Almond Milk: Preparation, Chemical, Fatty Acids, Mineral, Total Phenolic Compositions and Antioxidant Activity

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Abstract
The aim of this study was producing a new alternative milk for person who is vegetarian, lactose intolerance sick, cardio-vascular diseased, diabetic or for old people. The dilution fold (3–7) and dilution temperature (25–80 ^{0}C) as producing parameter by pro – tests were carried out. Totally 13 milks were produced. In these conditions, effects of dilution fold and dilution temperature on the proximate, fatty acid, mineral, total phenolic compositions and antioxidant activity of produced milks were investigated.

Keywords: Almond milk, Antioxidant activity, Fatty acids composition, Mineral composition, Total phenolic compositions

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1.Introduction

Nowadays, almond milk starts to be a good alternative non – dairy and plant – based beverage in Europe and USA. This miracle milk is prefered especially by people who suffering from diabetes, coeliac artery compression syndome, hypersensitive to cow or sheep or goat milk and lactose intolerance (Anonymous, 2013; Lacono, Lospalluti, Licastro, Scalici and Pediatria, 2008; Salpietro, 2005). Because of containing the important major mineral such as phosphore, magnesium, potassium and calcium, almond milk can make a benefit effect to bones in human body and also by low level sodium, it can be a protector from hypertension (Larsson et al., 2004; Esfahlan, Jamei, 2010; Ahmad, 2010). Many studies show that the consumption of almonds, walnuts, nuts and peanuts have a big role to blance of blood sugar (Jenkins, Kendall et al., 2003; Kendall et al., 2007; Bolling, Dolnikowski, Blumberg, Chen, 2010). And also these kind of foods contain high level of mono – unsaturated and poly – unsaturated fatty acids (Ahmad, 2010). That is the reason why, almond milk can be linked to reduction of the risk of cardiovascular diseases by decreasing the LDL in blood (Chen, Milbury, Lapsley and Blumberg, 2005). The purpose of this study was to procude a good and benefit plant milk.

2.Materials and methods

The used materials that raw almond and potable water used in this study were purchased from local market in Hatay, Turkey.

2.1.Preparation of almond milk

The response surface method (RSM), that is a kind of experimental design, was used on preparation of almond milk. The dilution fold (3 -7) and dilution temparature (25–80 ^{0}C) were chosen as two independent variables (Myers and Montgomery, 2002). The flow chart for RSM is shown in Figure 1. 250 grams of raw almonds were soaked during one night in the potable water at room temperature to obtained a soft skin and remove easily. Water ratio was of 1:4. Dehulled raw almonds were blended with 1 L of potable water in a 8011 EB model Waring blender for 5 min A muslin cloth was used as a filter in order to seperate solid particles. Extracted almond milk was pasteurized for 15 min. at 80 – 85 ^{0}C. The flow chart for almond milk is shown in Figure 2.

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Variable	**Code**	**–α**	**-1**	**0**	**+1**	**+ α**
Dilution Fold	X_1	3.0	3.60	5.0	6.40	7.0
Dilution Temp.	X_2	25.0	33.0	52.5	72.0	80.0
–α		-1.412			+1.412	+α

Samples	X_1	X_2
1	6.4	72.0
2	5.0	52.5
3	6.4	33.0
4	5.0	80.0
5	5.0	52.5
6	5.0	52.5
7	7.0	52.5
8	3.6	33.0
9	5.0	25.0
10	3.0	52.5
11	5.0	52.5
12	3.6	72.0
13	5.0	52.5

Figure 1: Flow chart for Response surface Method

Raw Almond (250 grams)
↓
Soaking (overnight)
↓
Dehulling
↓
Blending
↓
Filtration
↓
Almond milk
↓
Pasteurization (80 – 85 ^{0}C for 15 min)

Figure 2: Flow chart for Almond Milk Preparation

2.2.Chemical compositions

Dry matter, ash, pH, titratable acidity and crude protein were determined according to standard methods (Anonymous, 1990; Anonymous, 1995). For crude protein, 6,38 was used as conversion factor. Titratable acidity was calculated according to oleic acid. Fat of almond milks was determined by gerber method (Kurt et al., 1996). The amounts of total carbohydrate were obtained by subtracting the amounts of moisture, crude protein, total fat and ash from 100 (Gibson, 1990).

