COLOUR STABILITY OF CROSSBRED ELDERBERRY GENOTYPES AFTER HEAT TREATMENT

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Introduction

Elderberry (*Sambucus nigra* L.) is a deciduous shrub, which grows in many parts of the world especially on areas usually exposed to sunlight, such as the USA, Europe, Asia and North Africa (Veberic et al., 2009). Elderberry fruits are a good source of polyphenols including anthocyanins which are members of flavonoids, liable for the red, orange, blue and purple black colour in fruits. They are, therefore, a preferred source of natural food colourant in the food industry, to adjust food colour. However, anthocyanins are not very stable molecules, some factors especially heat can affect their concentration in berries and their products during processing. Furthermore, elderberry varieties have different anthocyanin concentration with different stability (Domínguez et al., 2021). Hence, different varieties should be studied to select elderberries with high and stable pigment concentration.

Aim

The aim of this study was to determine the colouring potential of different crossbred elderberry genotypes and evaluate the pigment stability after heat treatment.

Materials and Methods

Elederberry samples were collected in 2021 in Hungary. Haschberg (H) variety was the control sample; and its three different crossbred genotypes were the following: Haschberg×Sampo (HS), Haschberg×Samocco (HSC) and Haschberg×Wild (HW). Heat treatment of elderberry juice was performed at 85°C for 3 minutes.

The total anthocyanin concentration was evaluated using the pH differential method (AOAC Official Methods 2005.02). The total polyphenols were analysed using the Folin-Ciocalteu method (Singleton and Rossi, 1965). Colour parameters were determined by Konica Minolta digital colorimeter, and water soluble solid values were measured by digital refractometer.

