ANALITICAL DATES CONCERNING THE FRUITS OF SOME SWEET CHERRY CULTIVARS OBTAINED AT FRUIT GROWING DEVELOPMENT STATION IAŞI

DATE ANALITICE PRIVIND FRUCTELE UNOR SOIURI DE CIREŞ OBȚINUTE LA SCDP IAȘI

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Abstract. *The knowledge of the physical-chemical features of the cherry fruits is a very important element to define their quality and the establishing of their destination for fresh consumption or industrialization. The evaluation of the technological features of fruits for 7 cherry cultivars (Cetățuia, Cătălina, Golia, Ştefan, Bucium, Maria, Tereza) created at the Station for Research Development in fruit growing Iaşi and of a black test (Boambe de Cotnari, one of the most spread cultivars cultivated in Romania), was made on fruit samples from the harvest of 2007 within the comparative contest culture found on the experimental plot. We focused on aspects such as: the harvest time, the fruit size, the percentage of stones, the contents in dry soluble substance, the reducing sugars, total acidity, the ratio sugar/acidity, the antioxidizing capacity expressed in rH, the contents in pigments, the contents in phenolic substances and anthocians. The cultivars Golia, (by the size of the fruit 7,6 g, the contents in sugars 12,46 % and acidity of 1,05 g%), Ştefan (by the contents in dry soluble substance 22,2 ^{0}Brix), Tereza and Bucium (by the pulp/ stone ratio) stood out.*

Rezumat. *Cunoaşterea însuşirilor fizico-chimice ale fructelor la cireşe, constituie un element foarte important pentru definirea calității acestora. S-a încercat stabilirea unor criterii pentru caracterizarea şi aprecierea fructelor din punct de vedere fizic, chimic, tehnologic şi biochimic, criterii care vor putea fi utilizate pentru promovarea şi menținerea acestor soiuri în sortimentul zonal de influență a SCDP Iaşi. Analiza însuşirilor fizice şi a compoziției chimice ale fructelor la soiuri noi de cireşe create la Stațiunea de Cercetare Dezvoltare pentru Pomicultură Iaşi, a fost realizată pe probe de fructe din recolta anului agricol 2007, din cadrul unei culturi comparative de concurs aflată în poligonul experimental. S-au luat în studiu 8 soiuri, şi s-au urmărit aspecte privind : epoca de recoltare, mărimea fructelor, % sâmbure, conținutul în substanță uscată totală şi solubilă, % apă, glucide reducătoare, aciditate totală, raportul zahăr/aciditate, rezistența la deformare, capacitatea antioxidantă exprimată în rh, conținutul în pigmenți, conținutul în substanțe fenolice şi antociani.*

Key words: sweet cherry fruit, cultivar, chemical composition, phenolic content, antioxidant capacity.

INTRODUCTION

The knowledge of the physical-chemical features of the cherry fruits is a very important element to define their quality both for fresh consumption or processing

(*Beceanu and Chira, 2003; Gherghi et al. 2001)*. The cultivars under study were created at SCDP Iaşi and homologated in the interval 1999-2006.

From the harvest of 2007, we studied the fruits from 7 new cherry cultivars making determinations and analyses regarding the following aspects: the fruit size, the percentage of stones, the contents in dry soluble substance, the reducing sugars, total acidity, the ratio sugar/acidity, the antioxidizing capacity expressed in rH, the contents in pigments, the contents in phenolic substances and anthocians and chromatic characteristics. Depending on these features we noticed the most valuable cultivar, by destinations for capitalization in the climatic conditions of year 2007.

MATERIAL AND METHODS

The fruit productions registered in 2007 for sweet cherries were lower than in the previous years, the determining factor being the excessive drought registered in April-June that caused an accentuated physiological fall of fruits and an inferior quality of these.

For experiments, we used fruits harvested from 7 new sweet cherry cultivars (*Cetățuia, Cătălina, Golia, Maria, Ştefan, Tereza and Bucium*), existing within a contest culture at FGDS Iaşi and a blank test (*Boambe de Cotnari*, the most spread cultivar from the area of influence of FGDS Iaşi).

We made observations, determinations and analyses in terms of: the fruit size, the percentage of stones, the contents in soluble dry substance, the total contents of reducing sugars, total acidity, the ratio sugar/acidity, the reduction-oxidization potential expressed in rH, the contents in colour pigments, the contents in phenols and anthocians. The physical-chemical analysis of fruits was effectuated according to the existing standards. To determine the fruit size we measured the weight of 100 whole fruits (g) and the weight of 100 dry stones (g) using a precise electronic scales and then on account of these determination we calculated the pulp/stone ratio.

The titrating acidity was determined by neutralization with hydroxide solution 0,1 N, up to the equivalence point using timol-phtaleine as an indicator.

The contents in reducing sugars were determined by the Schoorl method and the soluble dry substance was determined by refractometry using a manual refractometer Zeiss.

The reduction-oxidization potential was determined by the potentiometer using a platinum electrode and a reference electrode (saturated calomel) (Zănoagă, 1988). The rH parameter was calculated by Clark formula, the result being expressed in volts.