2.3.Fatty acid compositions

Fatty acid composition was determined according to Eder (1995) using a Hewlett-Packerd GC/MS 6890/5972 system with HP-5MS capillary column (30 m 0.25 mm; 0.25 µm film thickness). The carrier gas was helium with a flow of 0.8 ml/min. The split ratio was 1:10. The column temperature was programmed at 60 - 260 ^{0}C with 4 ^{0}C/min. Mass spectra was taken at 70 eV. Mass range was from m/z 35 – 350 amu. For this analysis 2 mL 0.5 N sodiumhyroxide was added on 0.5 mL almond milk fat. After 2 min heating process, 2 mL BF_3 was added for 2 min heating more. At last 5 mL hexan was added and shaked to seperate the phasic. Hexan phasic was taken in 2 mL vial and injectioned into GC/MS (Eder, 1995).

2.4.Mineral compositions

Cu, Mg, Fe, P, Na, K, Zn, Mn and Ca were analysed in almond milks. There were some modifications on analysis. 1 mL almond milk was disposed in microwave tubes. Almond milks were mixed in 8 mL of 65% HNO_3 (v/v) and 2 mL of 30% H_2O_2 (v/v). All almond milks were burned for 20 min in microwave oven at 180 ^{0}C (Cem - MARS Xpress). At the end of the 20 min samples were allowed to be cooled and were diluted with ultra-deionized water until 25 mL level of tubes. In order to seperate solid matters, all solutions were filtered. Mineral composition of almond milk was analysed by inductively coupled plasma atomic emission spectroscopy (ICP - AES; Varian liberty series 2, USA) (Akbulut and Özcan, 2009). Working conditions of ICP-AES:

Instrument: ICP-AES (Varian-Liberty Series 2)

RF Power: 0.7–1.5 kw (1.2–1.3 kw for axial)

Plasma gas flow rate (Ar): 10.5–15 L/min. (radial) 15″ (axial)

Auxiliary gas flow rate (Ar):1.5″

Viewing height: 5–12 mm

Copy and reading time:1–5 s (max. 60 s)

Copy time: 3 s (max. 100 s)

2.4.Total phenolic compositions

Total phenolic compositions of almond milks were determined according to the Folin – Ciocalteu spectrophotometric method with some modifications (Abdulkasım et al., 2007). 20% of Na_2CO_3 as folin reactor, methanol and gallic acid were used for chemical materials and U.V. U – 1900 (Hitachi) spectrofotometer was used for analysis. First of all 5 mL almond milk was disposed and 5 mL 80% of methanol was added on it. This mixture was centrifugated 4000 xg for 20 min 100 µL of upper layer was taken and mixed with 100 µL of Folin – Ciocalteu phenol regant and 3000 µL deionized water. Then samples were holded for 10 min for reaction. At the end of 10 min 100 µL 20% of Na_2CO_3 was added on samples and holded for 2 hours in darkness to be incubated. After 2 hours of incubation at room temperature, the absorbance at 765 nm was determined. The measurement was compared to a standard curve of prepared gallic acid (GA) solution and the total phenolic content was expressed as milligrams of gallic acid equivalents (GAE) per gram of dry mater (mg GAE/g dm).

2.5.Antioxidant activity (DPPH)

The radical scavenging activity of the almond milk was determined according to method with some modifications (Klimzack et al., 2007). 2.2 – diphenyl – 1 – picrylhydrazly (DPPH) and 80% of methanol were used as chemical materials and U.V. U – 1900 (Hitachi, Japan) spectrofotometer was used for analysis. As a first step 5 mL almond milk measured and 5 mL 80% of methanol added on it. This mixture was centrifugated at 4000 xg for 20 min 100 µL of upper layer was taken and mixed with 2460 µL DPPH. This mixture had been allowed to stand in dark for 20 min. At the end of 20 min the absorbance was measaured at 515 nm and all samples were read indivially. Inhibition of free radical DPPH in percent (I %) was calculated in the following way:

$$I\ \% = (A_{\text{blank}} - A_{\text{sample}}/A_{\text{blank}}) \times 100 \qquad (1)$$

$A_{blank:}$ Absorbans value of blank sample which was used 80% of methanol

$A_{sample:}$ Absorbance value of each of samples.

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2.6.Statistical analysis

The response surface method with two variable and three level central composit design was used to determinate the effects of independent variables on dependent variables for analysis of variance. A regression equation had been determined to show relations between variables. Dilution fold and dilution tempareture had been determined as independent variables for experimental design. Design expert packet of 6.0 program was used for statistical analysis (Montgomery, 2001; Montgomery and Mayers, 2002).

