THE PHYSICAL, CHEMICAL AND TECHNOLOGICAL FEATURES OF FRUITS AT SWEET CHERRY CULTIVARS AND HYBRID ELITES CREATED AT FRUIT GROWING DEVELOPMENT STATION IAŞI – ROMANIA

ÎNSUŞIRILE FIZICE, CHIMICE ŞI TEHNOLOGICE ALE FRUCTELOR LA SOIURILE ŞI ELITELE HIBRIDE DE CIREŞ CREATE LA SCDP IAŞI ROMÂNIA.

PETRE L., SÎRBU SORINA, IUREA ELENA
Research and Development Station for Fruit Growing Iaşi

Abstract. *The sweet cherry fruits, because of great minerals content, vitamins, low assimilated sugars, good looking aspects and good refreshing taste, are destined both for fresh consumption, being the first fresh fruits in the market, and processing industry under the form of natural juice, syrup, stewed fruit, jam, liquors and confectionery products. Sweet cherry processing in different ways was established on the basis of essential criterion for direction of utilization. The technological and structure features assessment of fruits at sweet cherry cultivars and hybrid elites created at S.C.D.P.Iasi were analyzed during ten years (1996-2006), on fruit samples harvested on competition culture available at experimental area. Was taken in the study ten new sweet cherry cultivars (Cetățuia, Cătălina, Maria, Golia, Bucium, Tereza, Iașirom, Ștefan, Marina and George), three hybrid elites propose for homologated (HC 840830, HC 840836 and HC 840935) and two bitter cherry cultivars (Amar Maxut and Amar Galata). The directions of utilization were fixed on the basis of examination, tasting and determination on the following aspects: fruit size, shape fruit, skin, pulp and juice colour, pulp firmness, succulence, taste, acidity, peduncle length, stone size and fruit ratio and dry substance content.*

Rezumat. *Cireşele prin conținutul ridicat de săruri minerale, vitamine, zaharuri uşor asimilabile, aspectul atrăgător şi gustul plăcut răcoritor sunt destinate atât consumului în stare proaspătă, fiind primele fructe proaspete ale anului cât şi prelucrării industriale sub formă de sucuri, siropuri, compoturi, gemuri, dulcețuri, băuturi alcoolice şi produse de cofetărie patiserie. Prelucrarea cireşelor sub diferite forme de industrializare a fost stabilită pe baza unor criterii specifice de evaluare pe direcții de valorificare. Evaluarea însuşirilor de structură şi tehnologice ale fructelor la soiurile şi elitele hibride de cireş create la SCDP Iaşi a fost analizată pe o perioadă de zece ani (1996-2006), la probele de fructe recoltate la maturitatea deplină din culturile de concurs existente în poligonul experimental. Au fost studiate 10 soiuri noi de cireş (Cetățuia, Cătălina, Maria, Golia, Bucium, Tereza, Iaşirom, Ştefan, Marina şi George), trei elite hibride propuse pentru omologare (HC 840830, HC 840836 şi HC 840935) şi două de cireş amar (Amar Maxut şi Amar Galata). Direcțiile de valorificare ale fructelor au fost stabilite pe baza examinărilor, degustărilor şi determinărilor la următoarele însuşiri: mărimea şi forma fructului, culoarea epidermei pulpei şi sucului, fermitatea pulpei, suculența, gustul, aciditatea, lungimea pedunculului, mărimea sâmburelui în raport cu fructul şi conținutul în substanță uscată.*

Sweet cherries by their high level of mineral salts, vitamins, easily assimilable sugars, the attractive aspect and pleasant refreshing taste are intended for both the consumption in fresh state as the first fresh fruits of the year and the industrial processing as juices, syrups, compotes, jams, marmalades, alcoholic drinks and confectionery and pastry products.

The sweet cherry processing under different forms of industrialization was established on account of some specific evaluation criteria for valorization directions.