Preparation of the fruit samples. From each cultivar we took samples of 250 g of fruit at commercial maturity that were immediately frozen at –20 ^{o}C. From these fruits we took 10 fruits from each cultivar (x 4 repetitions), that were cold ground after which they were put into contact with 100 ml solution 5/1 methanol/HCl and then with another 50 ml 100/1 methanol/HCl. They were evaporated at 35 degrees with a rotating vapor and then adjusted to the volume of 100 ml with acidulated water of pH 2. We made the analyses using this methanol extract.

Analyses effectuated. The total contents in poly-phenols were determined through the total poly-phenolic index (TPI) at a wave length of 280 nm (D_{280}).

The determination of the anthocians contents was made through bleaching with sulphureous acid, anthocians reacting in an acid environment with the sulphureous acid forming colorless sulphitic combinations and the results were expressed in mg/l of methanol extract.

The determination of the chromatic characteristics was made through the method CIE Lab-76 expressed by luminosity parameters (parameter L) and the colour coordinates (parameter a for complementary colours red-green and parameter b for complementary colours yellow-blue).

RESULTS AND DISCUSSIONS

The quality of the cherry fruit is also determined by the fruit size that internationally tends to be more than 11 g (Webster, 1996). The fruit size is influenced by the climatic conditions and the soil characteristics. In the conditions of year 2007, the studied soils registered fruits ranging between 3,9 g and 7,6 g, from small size (the ones under 5 g), medium size (the ones with whole fruit 5-7 g) up to the big size (the ones with more than 7 g). The average weight of the fruit registered the lowest value for the cultivar *Cetățuia* (3,9 g), and the highest for the cultivar *Golia* with 7,6 g. As compared to the cultivar *Boambe de Cotnari*, the most known autochthonous cultivar, the cultivars *Golia* and *Tereza* have higher fruit weight but in terms of the ratio pulp/stone the cultivars *Tereza* and *Bucium* are superior as compared to the blank test and this happens because the cultivar *Bucium*, though having a smaller fruit than the cultivar *Boambe de Cotnari*, has a smaller stone too (*table 1*).

The chemical composition of sweet cherries has a special importance in the capitalization by consumption in fresh state or industrialization and varies depending on the cultivar. For the cultivars studied, the dry soluble substance registered values between 14 ^{0}Brix and 22,2 ^{0}Brix, the cultivars *Tereza, Ştefan* and *Golia*, having higher values than the blank test. The contents in soluble total sugars, the main component of the dry soluble substance, registered values between 7,21 % for the cultivar *Cătălina* and 14,9 % for the cultivar *Tereza*.

Table 1

The physical features of the fruits at some sweet cherry cultivars (2007, Iaşi)

Cultivar	Weight of 100 whole fruits (g)	Weight of 100 dry stones (g)	Stone percentage (%)	Flash /stone ratio	Difference of control cultivar	
					+/-	%
Cetățuia	389,59	21,9	5,62	17,79	-1,99	89,93
Cătălina	569,71	33,76	5,93	16,88	-2,91	85,30
Golia	758,62	45,86	6,05	16,54	-3,24	83,62
Maria	454,36	37,46	8,24	12,13	-7,65	61,31
Ştefan	568,74	29,58	5,20	19,23	-0,56	97,19
Tereza	637,65	26,93	4,22	23,68	3,90	119,69
Bucium	580,36	23,92	4,12	24,26	4,48	122,65
Boambe de Cotnari (as control)	632,64	31,98	5,06	19,78	-	-

Except the early cultivars *Cetățuia* and *Cătălina* that have a lower content in sugars than the blank test, all cultivars registered higher values than the blank test. The

titrating acidity registered values between 0,5222 g mallic acid /100 g fresh fruit and 1,0505 g mallic acid/100 g fresh fruit. Values lower than the blank test were registered by the cultivars *Ştefan* (0,4838 g/100 g f.f.) and *Bucium* (0,5222 g/100 g f.f.). The sweet easily acidulated taste of sweet cherries is influenced by the ratio between sugar and acidity and represents a criterion for the capitalization of the fruits in fresh state; that is why it is necessary to determine the optimum values for this ratio for each cultivar (*Webster et al. 1996, Beceanu et al. 2007, Sirbu et al. 2007*). For the cultivars under study, the ratio sugar/acidity registered values between 9,16 (*Cătălina*) and 29,75 (*Ştefan*), the cultivars *Bucium, Ştefan* and *Tereza* having higher values than the blank test cultivar *Boambe de Cotnari* (*table 2*). For the cultivars under study, we also made the analysis of the poly-phenolic total content since it is important in determining taste and sweet cherry flavour as well as an antioxidizing activity with anticancer effect. The highest values were registered by the cultivars *Golia* and *Cetățuia* (13,41 and 13,16 respectively), and the lowest values were registered for the cultivars *Cătălina* and *Tereza* 7,58 and 7 respectively).

