Asian Journal of Chemistry Vol. 20, No. 3 (2008), 2441-2444

Fatty Acids Composition of Some Pomegranate (*Punica granatum* L.) Varieties Grown in Southeastern Anatolia Region in Turkey

SEZAI ERCISLI*, EMINE ORHAN and YASEMIN HIZARCI
Department of Horticulture, Faculty of Agriculture
Ataturk University, Erzurum 25240, Turkey
E-mail: sercisli@hotmail.com

In this study, fatty acids composition in the aril (edible part) of 6 pomegranate (*Punica granatum* L.) varieties grown in Southeastern Anatolia region of Turkey were determined by using gas chromatography. The pre-dominant fatty acid in pomegranate arils was found linolenic acid (54.58-61.06 %) and followed by palmitic acid (19.36-30.67 %), linoleic acid (0.00-11.35 %), oleic acid (2.37-6.17 %), stearic acid (0.61-4.12 %) and myristic acid (0.28-0.94 %). The differences among pomegranate varieties in terms of fatty acid compositions suggested that fatty acid profile could be useful for chemotaxonomic classification.

Key Words: Pomegranate, Fatty acid, Chemotaxonomy.

INTRODUCTION

Turkey is situated at the junction of three important phytogeographic regions, namely Mediterranean, Irano-Turanian and Euro-Siberian with three different climates. Therefore its flora, which is highly used with medicinal purposes, is rich and diverse with over 10000 vascular plant taxa and 32 % of endemism[1].

The pomegranate is one of the oldest known edible fruits. Its history dates to ancient times. Pomegranates are one of the fruit species mentioned in the Bible and Koran and is often associated to fertility. It is native to Persia and perhaps some surrounding areas. It was cultivated in ancient Egypt and early in Greece and Italy. The fruit was very popular in Iraq. In time it spread into Asia, North Africa and Mediterranean Europe including Turkey. The domestication process took place independently in various regions and not only in the Mediterranean region[2,3].

Pomegranate is considered an excellent tree for growing in arid or semi-arid zones for its resistance to drought conditions. It is now widely cultivated in Mediterranean, in tropical and subtropical areas. A high number of scattered trees on the borders or within other fruit orchards are reported

in many Mediterranean countries where the fruit is very popular in local markets. It is cultivated in central Asia and to some extent in the USA (California), China and Japan for fruit production and is also developed as an ornamental tree in East Asia[4,5].

Turkey is one of the native lands of pomegranate and it has been cultivated in the Mediterranean region, Southern Anatolia and Northeast part of Turkey since ancient times. Numerous types and forms are well adapted to different agro-ecological conditions. Fruits produced in traditional orchards are not appropriate for the modern market[6]. The edible part of the fruit is called arils. The fresh juice contains 85 % moisture and considerable amounts of total soluble solids (TSS), total sugars, reducing sugars, anthocyanins, phenolics, ascorbic acid, organic acids and proteins[7-10] and has also been reported to be a rich source of antioxidants[11,12].

The edible parts of pomegranate fruits (arils) are consumed fresh. They are also used in the preparation of fresh juice, canned beverages, jelly, jam and paste and for flavouring and colouring drinks, *etc.*[13-15]. Pomegranate fruits contain considerable amounts of arils, ranging between 40 and 100 g/kg of fruit weight depending on cultivar. The seeds of diverse varieties are rich source of total lipids[16].

Data on fatty acid composition in the arils of pomegranate also help to establish the chemotaxonomic relationships among the varieties. Herein, the fatty acids compositions of arils from 6 pomegranate (*Punica granatum* L.) varieties grown in Southeastern Anatolia region in Turkey are reported.

EXPERIMENTAL

Pomegranate fruits harvested manually from 6 cultivars (Cekirdeksiz, Kuru Kabuk, Siyah Nar, Nuz Eksi, Yesil Kabuk, Kirli Hanim). The pomegranate shrubs were found same age and same ecological conditions at Gaziantep in Southeastern Anatolia region. All fruits were picked commercially ripe stage. The fruits selected according to uniformity of shape and colour. The arils obtained from these fruits.

Sample preparation and fatty acid (FAMEs) analysis: Sample preparation and fatty acids was analyzed according to a previous method[17,18].

RESULTS AND DISCUSSION

Fatty acid components representing about 96.83 % (cv. siyah nar)-99.15 % (cv. cekirdeksiz) were characterized. The amount of saturated and unsaturated fatty acids in arils was found to be 16.41 and 81.26 %, respectively (Table-1). Unsaturated fatty acids from *Punica granatum* seeds are the predominant constituents. Average 83 % of the fatty acids (Table-1) are unsaturated. Based on present study, the arils of all 6 varieties had similar (but not identical) fatty acids composition and contained low amounts of saturated fatty acids as previously described for *Punica granatum*[19].

Fatty acids analysis has shown that the arils from 6 pomegranate varieties studied contained six major compounds and statistically important variation of fatty acids was found among pomegranate varieties (Table-1).

The pre-dominant fatty acid in pomegranate seeds was found linolenic acid (54.58-61.06 %) and followed by palmitic acid (19.36-30.67 %), linoleic acid (0.00-11.35 %), oleic acid (2.37-6.17 %), stearic acid (0.61-4.12 %) and myristic acid (0.28-0.94 %) (Table-1).

