conclusion

In this study, effect of different blanching temperatures on some physicochemical, color, antioxidant activity and total phenolic content properties were investigated. Blanching temperature showed a significant effect on all parameters of the apricot chutney samples. Increase in temperature decreased pH, *L**, *b**, *C** ve *h°*, antioxidant activity and total phenolic contents while increased titration acidity, dry matter, °brix and *a** values. Results of this study revealed the importance of blanching temperature on the final product properties of apricot chutney.

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