Figure 1: Elderberry samples

Results

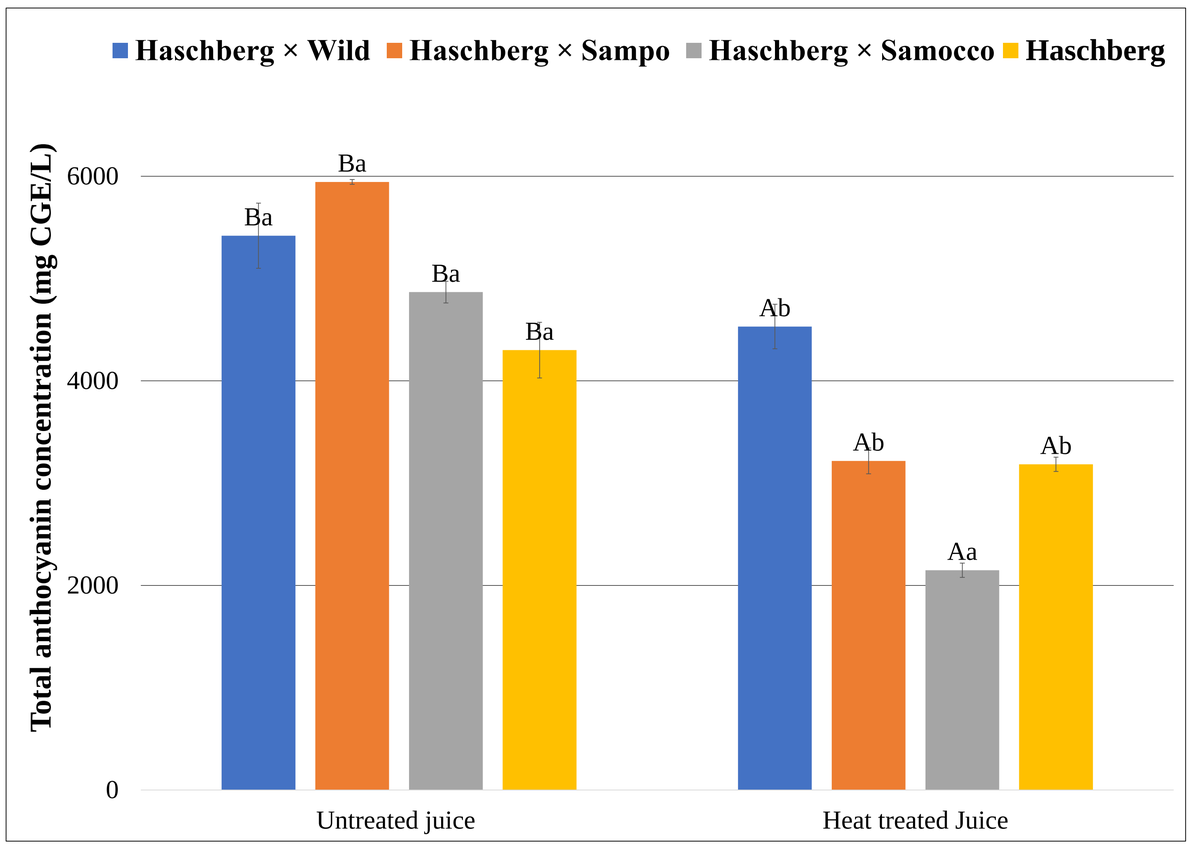

Figure 2. Concentration of total anthocyanins in elderberry samples

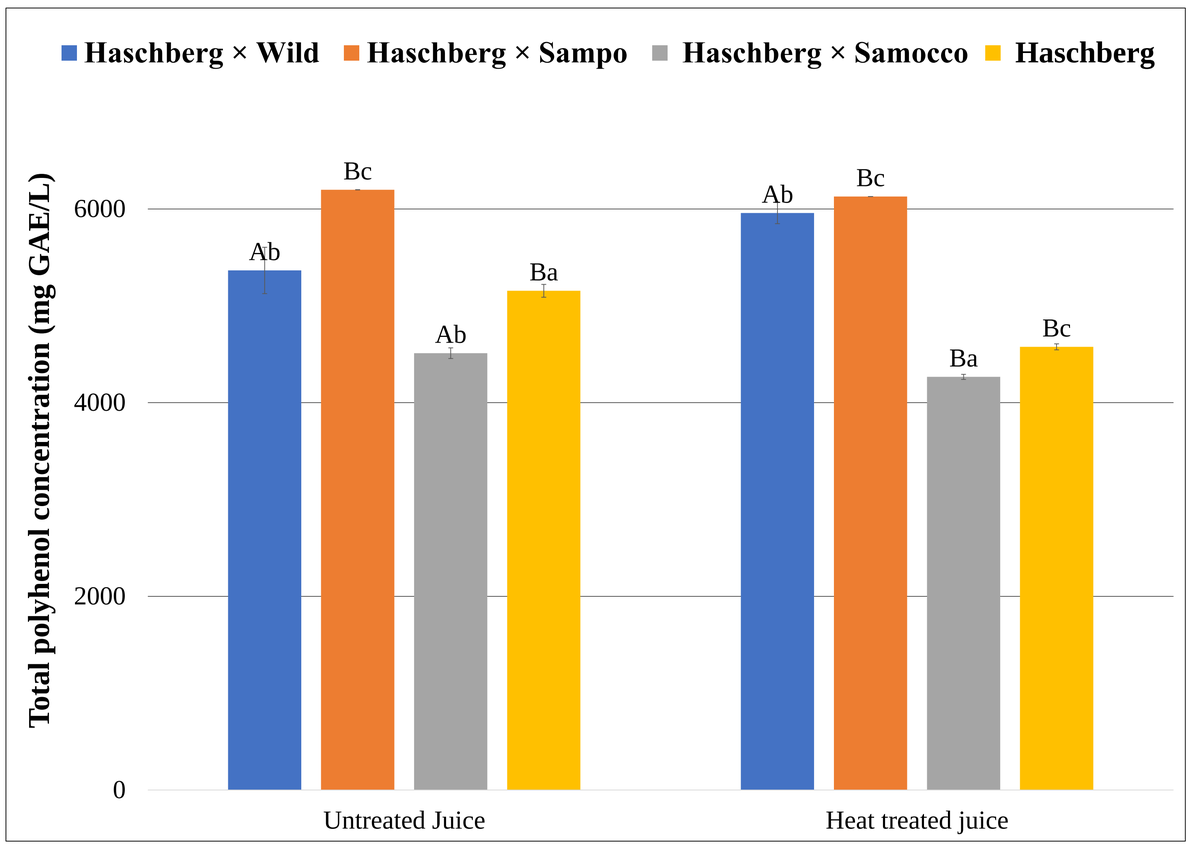

Figure 3. Concentration of total polyphenols in elderberry samples

Table 2: Colour parameters between samples after different treatments

Samples		L*	a*	b*	ΔE*
HW	Untreated	18.50±0.01^{Ab}	0.04±0.01^{Aa}	-0.26±0.02^{Ab}	**0.50**
	Heat treated	18.06±0.03^{Aa}	0.27±0.04^{Ac}	-0.22±0.01^{Cb}	
HS	Untreated	18.37±0.05^{Aa}	0.18±0.02^{Ab}	-0.27±0.023^{Ab}	**1.46**
	Heat treated	19.81±0.03^{Dc}	0.54±0.03^{Bc}	-0.34±0.02^{Aa}	
HSC	Untreated	20.08±0.01^{Cc}	0.26±0.02^{Ca}	-0.25±0.01^{Ab}	**1.20**
	Heat treated	19.17±0.07^{Cb}	1.03±0.05^{Dd}	-0.10±0.012^{Dc}	
H	Untreated	19.20±0.02^{Bc}	0.38±0.03^{Da}	-0.25±0.0^{Ab}	**0.61**
	Heat treated	18.67±0.02^{Bb}	0.66±0.01^{Cd}	-0.29±0.01^{Ba}	

x±SD(x: mean, SD: standard deviation
^{a,b,c} etc. Same letter indicates that there is no significant difference at 95% confidence level between results

Conclusion

The untreated samples had higher anthocyanin concentrations (ranged 5944-4300 mg CGE/L) than the treated ones (ranged 4530-2148 mg CGE/L). In terms of elderberry samples, pigment content decreased by 26% in case of Haschberg, by 46% in case of HS, by 56% in case of HSC and only by 13% in case of HW (Figure 2.).

Total polyhenol content was more stable against heat treatment than anthocyanins because the values did not change significantly or decreased only minimally in case of the samples after heat treatment (Figure 3.).

The calculated colour difference values (ΔE*) ranged 0.50-1.46 (Table 2.), so the differences between the untreated and treated samples were barely noticeable. Water soluble solids decreased by ca. 6-8% after heat treatment in case of each sample (data are not shown).

