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Nutritional values of traditional open-pollinated melon (*Cucumis melo* L.) and watermelon (*Citrullus lanatus* [Thumb]) varieties

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Summary: The aim of our experiments was to investigate the internal quality parameters of some old melon and watermelon landraces or varieties whether they have any desirable characteristics. Measurements were carried out using 8 different types of melon (*Cucumis melo* L.) and 8 accessions of watermelon (*Citrullus lanatus* [Thumb]), which were self pollinated under greenhouse conditions. Besides the determination of dry matter content; soluble solids, titratable acidity of the fruit juices, investigation of carbohydrates, total phenol content was measured by spectrophotometer. Total antioxidant capacities were determined spectrophotometrically using the FRAP method. We found some accesions both among melon and watermelon varieties, which could be characterized by outstanding inner content.

Key words: melon, watermelon, landrace, old variety, antioxidant capacity, total phenol content, quality, human nutrition

Introduction

Everyone knows about the large number of data published in the national and international surveys, according to which heart and cardiovascular disaseases and certain cancers play a leading role in the causes of death (*Anderson* et al., 2000; *Muszbek* et al., 2002). Ever-increasing levels of environmental pollution lead to the accumulation of free radicals that are hazardous substances for all living organisms. Antioxidant compounds are able to scavenge oxygen radicals and eliminate oxidative stress. Many epidemiological studies have concluded that a diet rich in fruits and vegetables reduces the incidence of heartdisease and cancer in humans. (*Stefanovits-Bányai* et al., 2005/a; *Stefanovits-Bányai* et al., 2005/b; *Hájos* et al., 2004).

According to the data reported in the literature, it is ever more frequently confirmed for melons that their known and unknown, often not sufficiently exploited, therapeutic effect can be ascribed to antioxidant compounds (*Leong & Shui*, 2002; *Lewinsohn* et al., 2005). Among them, citrullin and lycopene are demonstrated to play a prominent role in the watermelon (*Rimando & Perkins-Veazie*, 2005), while the therapeutic effect of the melon can be ascribed to the enzyme superoxid-dismutase (and to the Q10) and to carotenoids, as well as to the vitamins A, C, B1, B2 and E (*Vouldoukis* et al., 2004).

American researchers proved that, on average, watermelon has about 40 percent more lycopene (40–120 μg/g) than raw tomatoes, though it is true that the level of lycopene is dependant on the variety and the conditions of production. Furthermore, the lycopene contained in the watermelon is immediately available to the human organism in contrast to tomatoes, where the greater part of lycopene becomes only available after treatment with heat (*Perkins-Veazie* et al., 2004). This red pigment has a very significant antioxidant capacity. According to the trials, it is proved to be effective in the prevention of various vascular diseases, heart attacks and cancers (especially prostatic cancer). Some authors in their articles refer to certain watermelon varieties with high lycopene content as so-called functional food (*Collins* et al., 2005). In order to make possible its use in the lycopene-rich therapeutic diet for diabetic consumers who struggling against obesity, low-sugar watermelon varieties were developed recently using traditional plant breeding techniques.

Materials and methods

Measurements were carried out using 8 different types of melon (*Cucumis melo* L.) and 8 accessions of watermelon (*Citrullus lanatus* [Thumb]), which were forced under greenhouse conditions. The plants where nursed in plastic containers filled with peat/sand based soil mixture and fertilized equally. Both melon and watermelon plants were trellised and pruned to make the self-pollinations easier.

Supernatants obtained from the homogenized and centrifuged edible parts of the fruits were used for the measurements. Besides the determination of dry matter content (MSZ 2429-1980); soluble solids, titratable acidity (MSZ 3619-1983), of the fruit juices, Total phenol content – which represents an important fraction of the total antioxidant capacity – was measured by spectrophotometer (γ=760 nm) and expressed as gallic acid equivalents (Singleton & Rossi, 1965). Total antioxidant capacity, related to ascorbic acid was determined spectrophotometrically (γ=593 nm) using the FRAP (Ferric Reducing Ability of Plasma) method (*Benzie & Strain*, 1996).

Results and Discussion

Eight varieties of both species were analyzed in the present study. Very low titratable acidity levels (*Table 1*) were found both in the melon and watermelon fruits, but the measured values were only slightly lower than those published previously (*Bíró & Lindner*, 1998).

Table 1. Basic parameters of the investigated melon and watermelon accessions

Accession	flesh colour	dry matter content	soluble solids	titratable acidity
		(%)	(%)	(%)
Melon				
AMO	orange	10,970	15,180	0,100
PFB	orange	8,570	10,700	0,110
KS	orange	10,200	15,930	0,130
PGR	orange	10,950	14,230	0,094
TG	green	8,060	10,530	0,110
MK	green	10,600	13,980	0,110
DX	green	8,900	10,740	0,130
VAN	green	10,920	13,700	0,172
Watermelon				
SZNTS	yellow	9,020	11,900	0,110
GYV	orange	9,360	11,440	0,080
BTG	orange	9,790	10,900	0,100
NHN	orange	10,100	11,650	0,100
SP	red	8,240	10,500	0,100
SZZ	red	10,700	11,370	0,100
KV	red	10,950	11,330	0,060
MRT	red	8,660	10,500	0,100

Considering the results of total phenol content measurements (*Figure 1*) we can state that orange fleshed melons (AMO, PFB, KS, PGR) are generally richer in phenolic compounds than the green fleshed (TG, MK, DX, VAN) ones. We have found only one exception. The DX accession showed significantly higher total phenol content compared to the other green fleshed varieties.

