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REGULAR ARTICLE

PHYSIOCHEMICAL AND ANTIOXIDANT PROPERTIES OF POMEGRANATE JUICE ENRICHED WITH JUJUBE EXTRACT

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ABSTRACT

An investigation was done in order to evaluate the influence of jujube extract on physicochemical and anti-oxidant activity of juice from pomegranate. Pomegranate juice was treated with jujube extract (water, alcohol, and water-alcohol) at five concentration levels (5, 10, 15, 20, 25%). Color, total acidity, pH, total solid, activity and anti-oxidant capacity, ash, density, formalin value, tannin and sugar content of treatments were evaluated. From the results a decrease in acidity was noted in the juice after the addition of extract. There was significant enhancement in anti-oxidant capacity by addition of extract. The highest and lowest anti-oxidant capacity was dedicated to the samples with 25% water extract and 25% alcohol extract.

Keywords: Pomegranate juice, Jujube extract, Anti-oxidant activity

INTRODUCTION

In recent years, the consumers, researchers and food industry have chosen healthy food production and the role of diet has received much attention to avoid most diseases [11]. Pomegranate is full of folic acid, antioxidant and vitamins including C, B2, B1 and minerals as Sodium, phosphorus, Iron, Magnesium, potassium and sugar compounds sucrose, glucose, fructose and malic acid and citric acid [9]. The edible parts of pomegranate are used freshly or are applied to prepare fresh fruit juice, beverages, jelly, jam and paste and for flavouring and colouring the beverage products [4,6]. In addition, it is used widely in health, therapy formula and food spice. In ancient years, pomegranate was healthy food and it had useful effects on some diseases [10]. The increase of attention to pomegranate as pharmacological and nutritional product with its multi-functional capacity has some great advantages. This fruit is effective on mitigating disease risk [5, 8]. There are many biochemical compounds in the pomegranate juice [7].

The objectives of this study were to enrich pomegranate juice with Jujube extract to keep its antioxidant and colour properties and increase its Astringent flavour and nutritional value as a beverage.

MATERIALS AND METHODS

Jujube extract was randomly provided from Tajrish market in Tehran (Iran) and pomegranate concentrate was purchased from Noshin Company in Mazandaran. 5 gram Jujube powder was added to 95 ml distilled water, 95 ml ethanol solvent or 95 ml mixture of water and ethanol solvents, respectively to prepare water, ethanol or water-ethanol extract of Jujube. They were mixed for 24 h by a magnetic mixer to mix powder and solvent together. Then, the mixture was sieved by vacuum pump and then it was transferred to operator rotary to evaporate at temperature 45. This study applied three types of Jujube extract (water, alcohol, and water-alcohol) and five levels of concentration (5, 10, 15, 20, 25%). The parameters were including reducing sugar, sucrose, brix, tannin, antioxidant activity, titration pH and acidity.

Determination of chemical composition

Chemical compositions of the samples were determined according to the approved methods of Association of Official Analytical Chemists [2].

Determination of pH and density

The pH value was measured with a pH-meter (pH-meter Basic 20, Iran)

Measurement of total antioxidants

The antioxidant activity was determined using the DPPH method according to Brand-Williams *et al.* [3].

Measurement of sugars content

Sugars (glucose and fructose) were determined by AOAC [1].

Statistical analysis

The results are given as means±standard deviation of at least three independent determinations. One way ANOVA was used to compare the means and then the means were separated by Duncan's multiple range test. All statistical analysis was performed at $P<0.05$ using the SPSS 17.0.

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RESULTS AND DISCUSSION

Reducing sugar

The results of analysis of variance of data show that the effect of type of solvent to provide Jujube extract and concentration of Jujube extract in pomegranate juice beverage on reducing sugar in different beverage treatments was statistically significant. The highest amount of reducing sugar was found in treatment with 5% water extract of Jujube (6.12%). In all the studied treatments, with the increase of concentration of Jujube extract in beverage formulation, the reducing sugar was reduced. The lowest amount of reducing sugar was dedicated to the sample with 25% alcohol extract of Jujube (4.73%). The highest amount of reducing sugar was achieved in samples with water Jujube extract and the lowest was dedicated to the samples with alcohol extract of Jujube. With the increase of concentration level of Jujube extract in formulation, the reducing sugar was reduced significantly ($P<0.05$) and the highest amount of reducing sugar was found in samples with 5% Jujube extract and the lowest amount was seen in samples with 25% Jujube extract.

In treatments with different concentrations of Jujube extract, by the increase of concentration of extracts in formulation of production of pomegranate juice beverage, sucrose was reduced. The lowest amount of this sugar was found in sample with 25% water-alcohol of Jujube extract (3.56%). With the increase of concentration of Jujube extract in formulation of production of pomegranate juice beverage, their sucrose sugar was reduced. This was statistically significant among all the treatments ($p<0.05$).

