ASPECTS CONCERNING THE NUTRITIONAL QUALITY OF SOME FRESH CHERRIES GROWN IN THE MOLDAVIAN REGION OF ROMANIA

INVESTIGAREA CALITĂȚILOR NUTRITIVE ALE UNOR FRUCTE DE CIREȘ CULTIVATE ÎN ZONA MOLDOVEI A ROMÂNIEI

PAȘCU D. D.[1], GRĂDINARIU G.[1], CIOBOTARI Gh.[1]
e-mail: dragos_daniil@yahoo.com

Abstract. *In this paper, we have determined the soluble carbohydrates, fruit acidity, total flavanoids and total content of minerals of the fruit from 20 cherry-tree varieties, cultivated in the Moldavian area. The purpose of this paper has been the identification of the varieties with high quality value regarding the content of these compounds, substances and properties. Following the analysis carried out, it has been identified that the soluble carbohydrates content varied between 10.8 and 17.77 %, the fruit acidity registered values between 3.9 and 10 g/L (expressed in citric acid), the flavanoids content was between 21.8 – 73.69 mg/100 g FW, and the total mineral content has been between 0.27 and 2.4 %.*
Key words: soluble carbohydrates, acidity, flavanoids, total minerals

Rezumat. *În această lucrare am determinat glucidele solubile, aciditatea fructelor, flavanoli totali și conținutul total de minerale la 20 de varietăți de cireș cultivate în regiunea Moldovei. Scopul lucrării a constat în identificarea soiurilor cu fructe de calitate superioară din punct de vedere al continutului acestor compusi, substante si proprietati. In urma analizelor efectuate s-a constatat ca continutul de glucide solubile a variat între 10.8 și 17.77 %, aciditatea fructelor a înregistrat valori cuprinse între 3.9 și 10 g/L (exprimat în acid citric)., continutul de flavanoli s-a încadrat între 21.8 – 73.69 mg/100 g FW, iar continutul de minerale totale a fost cuprins între 0.27 și 2.4%*
Cuvinte cheie: glucide solubile, aciditate, flavanoli, minerale totale

INTRODUCTION

The cherry tree is one of the most important fruit bearing trees from the temperate area. Its fruit is highly appreciated due to their quality (sugar, vitamins, mineral content and various bio-active compounds), as well as due to the fact that in some areas these are the first fresh fruit of the year.

The colour of the fruit is its most important commercial quality and an indicator of the maturity of the cherries that fully depends on the total antocians content. (Esti et al., 2002). It is known that cherries have an important content of polyphenols and antocians, that contribute to their antioxidant activity (Goncalves et al., 2004; Khanizadeh et al., 2007; Serranoet al., 2005; Vangdal et al., 2007; Vursavuset al., 2006).

[1] University of Agricultural Sciences and Veterinary Medicine of Iasi, Romania

The objective of our researches has been to quantify the main qualitative properties for 20 varieties of cherry-trees, of different origin and tree characteristics.

MATERIAL AND METHODS

The fruit have been harvested on their commercial maturity directly in liquid nitrogen, afterwards they were stored at -80°C until the analysis were carried out. From the 20 varieties taken for the study, 17 had red epidermis (Ponoare, Cerna, Precoce della Marca, Viva, Iasirom, Daria, Rosii de Bistrita, Ramon Oliva, Rainbow, Timpurie Franceza, Victor, Bing, Lapins, Colina, Scorospelka, Bigarreau Burlat, Timpurii de Bistrita), one variety had yellow epidermis (Bigarreau Donissen) and two varieties were sour cherries, used mainly for industrialization (Amar Costuleni and Amar Boiste).

In order to determinate the soluble carbohydrates we have used the *School Method*, modified by Vlad Artenie. The dry soluble substance from the fruit juice has been determined through the *refracto-metric method.*

The total acidity from the fruit juice has been established through the *potentiometric method.* The diluted juice samples have been titred with a sodium hydroxide 0.1 N up to pH 7 which has been potentiometrically determined. Previously, the carbon dioxide has been removed from the sample.

The total flavanoids (TFA) have been determined using the *DMACA method* (Li, Tanner, Larkin, 1996). In a 10 mL test tube 0.2 mL extract has been mixed with 3 mL DMACA solution (0.1% HCl 1 mol/L in MeOH). The mixture was agitated and then 10 minutes later the absorbance was read at a wave length of 640 nm in comparison with the blind sample without DMACA. The TFA content has been established according to an echelon curve with catechin (6.25–200 mg/L).

In order to determine the total content of mineral from fruit, these have been weighed in porcelain crucible, then entered in the calcinations oven at 600°C for 6 hours, and after cooling, the crucibles were weighed.

RESULTS AND DISCUSSIONS

The early fruition of the species *Prunus avium* L. suggests that a substantial part of the carbohydrates used in the incipient phase of the culture development comes from reserves (Roper and Kennedy, 1986).

Carbohydrates are the most important compounds of wooden plants, totalling three quarters of their dry substance (Pallardy, 2008).

Some authors (Serrano et al., 2005; Usenik et al., 2005) think that the predominant sugar in cherry-tree fruits is glucose, and for this reason we have resumed to determining the content of soluble carbohydrates.