3.Results and discussions

3.1.Chemical compositions

Chemical compositions of almond milks were summarized in Table 1. Averagely almond milks contained 12.77% dry matter, 0.43% ash, 3.21% crude protein, 6.85% fat, 2.44% carbohyrate, 6.62 pH and 5.43 titratable acidity.

Table 1. Chemical compositions of almond milk

Samples	Dry matter (%)	Ash (%)	Protein (%)	Fat (%)	Carbohydrate (%)	pH	Titratable acidity (oleic acid)
1	13.11±0.03	0.45±0.01	3.02±0.01	6.40±0.02	3.26±0.02	6.68±0.02	5.64±0.03
2	15.11±0.03	0.52±0.03	4.21±0.03	7.30±0.01	2.49±0.02	6.57±0.01	6.70±0.02
3	11.70±0.04	0.38±0.01	2.85±0.02	6.80±0.02	1.68±0.01	6.71±0.03	5.68±0.02
4	14.62±0.02	0.48±0.01	3.93±0.01	6.50±0.02	3.73±0.02	6.53±0.02	6.58±0.01
5	12.67±0.03	0.43±0.02	2.93±0.01	7.50±0.03	1.82±0.02	6.63±0.02	4.18±0.02
6	10.95±0.04	0.35±0.02	2.70±0.02	6.40±0.02	2.05±0.02	6.75±0.01	4.02±0.03
7	9.75±0.02	0.32±0.01	1.78±0.02	5.80±0.03	2.10±0.02	6.70±0.01	3.10±0.02
8	15.10±0.04	0.50±0.02	4.19±0.03	7.40±0.01	3.91±0.01	6.50±0.02	6.74±0.02
9	9.90±0.02	0.34±0.01	1.96±0.02	6.50±0.03	1.70±0.02	6.63±0.03	4.23±0.04
10	16.50±0.03	0.58±0.03	4.60±0.02	8.0±0.01	3.37±0.02	6.43±0.03	8.34±0.02
11	10.80±0.04	0.35±0.02	2.69±0.01	6.50±0.03	1.36±0.02	6.63±0.02	4.95±0.02
12	15.45±0.04	0.54±0.01	4.22±0.02	7.60±0.02	3.14±0.02	6.54±0.02	6.51±0.01
13	10.35±0.06	0.35±0.02	2.65±0.03	6.30±0.02	1.15±0.02	6.76±0.01	3.97±0.03
Average	**12.77**	**0.43**	**3.21**	**6.85**	**2.44**	**6.62**	**5.43**

Dry matters of almond milks were determined between 9.75% and 16.50% and were determined as averagely 12.77%. According to analysis of variance, the effect of dilution fold had been determined significantly in dry matters ($p<0.01$). Increasing of water content caused to reduce the dry matter on almond milks. The linear regression model of relation between two independent factors (dilution fold and dilution temperature) had been shown by an equation with coded factories and real factors for dry matter.

$$D.M\ (C.F) = 12.63 - 2.72\ (A) + 1.62\ (B)$$

$$D.M\ (R.F) = 16.728 - 1.360\ (A) + 0.054\ (B) \qquad (2)$$

D.M: Dry matter, C.F: Coded factor, R.F: Real factor, A: Dilution fold, B: Dilution temperature

It s shown that dilution fold was more effective than the dilution temperature and it has been determined as significant ($p<0.01$). Three - dimensional graphic of response surface of dilution fold and dilution temperature were shown in Figure 3. According to Figure 3, increasing of dilution fold has caused a decrease in of dry matter linearly.

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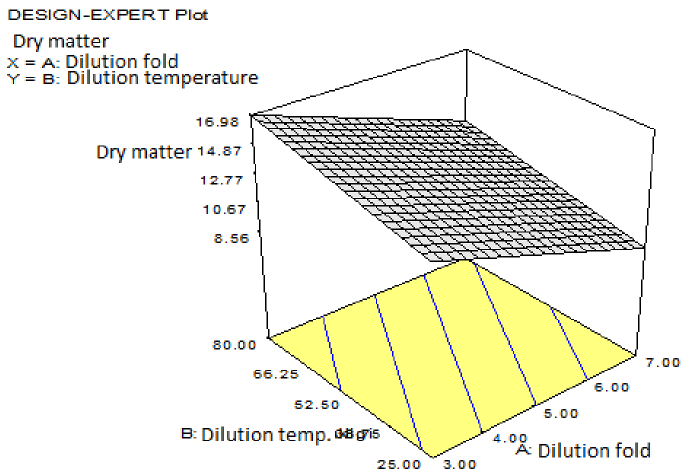

Figure 3: The effect of dilution fold and dilution temperature on dry matter.