The cultivars *Ştefan, Maria* and *Bucium* registered intermediate values close to the control cultivar (*table 3*).

Table 2

The chemical features of the fruits at some sweet cherry cultivars (2007, Iaşi)

Cultivar	SDS (^{o}Brix)	Fraction glucide (g %)	Acidity (g mallic acid /100g)	Sugar/ acidity ratio
Cetățuia	17,2	10,38	0,9192	11,29
Cătălina	16,2	7,21	0,787	9,16
Golia	19,4	12,46	1,0505	11,86
Maria	16	12,04	0,7879	15,28
Ştefan	22,2	14,4	0,4838	29,75
Tereza	18,4	14,9	0,7222	20,64
Bucium	14	12,6	0,5222	24,14
Boambe de Cotnari (martor)	18,2	11,77	0,6566	17,91

The contents in anthocians registered values between 16,66 mg/l and 58,75 mg/l, the highest values being registered for the cultivars *Cetățuia* and *Golia* with 58,75 and 56,4 mg/l respectively. The cultivar *Bucium* registered only 16,66 mg/l contents in anthocians. The cultivars *Ştefan, Tereza, Maria* and *Cătălina* registered a contents in anthocians with intermediate values (*table 3*).

Table 3

The reduction-oxidation potential and phenolic and anthocianyns content at some sweet cherry cultivars (2007, Iaşi)

Cultivar	Total poly-phenolic index D_{280}	Anthocians contents (mg/l)	rH (V)
Cetățuia	13,16	58,75	26,29
Cătălina	7,58	20,99	28,44
Golia	13,41	56,4	25,16

Maria	8,17	24,89	27,33
Ştefan	9,31	32,11	27,92
Tereza	7	26,43	-
Bucium	8,09	16,66	26,05
Boambe de Cotnari (as control)	8,12	35,31	25,75

Sweet cherries' antioxidizing capacity is superior to that of pears or apples but more reduced than that of the cultivars with small fruits such as wild strawberries, raspberries or bilberries (Battino et al., 2004). For the cultivars under study (the cultivar *Tereza* was not analyzed from this viewpoint), the reduction-oxidization potential expressed by the rH value registered values between 25,16 and 28,44. Knowing that a rH value of 28,2 from a chemical system corresponds to the neutrality from the reduction-oxidization viewpoint, we may say that the cultivar *Cătălina* is the only one with an easily oxidizing character, and the cultivars *Ştefan, Maria, Cetăţuia, Bucium* and *Golia*, as well as the control cultivar *Boambe de Cotnari*, have a reducing character (*table 3*).

The chromatic characteristics of fruits for the sweet cherries under study highlight values of luminosity ranging between 73,8 for the cultivar *Golia* and 90,6 for the cultivar *Boambe de Cotnari*. Among the colour parameters, the component a (red-green axis) presents absolutely positive values between 21,58 and 49,24, what shows a very important content in red colour pigments. The component b (yellow-blue axis) presents absolutely positive values between 4,87 and 15,93, suggesting the presence of a moderate quantity of yellow pigments (*table 4*).

Table 4

The chromatic characteristics of fruits at some sweet cherry cultivars (2007, Iaşi)

Cultivar	Luminosity L	Parameter a (red + - green -)	Parameter b (yellow + - blue -)
Cetăţuia	80,5	41,58	10,25
Cătălina	84	32,35	7,71
Golia	73,8	49,24	15,93
Maria	82,7	36,05	8,61
Ştefan	86,8	30,06	7,38
Tereza	87,5	28,92	6,37
Bucium	84,6	35,06	7,9
Boambe de Cotnari (as control)	90,6	21,58	4,87

CONCLUSIONS

In the climatic conditions of the year 2007, the cultivars created at SCDP Iaşi manifested valuable physical features. Thus, the cultivar *Golia* had a large fruit (7,6 g), as compared to the control cultivar (*Boambe de Cotnari*), and the cultivars *Tereza* and *Bucium* registered a pulp/stone ratio (23,68 and 24,26 respectively) higher than the control cultivar *Boambe de Cotnari*, though they had a smaller fruit.

As for the chemical characteristics, the ratio sugar/acidity registered superior values for the cultivars *Ştefan, Bucium* and *Tereza*, as compared to the control cultivar *Boambe de Cotnari*, so they have a better taste.

From the viewpoint of the reduction-oxidization potential, except the cultivar *Cătălina* that has an easily oxidizing character, the other cultivars have a reducing character what makes them important from the dietetic viewpoint.

The high contents in poly-phenols was registered by the cultivar *Golia*, with a total poly-phenolic index (D_{280}) of 13,41, the cultivar *Cetăţuia* following closer with an index of 13,16. The lowest values were registered by the cultivars *Tereza* (TPI 7) and *Cătălina* (TPI 7,58). The contents in anthocians registered high values for the cultivars *Cetăţuia* (58,75 mg/l extract) and *Golia* (56,4 mg/l extract). The lowest values of the contents in anthocians were registered by the cultivar *Bucium*.

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