As it can be observed from the results of our analysis, (tab. 1) the quantity of soluble carbohydrates from fruit varies between 10.8% at the Scorospelka variety and 17.77% at the Timpurie Franceza variety. Very similar values to the maximum one were also registered for the Amar Costuleni (17.33%) variety and Timpurii de Bistrita (17.32%).

Table 1

Soluble dry substance content and soluble carbohydrates for the fruit of several cherry tree varieties

Variety	S.U.S. (%)	Soluble carbohydrates (%)
Ponoare	15.50	13.95
Cerna	13.75	12.38
Precoce della Marca	14.49	13.04
Amar Costuleni	19.25	17.33
Viva	14.56	13.11
Daria	15.26	13.74
Iasirom	17.67	15.90
Rosii de Bistrita	14.54	13.09
Ramon Oliva	14.76	13.28
Bigarreau Donissen	15.75	14.17
Rainbow	14.71	13.23
Timpurie Franceza	19.75	17.77
Victor	15.00	13.50
Bing	16.50	14.85
Lapins	14.51	13.06
Colina	14.97	13.47
Scorospelka	12.00	10.80
Amar Boiște	16.26	14.63
Bigarreau Burlat	14.00	12.60
Timpurii de Bistrita	19.25	17.32

The fruit of the superior plants contain a large variety of organic acids, among which the most important is the malic, oxalic and critic acids that together total 80% of the titled acidity.

The titled acidity of the fruit juice, the leaves infusion etc measures the concentration of titled hydrogen ions that are contained in the analyzed samples, by neutralization with a strong base solution at fixed pH fix. Its value contains all substances of acid nature such as: free hydrogen ions, organic acids, acids and cations. Since the organic acid is the main component from the sample that reacts with a basic solution, the titled acidity is expressed as g/L or g/100 mL from the main acid. Usually, in fruit, the predominate acid is either the citric or the malic acid, or both.

The total acidity of the cherry fruit has been expressed in g L^{-1} citric acid ($C_6H_8O_7$).

The results of the analysis carried out for the fruit of the varieties presented in fig. 1 presented acidity values of the total acidity between 3.9 g L^{-1} $C_6H_8O_7$ at the Victor variety and 10.5 g L^{-1} $C_6H_8O_7$ la at Iasirom variety.

High values have also been registered for the varieties: Timpurie Franceza (8.51 g L^{-1} $C_6H_8O_7$), Ramon Oliva (7.42 g L^{-1} $C_6H_8O_7$) and Amar Costuleni (7.3 g L^{-1} $C_6H_8O_7$)

Some authors (Serrano et al., 2005; Usenik et al., 2005) state that in cherries the malic acid is the predominant one.

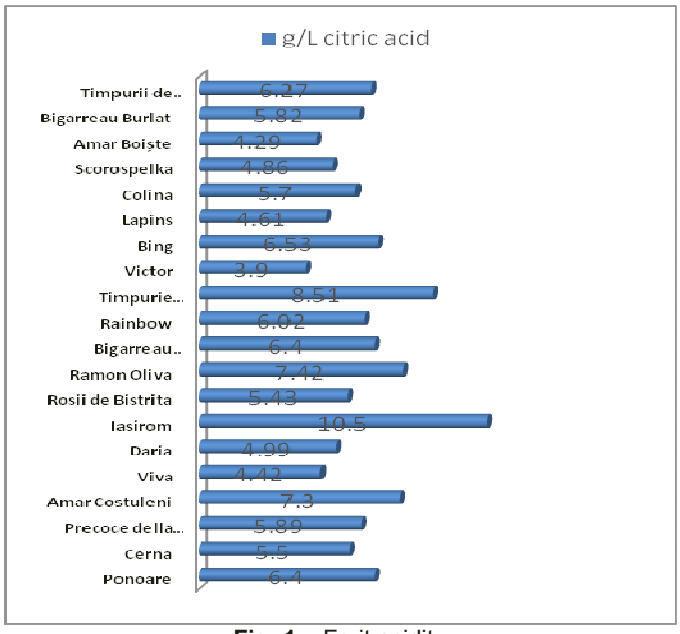

Fig. 1 – Fruit acidity

For total flavanoids (fig. 2), we have registered values between 21.8 mg/100 g FW for Iasirom variety and 73.69 mg/100 g FW for Amar Boiste variety. High values were also obtained for the Lapins (61.03 mg/100 g FW) and Daria (56.68 mg/100 g FW) varieties.