Ash of almond milks was determined between 0.32% and 0.58% and as average 0.43%. The effect of dilution fold had been determined significantly on ash ($p<0.05$). The linear regression model of relation between two independent (dilution fold and dilution temperature) had been shown by an equation with coded factors and real factors for ash.

$$\text{Ash (C.F)} = 0.43 - 0.10(A) + 0.06(B)$$

$$\text{Ash (R.F)} = 0.58 - 0.051(A) + 0.002(B) \quad (3)$$

C.F: Coded factor, R.F: Real factor, A: Dilution fold, B: Dilution temperature

Three - dimensional graphic of response surface of dilution fold and dilution temperature had been shown in Figure 4. According to Figure 4, the increasing of the dilution fold had caused a decreasing in ash value.

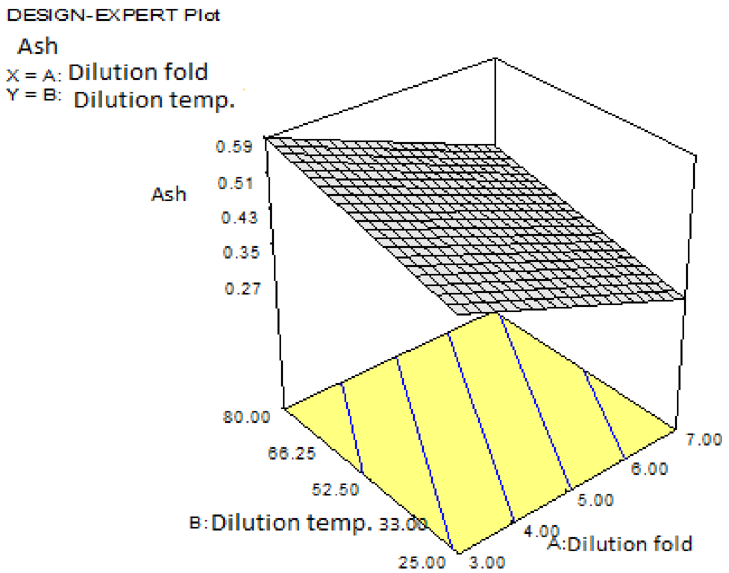

Figure 4: The effect of dilution fold and dilution temperature on ash.

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Proteins of almond milks were determined between 1.78% and 4.60% and as average 3.21%. The effect of dilution fold had been determined significant ($p<0.05$). The quadratic regression model of relation between two independent factors (dilution fold and dilution temperature) had been shown by an equation with coded factors and real factors for protein.

Protein (C.F)= $2.99–1.17(A)+0.54(B)+0.40(A^2)+0.19(B^2)+0.08(AB)$

Protein (R.F)= $8.37–1.65(A)+0.009(B)+0.10(A^2)+0.0002(B^2)+0.001(AB)$ (4)

C.F: Coded factor, R.F: Real factor, A: Dilution fold, B: Dilution temperature

Three - dimensional graphic of response surface of dilution fold and dilution temperature had been shown in Figure 5. According to Figure 5, increasing of the dilution fold had caused a decrease in protein value. This was similar with Figure 3 and Figure 4.

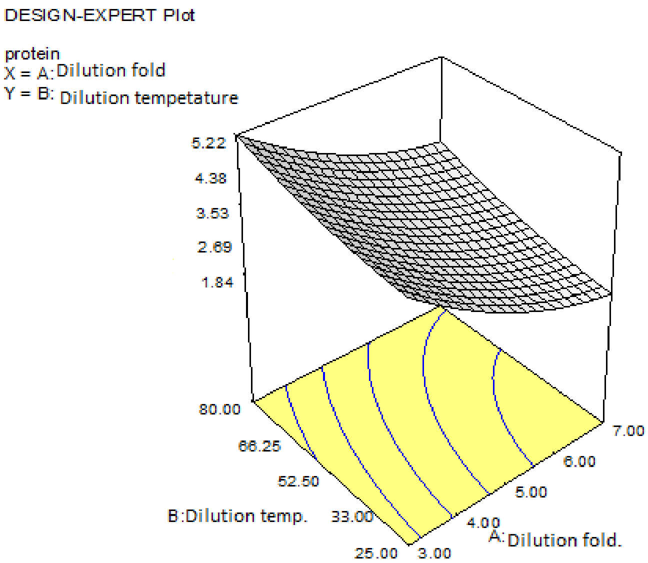

Figure 5: The effect of dilution fold and dilution temperature on protein.