According to the results of total antioxidant capacity measurements melon (*Figure 2*) varieties (PFB, KS) with the most vibrant yellow coloured flesh showed the highest antioxidant capacities. However, it was surprising that several green fleshed accessions (TG, DX, VAN) showed higher total antioxidant capacity than some of the orange fleshed ones (AMO, PGR).

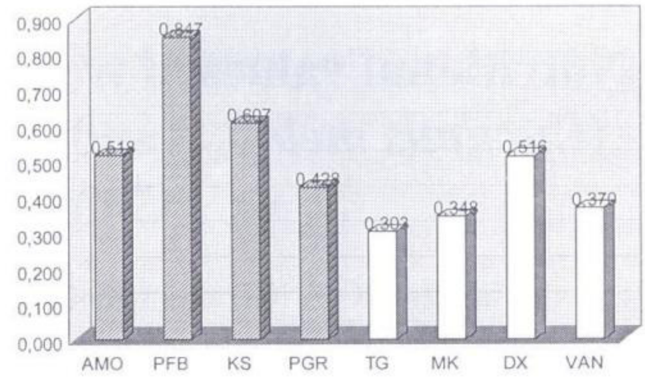

Figure 1. Total phenol content (mg/ml) in melon varieties
*AMO, PFB, KS, PGR – orange fleshed
TG, MK, DX, VAN – green fleshed

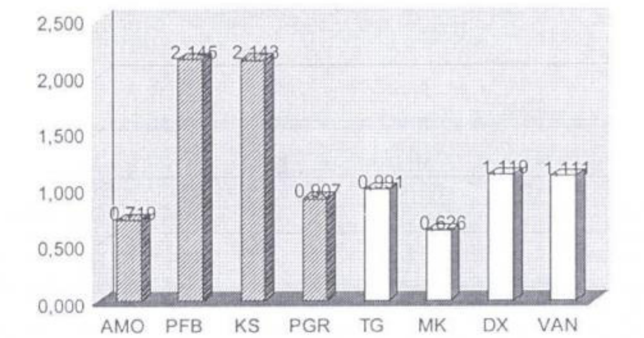

Figure 2. Total antioxidant capacity (mM Ascorbic Acid/L) in melon varieties
*AMO, PFB, KS, PGR – orange fleshed, TG, MK, DX, VAN – green fleshed

Among the watermelon landraces and old varieties an orange fleshed accession (GYV) showed the highest total phenol content (*Figure 3*). Significant differences have been determined between and within the yellow, orange and red fleshed watermelons.

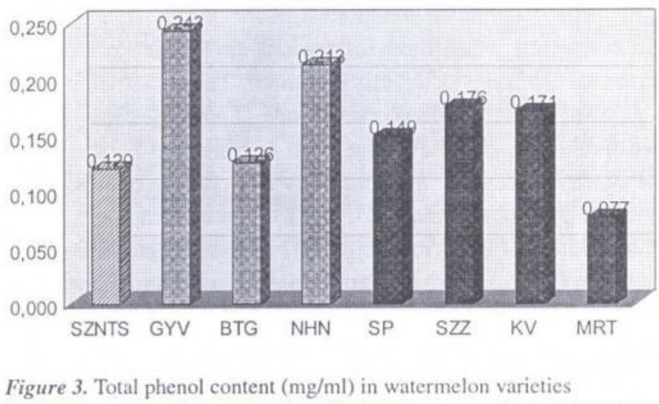

Figure 3. Total phenol content (mg/ml) in watermelon varieties
*SZNTS – yellow fleshed, GYV, BTG, NHN – orange fleshed, SP, SZZ,

Total antioxidant capacity results of watermelon accessions indicate that there is a close correlation between flesh colour and antioxidant power within red fleshed varieties. SP and KV can be characterized with the highest total antioxidant capacity and the deepest red flesh colour at the same time (*Figure 4*).

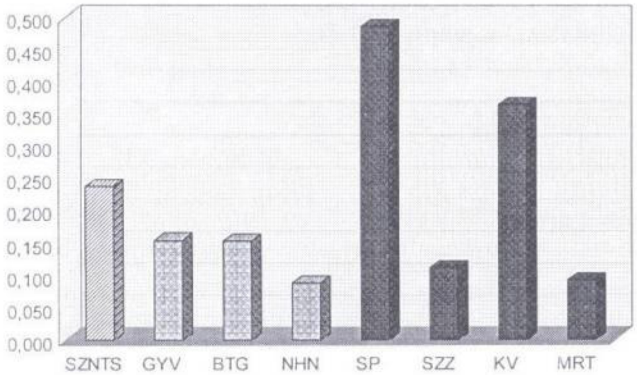

Figure 4. Total antioxidant capacity (mM Ascorbic Acid/L) in watermelon varieties
*SZNTS – yellow fleshed, GYV, BTG, NHN – orange fleshed, SP, SZZ, KV, MRT – red fleshed

Conclusion

Summarizing the results it could be clarified that there are outstanding accessions among the investigated traditional melon and watermelon landraces and old varieties. Knowledge on the internal quality parameters may help to decide which variety can be used as a breeding material in our future work.

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