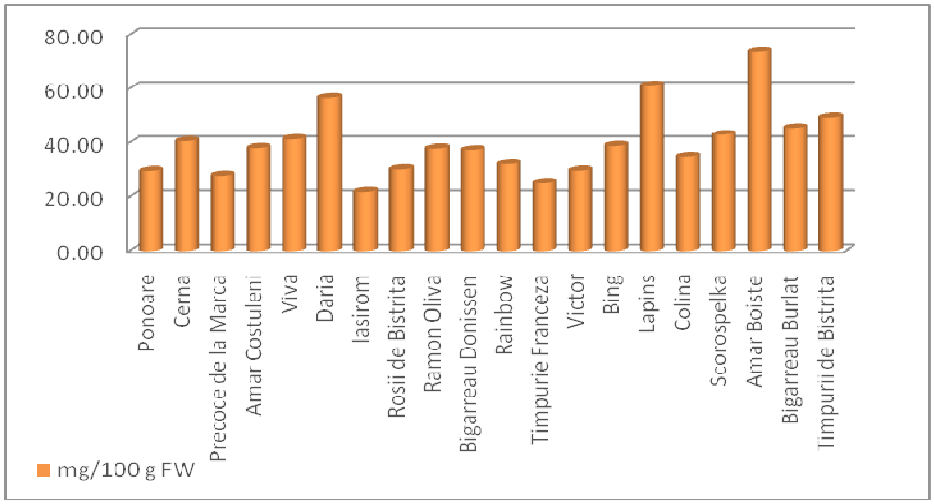

Fig. 2 – Total flavanols

Regarding the total minerat content (table 2), we have registered the highest values for Timpurie Franceza (1.12 %) and Ramon Oliva (1.05 %) varieties, and the lowest for Rainbow (0.32%) and Precoce della Marca (0.33%) varieties.

Table 2

Dry weight and total mineral content for the fruit of several cherry tree varieties

Variety	Dry weigth (%)	Total minerals (%)
Ponoare	14.50	0.72
Cerna	15.68	0.27
Precoce della Marca	15.42	0.33
Amar Costuleni	17.59	0.67
Viva	14.17	0.78
Daria	15.61	0.43
Iasirom	17.10	0.64
Rosii de Bistrita	19.17	0.94
Ramon Oliva	14.99	1.05
Bigarreau Donissen	19.18	0.86
Rainbow	13.88	0.32
Timpurie Franceza	17.51	1.12
Victor	16.43	0.47
Bing	17.40	0.82
Lapins	15.80	0.54
Colina	16.67	0.41
Scorospelka	11.52	0.37
Amar Boiște	17.10	0.65
Bigarreau Burlat	17.58	0.39
Timpurii de Bistrita	17.86	0.49

CONCLUSIONS

The results of the analysis carried out show the existence of some significant differences on the bio-chemical composition of the fruit from the cherry-tree varieties taken for the study. The cultivar Timpurie Franceza has stood out through its high content of sugar, citric acid and minerals, but also had one of the lowest quantities of flavonoids. For the Scorospelka variety we have obtained the lowest values at all the analysis

REFERENCES

1. **Esti L., Cinquanta F., Sinesio E., Moneta E., Di Matteo M.**, **2002** - *Physicochemical and sensory fruit characteristics of two sweet cherrycultivars after cool storage*. Food Chemistry 76, p. 399–405.
2. **Goncalves B., Landbo A. K., Let M., Silva A. P., Rosa E., Meyer A.S.**, **2004** - *Storage affects the phenolic profiles and antioxidant activities of cherries (Prunus avium L.) on human low-density lipoproteins*. Journal of the Science of Food and Agriculture, 84(9), p. 1013–1020.

3. **Khanizadeh S., Tsao R., Rekika D., Yang R., DeEll J.**, **2007** - *Phenolic composition and antioxidant activity of selected apple genotypes*. Journal of Food, Agriculture & Environment, 5(1), p. 61–66.
4. **Li Y.G., Tanner G., Larkin P.**, **1996** - *The DMACA-HCl protocol and the threshold proanthocyanidin content for bloat safety in forage legumes*, Jurnal of the Science of Food and Agriculture, 701, p. 89-101.
5. **Pallady S.G.**, **2008** – *Physiology of woody plants*, Academic Press, UK.
6. **Roper T. R., R. A. Kennedy**, **1986** - *Photosynthetic characteristics during leaf development in 'Bing' sweet cherry*. J. Amer. Soc. Hort. Sci. 111, p. 938-941.
7. **Serrano M., Guillen F., Martinez-Romero D., Castillo S., Valero D.**, **2005** - *Chemical constituents and antioxidant activity of sweet cherry at different ripening stages*. Journal of Agricultural and Food Chemistry 53, p. 2741–2745.
8. **Usenik Valentina, Fabčič Jerneja, Štampar F.**, **2008** - *Sugars, organic acids, phenolic composition and antioxidant activity of sweet cherry (Prunus avium L.).* Food Chemistry, Volume 107, Issue 1, 1 March 2008, p. 185-192.
9. **Usenik Valentina, Štampar F., Šturm K., Fajt N.**, **2005** - *Rootstocks affect leaf mineral composition and fruit quality of 'Lapins' sweet cherry*. ActaHorticulturae 667, p. 247–252.
10. **Vangdal E., Sekse L., Slimestad R.**, **2007** - *Phenolics and other compounds with antioxidative effect in stone fruit – Preliminary results*. Acta Horticulturae, 734, p. 123–131.
11. **Vursavus K., Kebelek H., Selli, S.**, **2006** - *A study on some chemical and physicomechanic propertis of three sweet cherry varieties (Prunus avium L.) in Turkey*. Journal of Food Engineering, 74(49), p. 568–575.