RESEARCH LOOKING THE CHANGE OF SOME PHYSICO-CHEMICAL PARAMETERS DURING FRUIT MATURATION TO SOME SWEET CHERRY CULTIVARS

CERCETĂRI PRIVIND MODIFICAREA UNOR PARAMETRI FIZICO-CHIMICI PE PERIOADA MATURĂRII FRUCTELOR LA UNELE SOIURI DE CIREŞ

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Abstract. *The research had been done in 2009, between May 14 – June 15, having as biological material four new sweet cherry cultivars with medium maturation ('Bucium ', 'Ştefan', 'Iaşirom' and 'Radu'), where it had in view the changes of some physical and chemical parameters during maturation. There had been made determinations about the equatorial diameter and about the fruit's weight in three stages corresponding to some different maturation stages sized between 30 and 56 days after full bloom. There had been recorded changes of these parameters between the first and the third maturation stage in this way: the fruit's weight increase on 'Ştefan' from 1.81 g at 30 days after full bloom to 7.27 g at 56 days after full bloom; the equatorial diameter increase on 'Bucium' from 12.67 mm to 22.25 mm. The soluble dry substance (DS%) determination had been made in 2 stages sized between 43 and 56 days after full bloom. At 'Bucium' had been recorded an increase of DS from 12.8% to 15.25%.*

Key word: sweet cherry, cultivars, parameters, maturation phase.

Rezumat. *Cercetările au fost efectuate în anul 2009, în perioada 14 mai - 15 iunie, având ca material de cercetare patru soiuri de cireş cu maturare medie, (Bucium, Ştefan, Iaşirom şi Radu), la care s-a urmărit modificarea unor parametri fizici şi chimici pe perioada maturării. S-au realizat determinări privind diametrul ecuatorial şi greutatea fructului în trei faze corespunzătoare unor stadii diferite de maturare cuprinse între 30 şi 56 zile de la înflorirea deplină. S-au înregistrat modificări ai acestor parametri între prima fază şi a treia fază de maturare, astfel: greutatea fructului a crescut la soiul Ştefan de la 1,81 g la 30 zile de la înflorirea deplină la 7,27 g la 56 zile de la înflorirea deplină; diametrul ecuatorial la soiul Bucium a crescut de la 12,67 mm la 22,25 mm. Determinarea substanţei uscate solubile s-a realizat în 2 faze cuprinse între 43 şi 56 zile de la înflorirea deplina. La soiul Bucium s-a înregistrat o creştere a S.U. de la 12,8% la 15,25%.*

Cuvinte cheie: cireş, soiuri, parametri, faze de maturare.

INTRODUCTION

Sweet cherry tree is sort of fruit-growing tree with a great economical importance, which can find in the N-E of Romania, optimal conditions for showing its both agricultural and biological potential.

Sweet cherries are the first fresh fruits of the year and by the raised content of vitamins, minerals, sugars, attractive aspect and good refreshing taste, they

make the object of one of the most efficient commercial activity which takes place from the second part of May to July, without having any competition from other sorts of fruit-growing tree (Petre, 2006; Budan & Grădinariu, 2000).

On the fresh fruits market there are preferred the "bigarreau" fruit cultivars, which are shining red with a weight of over 7 g (Grădinariu, 2002).

As the cultivars closes to the maturity of consumption, the fruit's size and its soluble dry substance are increasing (Sîrbu et al, 2009) and the fruit's colour parameter is setting up the optimal moment for harvesting (Petre, 2006; Rudi, 1992; Vulpe, 1995).

At the sweet cherry cultivars from the medium season (June 10 – June 31) the fruit's size classifies in four categories: extra – more than 20 mm in equatorial diameter, the first and the second – minimum 17 mm in equatorial diameter and the third – minimum 15 mm in equatorial diameter (Ghena & Branişte, 2003).

Object of this study aims at the improvement of the sweet cherry assortment for the N-E of Romania by promoting the new created cultivars at FGRS Iassy and by setting up the optimal period for harvesting, in the study of the dynamics of physico-chemical parameters on the maturation period.

MATERIAL AND METHODS

The research have been made in 2009, during May 14 and June 15, hading as biological material four cultivars of sweet cherry with medium maturation, created at FGRS Iassy, patented in 2008-2009 ('Bucium ', 'Ştefan', 'Iaşirom' and 'Radu') and grafted on mahaleb.

The fruit-growing trees were planted at the distance of 5 x 4 m, with the form of a free flat fan-shaped espalier crown without sustaining system and they are in the 18^{th} year from the planting.

There have been made measuring looking the fruit's size as equatorial diameter and fruit weight and the soluble dry substance (DS%).

The equatorial diameter of the fruit was determined by measuring the samples of 15 fruits in four repetitions in three different maturation phases, at intervals of 14 days using a vernier caliper reading to 1 mm.

For determining the fruit's weight there have been weighed samples of 15 fruits in four repetitions, in three different maturation phases, using an electronic Radwag balance with the precision of 0,01 g.