Brix

In treatments with different concentrations of water extract of Jujube, with the increase of extract concentration in formulation from 5% to 10% Brix was reduced and reduced 15% to 20% and then was increased from 20% to 25%. Türkmen and Ekşi [12] observed brix of different samples of pomegranate juice collected from different regions ranging 12.2-17.8 degree. In treatments with alcohol, water-alcohol extracts of pomegranate juice beverage, with the increase of concentration of extracts in formulation, Brix was reduced. The highest and lowest Brix degree were found in samples with concentration 5% water extract of Jujube (14. 16 degree Brix) and concentration 25% alcohol extract of Jujube (10.33 degree Brix). The highest Brix was dedicated to water extract of Jujube and water-alcohol extract of Jujube was in the second rank. The lowest Brix was found in alcohol extract of Jujube. The highest and lowest amount of Brix was in concentration 5% and concentration 25% of Jujube extract. With the increase of percentage of Jujube extracts in formulation of pomegranate juice beverage, Brix was reduced.

Tannin

The highest amount of Tannin was found in samples with 5% water-alcohol extract of Jujube (0.6%) and treatments with 10% water extract, 5% alcohol extract, 10% water-alcohol extract and 15% alcohol extract of Jujube in next ranks. The lowest amount of Tannin was dedicated to the treatment with 25% water-alcohol extract of Jujube (0.45%). The highest amount of Tannin was regarding concentrations 5%, 10% of Jujube extract. With the increase of concentration of Jujube extract, Tannin of beverage samples was reduced. There was no significant difference between the Tannin value in beverages with concentrations 5, 10, 15%, 20, 25% Jujube extract ($p>0.05$).

Antioxidant activity

With the increase of concentration of extract in beverage formulation, antioxidant was increased as the lowest amount of antioxidant activity was dedicated to concentration 5% (184.12%) and the highest to concentration 25% (201.0%). In treatments with different concentrations of alcohol extract of Jujube, with the increase of concentration from 5% to 20%, antioxidant activity of beverages was fixed but with the increase of concentration from 20% to 25%, antioxidant activity was reduced significantly ($p<0.05$). In samples with different extracts of water-alcohol Jujube extract, with the increase of concentration of extract from 5% to 15%, the beverage antioxidant is increased but the increase of concentration of this extract from 15% to 25% reduced antioxidant activity. The highest and lowest of antioxidant activity were achieved in treatments with water extract and alcohol extract and the antioxidant activity of samples with water-alcohol extract of Jujube was in the middle of these two extracts. With the increase of concentration of Jujube extracts from 5% to 20%, antioxidant activity was increased but the increase of concentration level of extracts from 20% to 25% was reduced significantly ($p<0.05$).

pH

The highest amount of pH was regarding the sample with 25% water-alcohol extract of Jujube (3.76) and the lowest value was found in the sample with 5% water-alcohol extract of Jujube (3.03). Ghasemtabar *et al.* [13] evaluated physical properties of pomegranate juice-milk beverage in different concentrations and found that with the increase of pomegranate juice, due to the acidity increase, pH of beverage was reduced. In all pomegranate extracts, with the increase of concentration of extract in beverage formulation, pH was increased. The highest and lowest pH was dedicated to concentrations 25%, 5%.

Titratable acidity

In all treatments with different Jujube extract, with the increase of concentration of extract in beverage formulation, acidity was reduced. The highest acidity was achieved in treatment with 5% water-alcohol extract (1.06%) and the lowest was dedicated to sample with 25% alcohol extract of Jujube (0.82%). Türkmen and Ekşi [12] evaluated the acidity of different samples of pomegranate juice from different regions. They stated that acidity of different samples of pomegranate juice was ranging 2.4-30g/l. Among different solvents, the highest acidity was dedicated to water-alcohol solvent. There was no significant difference between acidity of water and alcohol acidity ($p>0.05$). The highest acidity was dedicated to concentration 5% of Jujube extract. With the increase of concentration of Jujube extracts in formulation of pomegranate juice beverage, acidity was reduced, the lowest acidity was achieved at concentration level 25% of Jujube extract.

In the present study, the effect of Jujube extract (water, alcohol, water-alcohol) and its concentration (5, 10, 15, 20, 25%) on different properties of pomegranate juice beverage was investigated. The results showed that reducing sugar, sucrose and Tannin in different treatments of pomegranate juice were 4.73-6.12%, 3.56-4.50% and 0.45-0.60% and all were at the determined range by national standard of Iran. With the increase of concentration of Jujube extract in beverage formulation increased pH and reduced acidity. In terms of Brix degree, except treatments with 15-25%, alcohol extract of Jujube, the Brix degree of other treatments was in standard range.