Fat amounts of almond milks were determined between 5.8% and 8% and as average 6.85%. The effect of dulition fold had been determined significant on fat ($p<0.01$). The linear regression model of relation between two independent factors (dilution fold and dilution temperature) had been shown by an equation with coded factors and real factors for fat.

Fat (C.F)= $6.85 – 0.87(A)-0.039(B)$

Fat (R.F)= $9.098 – 0.437(A)-0.001(B)$ (5)

C.F: Coded factor, R.F: Real factor, A: Dilution fold, B: Dilution temperature

Three - dimensional graphic of response surface of dilution fold and dilution temperature had been shown in Figure 6. According to Figure 6, increasing of the dilution fold had caused a decrease in fat value as linearly.

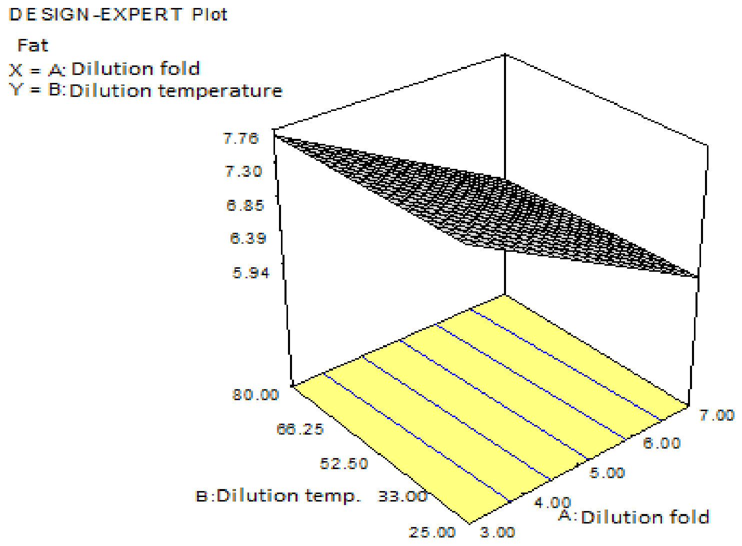

Figure 6: The effect of dilution fold and dilution temperature on fat.

Carbohydrate amounts of almond milk were determined between 1.15% and 3.91% and as average determined 2.44%. According to result of variance analysis, the effect of dilution fold had been significant ($p<0.05$). The linear regression model of relation between two independent (dilution fold and dilution temperature) had been shown by an equation with coded factors and real factors for carbohydrate.

Carbohydrate (C.F)= 2.38–0.69(A)+0.71(B)

Carbohydrate (R.F)= 2.94–0.35(A)+0.024(B) (6)

C.F: Coded factor, R.F: Real factor, A: Dilution fold, B: Dilution temperature

Three - dimensional graphic of response surface of dilution fold and dilution temperature had been shown in Figure 7. According to Figure 7, increasing of the dilution fold had caused a decrease in carbohydrate value as linearly.

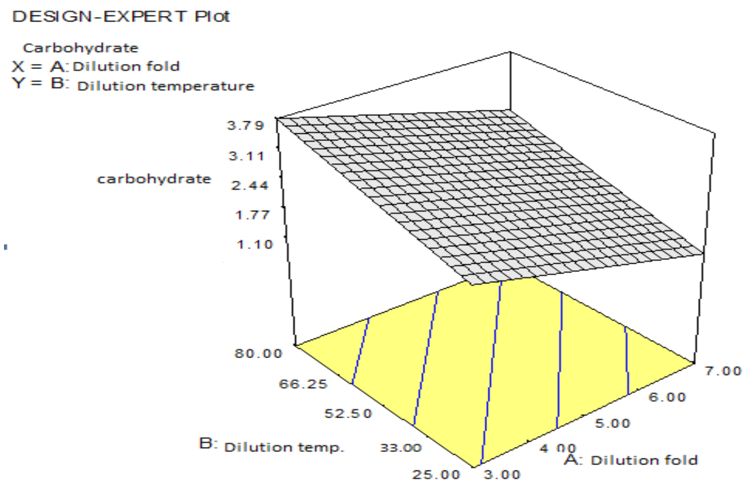

Figure 7: The effect of dilution fold and dilution temperature on carbohydrate.