The evaluation of the structural and technological features of fruits for the sweet cherry cultivars and hybrid elites created at SCDP Iaşi was analyzed for a period of ten years (1996-2006), for the fruit samples harvested at their full maturity from the contest cultures existing on the experimental polygon.

We studied 10 new sweet cherry cultivars (Cetățuia, Cătălina, Maria, Golia, Bucium, Tereza, Iaşirom, Ştefan, Marina and George), three hybrid elites proposed for homologation (HC 840830, HC 840836 and HC 840935) and two of bitter cherries (Amar Maxut and Amar Galata).

The valorization directions of fruits were established on account of examinations, tasting and determinations of the following features: size and fruit shape, skin colour and juice, pulp firmness, succulence, taste, acidity, peduncle length, size of stone as compared to the fruit and the contents of dry substance.

The knowledge of the physical-chemical composition of the cherry fruits constitutes a very important element to define their quality. By means of these data they may establish the cultivars that, in the respective soil and climatical conditions, have the best features and are worth being promoted, maintained in culture and bred in nursery-trees.

The alimentary value of fruits and the possibilities of integral valorization by the conservation in fresh state and as raw material for industrialization are reflected and result directly from their physical-chemical composition.

The continuous melioration of means and methods of packing, storage, transportation and distribution for the fresh fruits intended for the internal consumption or exportation and the progress made in the field of industrialization rely on the detailed knowledge of the physical and chemical features of fruits.

This paper comprises the description of the physical-chemical compositions of the most important cherry cultivars and hybrid elites created at SCDP Iaşi and the interpretation of the results obtained according to the soil and climatical conditions.

We tried to establish some criteria for the characterization and appreciation of the fruits from the physical, chemical, technological and biological and chemical viewpoint, criteria that will serve as a guide for the promotion and maintenance of these cultivars and hybrid elites, the establishing of the cultivar assortment for the influence zone of SCDP Iaşi and their zoning by regions and culture centers.

MATERIAL AND METHODS

For experimentation we used the fruits harvested from 12 cultivars homologated at SCDP Iaşi in the interval 1996 – 2006 and other three hybrid elites of cherry proposed for homologation. The cherry cultivars and hybrid elites are in two contest cultures with trees grafted on franc and mahaleb planted at distances of 5 x 4 m, guided as a free fan-shaped espalier without a sustaining system. The farm practices applied was that specific to the sweet cherry culture. We effectuated

observations and determinations concerning the productivity, date of fruit maturation, size, shape, skin colour, pulp and juice colour, pulp firmness, succulence, taste, peduncle length, stone size, contents if dry substance and acidity. The physical and chemical analyses were made on account of some parameters established by the testing guide UPOV and the requirements of the processing sector.

RESULTS AND DISCUSSIONS

Cultivar productivity. On account of the average productions obtained in the interval 1996 – 2006, within an intensive plantation (500 trees/ha) the cherry cultivars and hybrid elites under study may be grouped as follows (Table 1):

a. Very productive cultivars (over 12 t/ha);
b. Productive cultivars(10-12 t/ha);
c. Average productive cultivars (under 10 t/ha).

Fruit size. The majority of sweet cherry cultivars and hybrid elites under study have big and very big fruits (6,6 – 8,6 g the average weight of a fruit), only *Cetățuia* having medium size fruits (5,9-6,1 g). Though the bitter cherry cultivars have smaller fruits (4,5-5,9 g) the size is quite good for their category.

Fruit shape. It is variable from kidney shape (Cetățuia, HC. 840836) to heart shape (majority), two cultivars having the elongated heart shape.

By tasting they appreciated the acidity and fruit taste. Most of the cultivars and elites have a small acidity (10), five of them having an average acidity. The taste was sweet from Cetățuia and Cătălina to strong sweet, most of the cultivars and elites having an acidulated sweet taste.

Peduncle length. It was short at one cultivar (840836), long at five cultivars (Cătălina, Golia, Marina, Amar Maxut and Amar Galata) and medium for the remaining ones.

