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Chemical composition of pomegranate (*Punica granatum* L.) cultivars grown in Croatia

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Abstract. Pomegranate is among the oldest cultivated sub-tropical fruit species in the coastal part of Croatia, traditionally grown in central and southern Dalmatia. More recently, its fruits have gained interest for their nutritional values. The edible part of pomegranate fruit contains considerable amounts of vitamins, polysaccharides, polyphenols and minerals. One of the most important quality characteristics of pomegranate fruit are the arils and juice, which are primarily associated with anthocyanin pigments. Fruit samples of seven domestic pomegranate cultivars (Barski slatki, Ciparski rani, Crveni rani, Dividiš, Konjski zub, Sladun, and Šerbetaš) and wild pomegranate were collected from a productive pomegranate orchard in Metković (Croatia) (43°01'N 17°65 'E). The results on the main fruit quality traits (total soluble solids, total acidity, total sugar contents, total phenolic content, antioxidant activity and anthocyanins content) indicated significant statistical differences among cultivars.

Keywords. Pomegranate – Total soluble solids – Total acidity – Anthocyanins – Phenols.

I – Introduction

Pomegranate (*Punica granatum* L.) has been cultivated since ancient times through the Mediterranean region, Asia, Africa and parts of Europe (Morton, 1987). Pomegranate fruits are important for human health because of high antioxidant capacity and a high content of polyphenols and anthocyanins (Gil *et al.*, 2000).

In Croatia, pomegranate has been traditionally grown in Mediterranean part mainly in small orchards and gardens. The objective of this research was to analyse chemical properties of main pomegranate cultivars grown in the Mediterranean part of Croatia.

II – Material and methods

Fruit samples of seven pomegranate cultivars (Barski slatki, Ciparski rani, Crveni rani, Dividiš, Konjski zub, Sladun and Šerbetaš) and wild pomegranate were collected at the time of harvest in 2009 in productive pomegranate orchard in Metkovic (43°01'N longitude and 17°65 'E latitude).

The total soluble solids (TSS, °Brix) was determined using an optical refractometer, titratable acidity (TA, % of citric acid) was measured according to the AOAC method and total sugar content was determined by Luff-Schoorl method (AOAC, 1995). Maturity index (MI) was expressed as TSS/TA. Total phenolics were determined using Folin-Ciocalteu method (Singleton and Rossi, 1965). Antioxidant activities were determined with DPPH (Brand-Williams *et al.*, 1995) and TOSC (MacLean *et al.*, 2003) method. The analysis of anthocyanin content was carried out using Agilent 1200 HPLC system, using C18 column (150 x 3.5 mm; particle size 5 µm).

III – Results and discussion

Total soluble solids (TSS) of studied cultivars ranged from 12.5° to 15.0° Brix (Table 1). Cultivar Barski slatki had the highest TSS compared to other studied cultivars, except Šerbetaš and Wild. Turkish cultivars obtained TSS from 14.7%-17.9% (Ozgen *et al.*, 2008). Cultivars in this study belong to a group of sweet cultivars except cultivar Dividiš which belongs to a group of sweet-sour cultivars according to Onur and Kaska (1985). Titratable acidity of wild pomegranate (2.2%) was significantly higher than in other studied cultivars (Table 1). The MI depended on the cultivar, and in investigated cultivars varied from 11.5 in Dividiš to 33.9 in Konjski zub (Table 1). Higher TA resulted with the lowest MI (6.9). The highest TSC had cultivars Šerbetaš (13.7%) and Crveni rani (13.0%), where as the lowest one had cultivar Sladun (10.5%) (Table 1). In sweet Spanish cultivars TSC ranged from 11.96 g/100g to 15.89 g/100g (Melgarejo *et al.*, 2000).

Table 1. Total soluble solids (TSS), titratable acidity (TA), maturity index (MI), total sugar content (TSC), total phenolic content (TPC), DPPH, TOSC and total anthocyanin content (TAC) of seven Croatian pomegranate cultivars and wild pomegranate (means±SD)

Cultivar	TSS (°Brix)	TA (%)	Maturity Index (MI)	TSC (%)	TPC mg GAE/l	DPPH (%)	TOSC µmol Trolox eq/kg	TAC (Total anthocyanin content) mg/100g
Barski slatki	15.0±0.2a**	0.592±0.03c	25.7±0.9b	12.1±0.2 b	2603.0±124.1abc	67.7±1.2ab	425.8±10.1	214.8±20.9a
Ciparski rani	14.1±0.2b	0.429±0.01d	33.3±1.1a	12.0±0.1 b	2902.0± 47.2a	73.6±1.8a	450.1± 4.1	228.0±10.0a
Crveni rani	14.1±0.1b	0.423±0.01d	33.5±1.0a	13.0±0.4 a	2948.7±161.1a	68.8±2.7ab	410.9±12.7	130.1±7.8b
Dividiš	13.1±0.5cd	1.141±0.04b	11.5±0.1c	11.3±0.3 b	1985.6±170.3d	56.3±5.0c	436.4±13.2	13.2±6.4d
Konjski zub	12.5±0.4d	0.369±0.00d	33.9±0.6a	11.9±0.4 b	2443.4± 85.6bc	63.1±2.2bc	404.9± 5.0	28.6±3.2d
Sladun	13.9±0.1bc	0.431±0.00d	32.3±0.3a	10.5±0.1 c	2327.9±182.2cd	63.8±6.4bc	434.8± 6.0	79.1±16.4c
Šerbetaš	14.4±0.2ab	0.464±0.01d	31.4±0.3a	13.7±0.5 a	2851.9± 99.2ab	67.1±1.7ab	420.0±16.6	203.1±15.0a
Wild	14.8±0.4ab	2.164±0.08a	6.9±0.3d	11.3±0.1 b	2261.1±202.7cd	63.5±1.8bc	427.5±17.5	42.1±3.1cd

** Different letters within column indicate significant differences by *LSD* test at $P \leq 0.05$.

In this study, TPC differed significantly between cultivars and varied from 1985.6 mg/l to 2948.7 mg/l (Table 1). Gil *et al.* (2000) found that TPC of the cultivar Wonderful was 2117 mg/l, TPC of pomegranates from Turkey was reported from 1245 to 3436 mg/l (Ozgen *et al.*, 2008). Differences between cultivars were found for DPPH but not for TOSC values (Table 1), presumably due to differences in reaction kinetics between these two methods and their interaction with radicals. In our study, DPPH averaged 65.5% and is higher compared to 36.9% that Tezcan *et al.* (2009) reported in their study of commercial juices, which have higher activity than experimental juices obtained by pressing the arils (Gil *et al.*, 2000).

The TAC of investigated cultivars varied significantly, the lowest values were recorded for Konjski zub and the highest TAC was found for Barski slatki, Ciparski rani, and Šerbetaš (Table 1).

IV – Conclusions

This study showed variation in some of the chemical and antioxidant characteristics of pomegranate cultivars grown in Croatia. It is important to further evaluate and conserve local genetic materials.

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