TABLE-1
FATTY ACIDS COMPOSITION (%) OF ARILS OF POMEGRANATE VARIETIES

Varieties	Fatty acids							
	14:0	16:0	18:0	18:1	18:2	18:3	Σ Sat.	Σ Unsat.
Cekirdeksiz	0.82^{NS}	13.39ab	3.40ab	4.93^{NS}	10.87a	65.74ab	17.61	81.54
Kuru Kabuk	0.34	14.07ab	2.63ab	5.22	11.35a	64.58b	17.04	81.15
Siyah Nar	0.28	9.36b	4.12a	2.37	10.97a	69.73ab	13.76	83.07
Nuz Eksi	0.71	11.41ab	0.61b	6.17	7.53a	71.06a	12.73	84.76
Yesil Kabuk	0.94	11.31ab	1.72ab	4.30	8.48a	70.21ab	13.97	82.99
Kirli Hanim	0.56	20.67a	2.12ab	4.72	0.00b	69.33ab	23.35	74.05
Average	0.61	13.37	2.43	4.62	8.20	58.44	–	–

NS: Non significant, *Values in the same line with different lower-case letters are significantly different at $p < 0.05$.

In previous study conducted on pomegranate seeds, main fatty acids were found linolenic and linoleic acid[19] which are in agreement with present study. High content of linoleic acid and linolenic acid (polyunsaturated fatty acids) is favourable for medicinal (profilaxis and treatment of arteriosclerosis, eczema) and nutritional application since these components particularly linolenic acid, are responsible for cardia-protective, antidiabetic, antimicrobial activities[20-23].

It has been confirmed that the unsaturated fatty acids were pre-dominant in all varieties. However, linolenic acid was the main fatty acid in the present study. We could not confirm caprylic acid and stearic acid as the major fatty acids reported in a sweet Egyptian pomegranate cultivar[7].

The present results did not confirm the presence of caproic, capric, myristoleic acids as reported by El-Nemr *et al.*[7]. Neither could we confirm the presence of C12:1, C15:0, C14:1, C20:1, C20:2 and C22:1 found by Tsuyuki *et al.*[24] in the ornamental Nana pomegranate. However, present results confirm the presence of linolenic acid (C18:3) and linoleic acid (C18:2) in all seeds of pomegranates as reported[19,25].

As a conclusion fatty acids content of arils of pomegranate varieties were found different among varieties. This could be their different possible genetic back round. More detailed molecular studies are necessary to support this idea. The differences among pomegranate varieties in terms of fatty acids composition suggested that fatty acids profile could be useful to establish chemotaxonomic classification.

REFERENCES

1. K.H.C. Baser, *Pure Appl. Chem.*, **74**, 527 (2002).
2. M.E. Salaheddin and A.A. Kader, *Scientia Horticult.*, **24**, 287 (1984).
3. M.P. Melgarejo and R.V. Martinez, El Granado, Ediciones Mundi Prensa (1992).
4. M. Mars, In: Proc. First MESFIN Plant Genetic Resources Meeting, Tenerife, Spain, 2-4 October, 1995, p. 345 (1996).
5. J. Tous and L. Ferguson, in ed.: J. Janick, Mediterranean Fruits, Progress in New Crops, ASHS Press, Arlington, VA, p. 416 (1996).
6. S. Ercisli, *Genet. Resour. Crop Evol.*, **52**, 787 (2005).
7. S.E. El-Nemr, I.A. Ismail and M. Ragab, *Die Nahrung*, **34**, 601 (1990).
8. S.M. Mavlyanov, Sh. Yu. Islambekov, A.K. Karimdzhanov and A.I. Ismailov, *Chem. Natur. Comp.*, **33**, 98 (1997).
9. D.N. Dalimov, G.N. Dalimov and M. Bhatt, *Chem. Natural Comp.*, **39**, 1, 37 (2003).
10. E.P. Nosacheva., Yu. B. Kerimov and T.N. Bikbulatova, *Chem. Natural Comp.*, **9**, 98 (1975).
11. M.I. Gil, F.A. Tomas-Barberan, B. Hess-Pierce, D.M. Holcroft and A.A. Kader, *J. Agric. Food Chem.*, **48**, 4581 (2000).
12. A.P. Kulkarni and S.M. Aradhya, *Food Chem.*, **93**, 319 (2005).
13. E.H. Ewaida, Arab Gulf Journal of Scientific Research Agricultural and Biological Sciences B5, p. 367 (1987).
14. R.W. Hodgson, The Pomegranate, California Agricultural Export Statistics Bulletin 276, 163 (1971).
15. P. Nagy, P.E. Shaw and W.F. Wordowski, Fruit of Tropical and Subtropical Origin, Florida Science Source, Florida, USA, 328 (1990).
16. A. Sh. Isamukhamedov and S.T. Akramov, *Chem. Natural Comp.*, **18**, 367 (1997).
17. Anonymous, Sherlock Microbial Identification System, Version 4 MIS Operating Manual, Newark, DE, USA (2000).
18. A. Adiguzel, G. Agar, O. Baris, M. Gulluce, F. Sahin and M. Sengul, *Biochem. Systemat. Ecol.*, **34**, 424 (2006).
19. A. Fadavi, M. Barzegar and M.H. Azizi, *J. Food Compos. Anal.*, **19**, 676 (2006).
20. U.N. Das, *Prostag, Leukotr. Ess.*, **63**, 351 (2000).
21. M. Igarashi and T. Miyazawa, *Lipid*, **40**, 109 (2005).
22. T. Suzuki, Y. Tokuyama, M. Igarashi and T. Miyazawa, *Carcinogenesis*, **25**, 1417 (2004).
23. H. Kohno, Y. Yasui, R. Suzuki, M. Hosokawa, K. Miyashita and T. Tanaka, *Int. J. Cancer*, **110**, 896 (2004).
24. H. Tsuyuki, H.S. Itoh and Y. Nakatsukasa, *Bull. Coll. Agric. Veter. Med.*, **38**,141 (1981).
25. P. Melgarejo and F. Artes, *J. Sci. Food Agric.*, **80**, 1452 (2000).

(*Received*: 3 September 2007; *Accepted*: 10 December 2007) AJC-6125