Stone size. As compared to the fruit, the stones were small (at HC 840836 and Tereza) and big to the Marina. The great majority of cultivars and elites had medium size stones and their size as compared to the fruit was also medium.

Dry substance. For the cultivars and hybrid elites under study there were values between 16% at the early cultivars (Cetățuia and Cătălina) up to 21% for the Amar Maxut. The dry substance values were high for the majority of cultivars and elites (16,8 – 20,3%).

We must mention that the data registered by percentage of dry substance were taken at the full maturity of fruits. The main technological features of fruits for the cultivars and elites studied are given in table 2.

Ripening date. The earliest fruits were obtained at the cultivars Cetățuia (21-29.06) and Cătălina (7-15.06). Most of the cultivars and elites had a medium maturation (15-28.06), two cultivars having a late maturation (Marina and Amar Galata between 28.06 and 15.07) and one having a very late maturation (George -15-25.07)

Fruit colour. The red colour was dominant with hues from red at the cultivar George, crimson red at the cultivar Cătălina up to dark red or brown at the majority of cultivars and elites. Two cultivars Marina and Amar Galata were bicolor (red and yellow) and one cultivar (Amar Maxut) was black.

Table 1

Structure characteristics of the fruits to same sweet cherry cultivars and hybrid elites. Annual average 1996 – 2006

Cultivar	Average fruits yields t/ha	Average weight -g-	Shape	Acidity	Taste	Peduncle length	Stone size	Stone size fruit ratio %	Dry substance %
				By tasting					
CETĂŢUIA	10,4	5,9-6,1	Kidney shape	Small	Sweet	Medium	Medium	6,5	16,0
CĂTĂLINA	9,6	6,8-7,8	Heart shape oblong	Small	Sweet	Long	Medium	6,5	16,0
HC. 840830	9,0	7,5-7,9	Kidney shape	Small	Very sweet	Medium	Medium	5,7	19,6
MARIA	12,1	7,4-8,3	Heart shape oblong	Small	Sweet	Medium	Medium	5,9	17,0
GOLIA	9,2	7,5-8,0	Heart shape	Small	Sweet	Long	Medium	5,2	17,5
BUCIUM	12,0	7,8-8,5	Heart shape	Small	Sweet tart	Medium	Medium	6,0	18,6
HC. 840836	9,3	6,6-7,6	Kidney shape	Small	Very sweet	Scurt	Small	5,2	18,0
HC. 840935	8,2	7,7-8,6	Heart shape	Medium	Sweet tart	Medium	Medium	6,0	17,3
TEREZA	11,5	7,0-7,8	Cordiform	Small	Sweet tart	Medium	Small	5,0	18,8
IAŞIROM	10,2	7,7-8,0	Heart shape	Small	Sweet tart	Medium	Medium to big	6,8	19,3
ŞTEFAN	11,3	7,8-8,1	Heart shape	Medium	Very sweet	Medium	Medium	5,6	20,3
AMAR MAXUT	8,1	4,5-4,7	Heart shape	Medium	Sweet tart	Long	Medium	5,8	21,0
AMAR GALATA	10,1	4,7-5,9	Heart shape	Medium	Sweet tart	Long	Medium	5,6	17,6
MARINA	12,3	7,6-8	Heart shape	Medium	Sweet tart	Long	Big	6,9	16,8
GEORGE	12,5	6,7-7,4	Heart shape	Small	Sweet tart	Medium	Medium	6,1	17,6

Tabelul 2

Tehnological features of the fruits at the new sweet cherry cultivars and hybrid elites to SCDP Iaşi. Annual average 2004 – 2006