pH of almond milks was determined between 6.43 and 6.76 and as average determined 6.62%. According to result of variance analysis, the effect of dilution fold had been significant on pH. ($p<0.01$). The linear

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regression model of relation between two independent factors (dilution fold and dilution temperature) had been shown by an equation with coded factors and real factors for pH.

pH(C.F)= 6.62+0.13(A)-0.03(B)

pH(R.F)= 6.34+0.065(A)-0.0008(B) (7)

C.F: Coded factor, R.F: Real factor, A: Dilution fold, B: Dilution temperature

Three - dimensional graphic of response surface of dilution fold and dilution temperature had been shown in Figure 8. According to Figure 8, icreasing of the dilution fold had caused a increase in pH value as linearly.

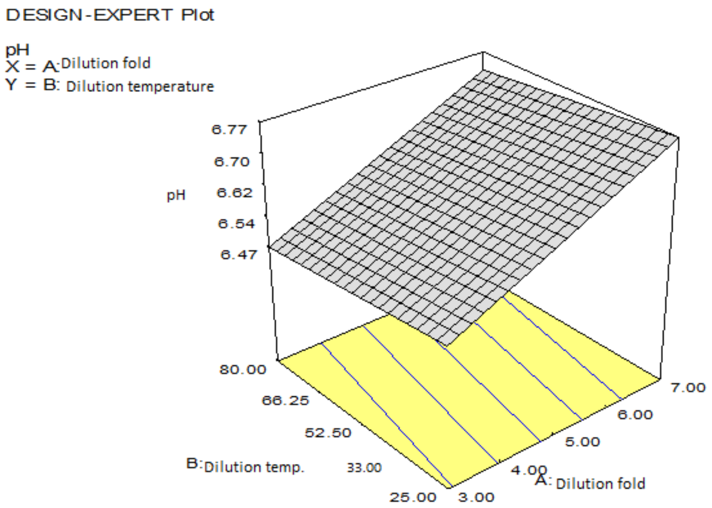

Figure 8: The effect of dilution fold and dilution temperature on pH.

Titratable acidity of almond milks was determined between 3.10 and 8.34 and as average determined 5.43. Titratable acidty was calculated according to oleic acid. According to result of variance analysis, the effect of dilution fold had been significant on titratable acidity. ($p<0.05$). The linear regression model of relation between two independent factors (dilution fold and dilution temperature) had been shown by an equation with coded factors and real factorsfor titratable acidity.

Titratable acidity(C.F)= 5.38–1.66(A)+0.59(B)

Titratable acidity (R.F)= 8.57–0.83(A)+0.02(B) (8)

C.F: Coded factor, R.F: Real factor, A: Dilution fold, B: Dilution temperature

Three - dimensional graphic of response surface of dilution fold and dilution temperature had been shown in Figure 9. According to Figure 9, icreasing of the dilution fold had caused a decrease in titratable acidity value as linearly.

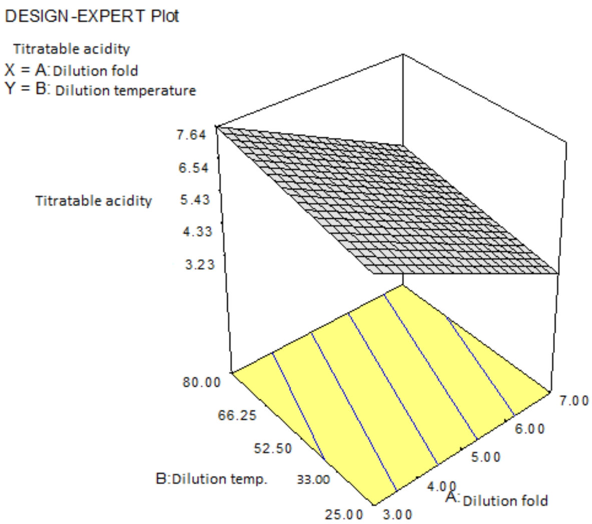

Figure 9: The effect of dilution fold and dilution temperature on titratable acidity.