The content in soluble substance has been determined refractometric on samples of 15 fruits in four repetitions, in two different maturation phases, using an handle refractometer Zeiss.

The performed determinations used to statistical processing of the data by analysing the variance ('t' test) for bifactorial experiences.

A factor is represented by the maturation phase and it has three graduations in the case of the determinations looking the equatorial diameter and the fruit weight: a_1= 30 days after full bloom, a_2=43 days after full bloom, a_3=56 days after full bloom.

When the content in soluble dry substance has been determined, the A factor had two graduations: a_1=43 days after full bloom, a_2 =56 days after full bloom.

B factor is represented by the cultivar and it has four graduations: b_1='Bucium', b_2= 'Ştefan', b_3='Iaşirom' şi b_4='Radu'.

RESULTS AND DISCUSSIONS

From the statistical point of view in the first maturation phase (30 days after full bloom), by comparing the cultivars, the equatorial diameter differences were significative positive for 'Iaşirom' (0,92 mm) toward 'Bucium' and significative negative for 'Radu' (0,84 mm) toward 'Iaşirom'.

Between 30-43 days after full bloom (the second phase of maturation), 'Ştefan' (1.81 mm), 'Iaşirom' (1.22 mm) and 'Radu' (1.44 mm) were very significant toward 'Bucium'. Between 43-56 days after full bloom (the third phase of maturation) the diameter differences was insignificant, exception making 'Radu' which registered negative values (1.08 mm and 0.75 mm) toward 'Bucium' and 'Ştefan' (table 1).

Table 1

Differences of the fruit equatorial diameter (mm) at different cultivars in same maturation phase

Comparison between cultivars	The difference (mm) and the signification	Comparison between cultivars	The difference (mm) and the signification
a_1b_2-a_1b_1	0.68	a_2b_4- a_2b_1	1.44^{+++}
a_1b_3-a_1b_1	0.92^{+}	a_2b_4- a_2b_2	- 0.43
a_1b_3-a_1b_2	0.24	a_2b_4- a_2b_3	0.16
a_1b_4-a_1b_1	0.08	a_3b_2- a_3b_1	- 0.33
a_1b_4-a_1b_2	- 0.6	a_3b_3- a_3b_1	- 0.66
a_1b_4-a_1b_3	$- 0.84^{o}$	a_3b_3- a_3b_2	- 0.33
a_2b_2- a_1b_1	1.81^{+++}	a_3b_4- a_3b_1	-1.08^{oo}
a_2b_3- a_2b_1	1.22^{+++}	a_3b_4- a_3b_2	$- 0.75^{o}$
a_2b_3- a_2b_2	- 0.59	a_3b_4- a_3b_3	- 0.42

LSD 5%= 0.73 mm **LSD 1% = 0.99 mm** **LSD 0.1% = 1.22 mm**

a_1= 30 days after full bloom; a_2= 43 days after full bloom; a_3= 56 days after full bloom

b_1= Bucium; b_2= Ştefan; b_3= Iaşirom; b_4= Radu

Table 2

Differences of the equatorial diameter (mm) for the same variety in different maturation phases

Comparison between maturation phases	The difference (mm) and the signification	Comparison between maturation phases	The difference (mm) and the signification
a_2b_1- a_1b_1	5.29^{+++}	a_3b_1- a_2b_1	4.29^{+++}
a_2b_2- a_1b_2	6.42^{+++}	a_3b_2- a_2b_2	2.15^{+++}
a_2b_3- a_1b_3	5.59^{+++}	a_3b_3- a_2b_3	2.41^{+++}
a_2b_4- a_1b_4	6.62^{+++}	a_3b_4- a_2b_4	1.80^{+++}

LSD 5%= 0.76 mm **LSD 1% = 0.93 mm** **LSD 0.1% = 1.55 mm**

a_1= 30 days after full bloom; a_2= 43 days after full bloom; a_3= 56 days after full bloom

b_1= Bucium; b_2= Ştefan; b_3= Iaşirom; b_4= Radu

About difference of the fruit's equatorial diameter at the same cultivar in different maturation phases, all the cultivars registered very significant positive values (table 2).

The fruit's weight differences at different cultivars in the same maturation phase were insignificant from the statistic point of view (table 3).

Table 3

Differences of the fruit's weight (g) at different cultivars in the same maturation phase

Comparison between cultivars	The difference (g) and the signification	Comparison between cultivars	The difference (g) and the signification
a_1b_2-a_1b_1	0.32	a_2b_4- a_2b_1	0.05
a_1b_3-a_1b_1	0.37	a_2b_4- a_2b_2	-0.44
a_1b_3-a_1b_2	0.05	a_2b_4- a_2b_3	- 1.12
a_1b_4-a_1b_1	0.03	a_3b_2- a_3b_1	0.88
a_1b_4-a_1b_2	-0.29	a_3b_3- a_3b_1	- 0.33
a_1b_4-a_1b_3	-0.34	a_3b_3- a_3b_2	- 1.21
a_2b_2- a_1b_1	0.49	a_3b_4- a_3b_1	- 0.4
a_2b_3- a_2b_1	1.17	a_3b_4- a_3b_2	- 1.28
a_2b_3- a_2b_2	0.68	a_3b_4- a_3b_3	- 0.07