In summary, heat caused considerable change in total anthocyanin concentration, which influences the colouring ability of elderberry. Based on the measurements, Haschberg×Wild genotype has a good potential for use as food colouring due to the relatively high and stable anthocyanin concentration against heat.

References:

Bonerz, D., Würth, K., Dietrich, H., & Will, F. (2006). Analytical characterization and the impact of ageing on anthocyanin composition and degradation in juices from five sour cherry cultivars. *European Food Research and Technology*, *224*(3): 355–364. https://doi.org/10.1007/s00217-006-0328-7

Domínguez, R., Pateiro, M., Munekata, P. E. S., López, E. M. S., Rodríguez, J. A., Barros, L., & Lorenzo, J. M. (2021). Potential Use of Elderberry (Sambucus nigra L.) as Natural Colorant and Antioxidant in the Food Industry. A Review. 17.

Lee et al., J., (2005). OAC 2005.02: Total Monomeric Anthocyanin Pigment Content of Fruit Juices, Beverages, Natural Colorants, and Wines- pH Differential Method. Official Methods of Analysis of AOAC International , 37: 37-39.

Singleton, V. & Rossi, J., (1965). Colorimetry of Total Phenolics with Phosphomolybdic-Phosphotungstic Acid Reagents. American Journal of Ecology and Viticulture, 16: 144- 158.

Veberic, R., Jakopic, J., Stampar, F., & Schmitzer, V. (2009). European elderberry (Sambucus nigra L.) rich in sugars, organic acids, anthocyanins and selected polyphenols. *Food Chemistry*, *114*(2): 511–515. https://doi.org/10.1016/j.foodchem.2008.09.080

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