3.2.Fatty acid compositions

Fatty acid compositions of almond milks were summarized in Table 2. According to Table 2, 100mL of almond milk contained about 7.4% of saturated fatty acid (Palmitic acid 16:0), 65.82% of mono – unsaturated fatty acid (Oleic acid) and 24.45% of poly – unsaturated fatty acid (linoleic acid) as averagely. Almond milks were analysed for palmitic acid, stearic acid, palmitoleic acid, oleic acid and linoleic acid.

Table 2. Fatty acid composition of almond milk samples (%)

Samples	C16:0(Palmitic)	C18:0(Stearic)	C16:1(Palmitoleic)	C18:1(Oleic)	C18:2(Linoleic)
1	7.75 ±0.03	ND	ND	64.23±0.02	24,50±0,02
2	7.78 ±0.05	ND	ND	65.30±0.05	24.23±0.01
3	7.67 ±0.06	ND	ND	65.45±0.02	25.05±0.02
4	7.50 ±0.02	ND	ND	64.10±0.03	24.30±0.02
5	7.47 ±0.01	ND	ND	64.15±0.02	23.25±0.03
6	7.78 ±0.03	ND	ND	64.15±0.02	28.06±0.04
7	7.79 ±0.02	ND	ND	68.60±0.04	23.61±0.03
8	7.63 ±0.04	ND	ND	68.55±0.01	22.95±0.05
9	6.48 ±0.05	ND	ND	68.70±0.02	24.81±0.04
10	6.90 ±0.03	ND	ND	65.30±0.03	24.70±0.03
11	7.15 ±0.02	ND	ND	63.20±0.01	24.85±0.02
12	7.12 ±0.02	ND	ND	64.50±0.03	23.68±0.02
13	7.19 ±0.01	ND	ND	65.60±0.02	23.92±0.01
Average	**7.4**			**65.53**	**24.45**

ND: Not detected

The main fatty acid of almond milk were oleic, linoleic and palmitic acids (Gallier, Gordon, Singh, 2012). However, Gallier et al. (2012) reported 66.58% of oleic acid, 5.38% of palmitic acid, 1.62% of stearic acid, 0.42% of palmitoleic acid, 24.34% of linoleic acid in almond milk which are closed to the values reported in Table 2. But in our study stearic acid and palmitoleic acid were not measured. These diferences may arise from almond cultivars (Miraliakbari and Shahidi, 2008). Fatty acid compositions is very important in the foods because of benefication to people health (Kırbaşlar and Erkmen, 2003). The food which has high amounts of saturated fatty acids might be damage to heart and vasculars (Milner, 2000). By taking these kinds of fatty acids, make the low – density lipid (LDL) augmented in blood. This is one of the main factors to catch disease of cardiovascular (Halsted, 2003; Chisholm et al., 2005; Özer, 2007).

3.3.Mineral compositions

Mineral compositions of almond milks had been shown in Table 3. Ca, Fe, Mn, Zn, K, Na, P, Cu were determined as mg in 100 mL almond milk. According to Table 3. 100 mL almond milk contained averagely 0.051 mg cupper, 15.528 mg magnesium, 0.218 mg ferrous, 16.099 mg phosphor, 2.962 mg sodium, 17.889 mg potassium, 0.162 mg zinc, 0.045 mg manganese and 13.991 mg calcium.

The amounts of potassium, calcium, phosphor and magnesium were higher than other minerals. By the high content of potassium, almond milk can help to blance the pressure of blood and can help to reduce the risk of the arrhythmia (Baysal, 2012). Mineral of calcium has a big role on powerness of bone and teeth. And also by taking sufficient amount of calcium might affect the neural structure, keep cells togetter and on blood coagulation (Ball & Rutishauser, 1997). Phosphor is a one of important major mineral on enzymes. Also it works togetter with calcium about health of bone and teeth. It s ranged about 90% in bone and 10% in cells of whole of phosphor in body (Duyff, 2003). An other important major mineral is magnesium which might take a big role in metabolism, muscles and neural health. However it has an effect on blood pressure (Neyzi and Ertuğrul, 2002).