Table 1: The comparison of the mean of studied attributes in response to experiment treatments

		Percent of reducing sugar		Sucrose		Brix		Tannin		Antioxidant activity		pH		Titratable acidity	
5%	water	6.12	a	4.45	a	14.17	a	0.51	b	184.12	b	3.067	c	1.040	a
	alcohol	5.96	a	4.46	a	12.77	cd	0.58	a	173.17	c	3.053	c	1.047	a
	water-alcohol	6	a	4.51	a	13.17	bc	0.60	a	178.70	bc	3.033	c	1.063	a
10 %	water	6.09	a	4.38	ab	13.50	b	0.59	a	194.40	a	3.257	bc	1.017	a
	alcohol	5.43	b	4.21	b	12.17	e	0.54	b	174.48	c	3.257	bc	0.977	ab
	water-alcohol	5.86	ab	4.32	ab	12.83	cd	0.57	a	183.68	b	3.243	bc	1.010	a
15 %	water	5.97	a	4.12	b	13.67	ab	0.54	a b	197.15	a	3.437	b	0.937	b
	alcohol	5.28	b	4.02	bc	11.50	f	0.57	a	172.35	c	3.363	b	0.937	b
	water-alcohol	5.66	ab	3.93	bc	12.58	de	0.55	a b	185.37	b	3.397	b	0.983	ab
20 %	water	5.87	ab	3.84	c	13.50	b	0.49	b	200.17	a	3.403	b	0.863	bc
	alcohol	5.09	bc	3.75	c	10.83	g	0.51	b	171.17	c	3.587	ab	0.867	bc
	water-alcohol	5.5	b	3.81	c	12.33	de	0.49	b	183.66	b	3.520	ab	0.933	b
25 %	water	5.62	b	3.72	cd	13.67	ab	0.50	b	201.00	a	3.727	a	0.830	c
	alcohol	4.73	c	3.66	d	10.33	g	0.51	b	156.44	d	3.657	a	0.820	c
	water-alcohol	5.36	b	3.57	d	12.17	e	0.45	c	177.74	bc	3.760	a	0.900	bc

Treatments with at least one common name (a,b,c,d,...) do not differ significantly

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REFERENCES

1. AOAC. 1990. *Official Methods of Analysis of AOAC International*. 16th Edition, Ed. by Association of Official Analytical Chemists, Washington, DC.
2. AOAC. 1997. *Official Methods of Analysis of AOAC International*. 16th Edition, Ed. by Association of Official Analytical Chemists, Washington, DC.
3. Brand-Williams, W., Culivier, M. E. and Berset, C. 1995. Use of a Free Radical Method to Evaluate Antioxidant Activity. *LWT–Food Sci. Tech.*, 28:25-30. https://doi. org/10.1016/S0023-643880008-5
4. Fadavi, A., Barzegar, M., Azizi, M. H., Bayat, M. 2005. Physicochemical composition of ten pomegranate cultivars (*Punica granatum* L.) grown in Iran. Food Science and Technology International, 11:113–119. https://doi. org/10.1177/1082013205052765
5. Jaiswal, V., DerMarderosian, A., Porter, J. R. 2010. Anthocyanins and polyphenol oxidase from dried arils of pomegranate (*Punica granatum* L.). Food Chemistry, 118:11–6. DOI: 10.1016/j. foodchem.2009.01.095
6. Mousavinejad, G., Emam-Djomeh, Z., Rezaei, K., Khodaparast, M. H. H. 2009. Identification and quantification of phenolic compounds and their effects on antioxidant activity in pomegranate juices of eight Iranian cultivars. Food Chemistry, 115:1274–1278. doi: 10.1016/j. foodchem.2009.01.044
7. Salehi Surmaghi, M. H. 2010. Medicinal plants and phytotherapy. Vol. 3, Donya e Taghzieh Publications., Tehran: 292.
8. Solati, J., Soleimani, N. 2010. Antihyperglycemic and antihyper¬lipidemic effects of *Ziziphus vulgaris* L. onreptozocin-induced diabetic adult male Wistar rats. Acta Diabetology, 47: 219-223. DOI: 10.1007/s00592-009-0166-8
9. Stover, E., Mercure, E. W. 2007. The pomegranate: a new look at the fruit of paradise. Hort Science, 42:1088–1092.
10. Vidal, A., Fallarero, A., Pena, B. R., Medina, M. E., Gra, B., Rivera, F., Gutierrez, Y., Vuorela, P. M. 2003. Studies on the toxicity of *Punica granatum* L. (Punicaceae) whole fruit extracts. Journal of Ethnopharmacology, 89:295–300. https://doi. org/10.1016/j. jep.2003.09.001
11. Viuda-Martos M, Ruiz-Navajas Y, Fernández-López J, Pérez-Álvarez JA. Spices as functional foods. Critical Reviews in Food Science and Nutrition. 2010 51(1):13-28.
12. Türkmen, I. and Ekşi, A.2011. Brix degree and sorbitol/xylitol level of authentic pomegranate (*Punica granatum*) juice. *Food Chem.* 127, 1404–1407.
13. Ghasemtabar E., Goli S. A. H., Nasirpour A. 2013. Physico-chemical and sensory properties of milk-pomegranate juice drink during storage. *Iranian Food Science and Technology Research Journal*. 9: 340-347.