LSD 5%= 2.02 g **LSD 1% = 2.74 g** **LSD 0.1% = 3.65 g**

a_1= 30 days after full bloom; a_2= 43 days after full bloom; a_3= 56 days after full bloom

b_1= Bucium; b_2= Ştefan; b_3= Iaşirom; b_4= Radu

In the second maturation phase, there were registered very significant positive differences of the fruit's weight at 'Iaşirom' (3.67 g) and distinct significant positive at 'Bucium' (2.87 g), 'Ştefan' (3.04 g) and 'Radu' (2.89 g) comparative to the first maturation phase (30 days after full bloom) (table 4).

In the third maturation phase, there were registered significant positive differences of the fruit's weight at 'Bucium' (2.03 g) and 'Ştefan' (2.42 g) comparative to the second maturation phase of the fruit (table 4).

Table 4

Differences of the fruit's weight (g) at the same variety in different maturation phases

Comparison between maturation phases	The difference (g) and the signification	Comparison between maturation phases	The difference (g) and the signification
a_2b_1- a_1b_1	2.87^{++}	a_3b_1- a_2b_1	2.03^{+}
a_2b_2- a_1b_2	3.04^{++}	a_3b_2- a_2b_2	2.42^{+}
a_2b_3- a_1b_3	3.67^{+++}	a_3b_3- a_2b_3	0.53
a_2b_4- a_1b_4	2.89^{++}	a_3b_4- a_2b_4	1.5

LSD 5%= 1.81 g **LSD 1% = 2.49 g** **LSD 0.1% = 3.42 g**

a_1= 30 days after full bloom; a_2= 43 days after full bloom; a_3= 56 days after full bloom

b_1= Bucium; b_2= Ştefan; b_3= Iaşirom; b_4= Radu

In the interval of 30-43 days after full bloom, there have been registered soluble dry substance differences distinct significant positive at 'Ştefan' (0.47 %) and 'Radu' (0.75 %) comparative to 'Bucium ' and 'Iaşirom' (table 5).

In the interval of 43-56 days after full bloom, there have been registered soluble dry substance distinct significant positive at 'Ştefan' (0.5 %) and 'Radu' (0.58 %) comparative to 'Bucium' (b_1) and 'Iaşirom' (b_3) (table 5).

Table 5

Differences of the content in soluble dry substance (%) at different cultivars in the same maturation phase

Comparison between cultivars	Difference (%) and the signification	Comparison between cultivars	Difference (%) and the signification
a_1b_2-a_1b_1	0.47^{++}	a_2b_2- a_1b_1	0.50^{++}
a_1b_3-a_1b_1	$- 1.55^{ooo}$	a_2b_3- a_2b_1	$- 0.58^{oo}$
a_1b_3-a_1b_2	$- 2.02^{ooo}$	a_2b_3- a_2b_2	$- 1.08^{ooo}$
a_1b_4-a_1b_1	$- 0.80^{oo}$	a_2b_4- a_2b_1	0.00
a_1b_4-a_1b_2	-1.27^{ooo}	a_2b_4- a_2b_2	$- 0.50^{oo}$
a_1b_4-a_1b_3	0.75^{++}	a_2b_4- a_2b_3	0.58^{++}

LSD 5%= 0.47 % LSD 1% = 0.64 % LSD 0.1% = 0.87 %

a_1= 43 days after full bloom; a_2= 56 days after full bloom;

b_1= Bucium; b_2= Ştefan; b_3= Iaşirom; b_4= Radu

From table 6 it can be seen that in the interval of 43-56 days after full bloom, all the cultivars have registered differences very significant positive at soluble dry substance content.

Table 6

Differences of the content in soluble dry substance (%) at the same cultivar in different maturation phases

Comparison between maturation phases	Difference (%) and significance
a_2b_1- a_1b_1	2.45^{+++}
a_2b_2- a_1b_2	2.48^{+++}
a_2b_3- a_1b_3	3.42^{+++}
a_2b_4- a_1b_4	3.25^{+++}

DL 5%= 0.05 % DL 1% = 0.60 % DL 0.1% = 0.86 %

a_1= 43 days after full bloom; a_2= 56 days after full bloom

b_1= Bucium; b_2= Ştefan; b_3= Iaşirom; b_4= Radu

CONCLUSIONS

1. 'Ştefan' and 'Radu' have got noticed by the fruit's growing size (mm), weight (g) and content in soluble dry substance (%) in the second maturation phase, the differences being very significant positive.

2. Due to high fruit's quality, the two cultivars can be harvested (earlier) at 43 days after full bloom for fresh consumption.

3. ‘Iaşirom’ and ‘Bucium’ have the quality conditions in the third maturation phase and they can be harvested at 56 days after full bloom.

4. The dynamics of the physical and chemical parameters study can set up a criteria for establishement of optimal harvesting period.

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