Table 3. Mineral compositions of almond milks (%)

Samples	Cu (mg)	Mg (mg)	Fe (mg)	P (mg)	Na (mg)	K (mg)	Zn (mg)	Mn (mg)	Ca (mg)
1	0.05±0.03	8.51±0.02	0.11±0.03	4.96±0.02	3.06±0.02	13.63±0.02	0.08±0.02	0.04±0.02	10.74±0.01
2	0.04±0.03	12.30±0.01	0.04±0.02	6.00±0.03	3.34±0.01	28.47±0.01	0.04±0.02	0.04±0.02	25.10±0.01
3	0.03±0.04	11.22±0.03	0.18±0.02	6.49±0.02	3.04±0.03	21.64±0.03	0.04±0.01	0.03±0.01	15.06±0.02
4	0.04±0.02	15.79±0.02	0.12±0.01	6.17±0.02	3.38±0.01	26.67±0.02	0.01±0.02	0.05±0.02	16.04±0.01
5	0.03±0.03	10.54±0.02	0.34±0.02	5.61±0.04	3.33±0.01	21.11±0.01	0.08±0.02	0.04±0.02	25.21±0.01
6	0.10±0.04	21.26±0.01	0.07±0.03	35.10±0.03	3.46±0.02	17.66±0.01	0.11±0.03	0.03±0.02	14.12±0.02
7	0.02±0.02	18.66±0.01	0.07±0.02	31.55±0.03	3.41±0.02	13.75±0.02	0.05±0.02	0.04±0.02	11.84±0.02
8	0.01±0.04	19.07±0.02	0.12±0.02	32.99±0.02	3.57±0.01	17.47±0.02	0.10±0.03	0.03±0.01	11.91±0.03
9	0.04±0.02	10.20±0.03	0.07±0.04	22.45±0.01	3.28±0.02	9.14±0.03	0.02±0.01	0.06±0.03	5.57±0.01
10	0.05±0.03	19.48±0.03	0.66±0.02	15.16±0.03	0.51±0.01	20.74±0.02	0.22±0.03	0.03±0.02	11.64±0.02
11	0.07±0.04	12.69±0.02	0.11±0.02	10.62±0.03	1.36±0.03	11.84±0.02	0.20±0.01	0.06±0.02	8.41±0.01
12	0.06±0.04	23.95±0.02	0.64±0.01	16.67±0.02	3.55±0.02	17.40±0.01	0.42±0.03	0.03±0.01	13.46±0.02
13	0.04±0.06	18.20±0.01	0.27±0.03	15.4±0.03	3.17±0.01	12.98±0.02	0.68±0.02	0.05±0.02	12.71±0.03
Average	**0.05**	**15.52**	**0.21**	**16.09**	**2.96**	**17.88**	**0.16**	**0.04**	**13.99**

3.4.Total phenolic compositions and antioxidant activity

Total phenolic compositions and antioxidant activity of almond milks were shown in Table 4

According to Table 4, total phenolic composition of almond milks was about 0.34 mg/mL as average and about 67.11% for antioxidant activity as average. There was no significant effects of independent variables (dilution fold, dilution temperature) on antioxidant activity of almond milks ($p>0.05$). At the same time there was no significant the effects of independent variables (dilution fold, dilution temperature) on total phenolic composition of almond milks ($p>0.05$). The antioxidant activity of any foods can be explained by chemical composition of food such as phenolic compounds. In other studies reported that some of phenolic compounds may scavenge the free radicals (Apak et al., 2004).

Table 4. Total phenolic compositions (mg/mL) and antioxidant activity (%)

Samples	Total phenolic composition (mg/ml)	Antioxidant activity (%)
1	0.172±0.002	66.02±0.02
2	0.553±0.003	72.32±0.01
3	0.520±0.001	68.38±0.01
4	0.414±0.002	67.74±0.02
5	0.315±0.002	66.54±0.02
6	0.253±0.003	65.62±0.02
7	0.154±0.002	65.35±0.02
8	0.355±0.002	66.79±0.01
9	0.396±0.001	66.95±0.01
10	0.102±0.001	63.29±0.01
11	0.205±0.002	66.07±0.02
12	0.403±0.001	67.05±0.03
13	0.540±0.002	70.27±0.02
Average	**0.34**	**67.11**

4.Conclusion

It was thought that; this study may be a homer for producing vegetable milk as alternative to dairy products. Day by day, people take care about healthy nourishment, and people know that healthy nourishment is in direct relationship with health. In this area almond milk does not contain lactose so this maintains to no allergenic effect for the people who has problem with lactose intolerance and diabetes. In the other hand, almond milk does not have any glutens, from this aspect almond milk can be consupted by people who has problem with celiac. In our study, it was determined 65.82% of oleic acid by this way almond milk might be good at reducing LDL and cardiovascular diseases. We think that, this study can promote to assessment and consuption shape of almond in turkey by this way it can contribute to industry.

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