Cultivar/elite	Ripening date	Skin colour	Juice colour	Pulp firmness	Pulp colour	Suculence
CETĂŢUIA	21-29.05	Red blackish	Purple red	Semifirm	Red	Medium
CĂTĂLINA	7-15.06	Purple red	Red	Semifirm	Red	Medium
HC. 840830	17-23.06	Red blackish	Red blackish	Firm	Red blackish	Mare
MARIA	10-20.06	Thin red	Red	Firm	Red	Medium
GOLIA	20-28.06	Roşie închisă	Purple red	Firm	Red blackish	Medium
BUCIUM	16-24.06	Red blackish	Red blackish	Firm	Red to red blackish	Big
HC. 840836	17-23.06	Red brown	Red blackish	Firm	Red blackish	Small
HC. 840935	17-25.06	Red brown	Red blackish	Firm	Red blackish	Big
TEREZA	15-23.06	Red brown	Red blackish	Firm	Red blackish	Big
IAŞIROM	14-20.06	Red brown	Red blackish	Firm	Red to red blackish	Big
ŞTEFAN	15-25.06	Red brown	Red blackish	Firm	Red blackish	Big
AMAR MAXUT	20-28.06	Black	Red blackish	Semifirm	Red blackish	Big
AMAR GALATA	28.06-8.07	Half red half yellow	White yellow	Semifirm	Yellow light	Big
MARINA	5-15.07	Half red half yellow	White yellow	Firm	White yellow	Medium
GEORGE	15-25.07	Red	Red	Firm	Red	Medium

Juice colour. Two cultivars (Marina and Amar Galata) had a white-yellowish juice colour the remainder of cultivars and elites having juice colours from crimson red to dark red.

Pulp colour. Most of the cultivars and elites it was red with hues from red to dark red except for the cultivars Marina and Amar Galat*a* where the pulp was white-yellowish or yellow-whitish.

Pulp firmness and succulence. It was high for the majority of cultivars and medium just for several favoring the consumption in fresh state with resistance to transportation and adaptability to the industrial processing.

CONCLUSIONS

1. The sweet cherry cultivars and hybrid elites studied have a good productive capacity and a very good fruit maturation for a period of 60 days from then ones with an extra-early maturation (Cetățuia) to those very late in maturation (George).

2. The 15 sweet cherry cultivars and hybrid elites provide fruits for consumption in fresh state and industrialization satisfying a large variety of tastes and requirements of the market and industry.

3. The ecological conditions of the years under study (1996-2006) had a significant influence on the conditions and especially on the fruit quality. The farm techniques applied and the moment of harvesting influenced this aspect in an equal mount.

4. Size, shape, firmness, uniformity, dominant colour of skin and pulp are basic features for the consumers of fresh cherries both on the internal market and the exportation.

5. Taste, flavour, succulence, juice colour, stone size, the adherence of pulp to stone, the easiness of peduncle separation, acidity and the contents in dry substance are essential characteristics in the industrialization process.

REFERENCES

1. **Bădescu GH., Constantinescu M., Bădescu Lidia, Isac Gh.,** 1984 **–** *Fructele şi sănătatea,* Editura Ceres, Bucureşti.
2. **Budan S., Grădinariu G.,** 2000 **–** *Cireşul,* Editura Ion Ionescu de la Brad, Iaşi.
3. **Chiriac Şt., Rudi Evelina, Chiriacula Micu, Stoiculescu Elena,** 1990 **–** *Cerințe privind valorificarea cireşelor şi vişinelor prin prelucrare, Rezultate de cercetare şi producție privind cultura cireşului şi vişinului,* Tipo Agronomia, Cluj Napoca.
4. **Gherghi A.,** 2000 **–** *Sinteza rezultatelor de cercetare ştiințifică obținute în domeniul biochimiei şi tehnologiei de valorificare a fructelor,* SCDP Bistrița la 50 de ani de existență şi activitate de cercetare ştiințifică şi dezvoltare (1950-2000), Bistrița.
5. **Grădinariu G.,-----Petre L., 2005 -** *New sweet cherry varieties and hybrids obtained in Iaşi, România, 5th Internațional Cherry Symposium*, Bursa-Turkey.
6. **Iezzoni Amy, Collen Mulinix, Budan S.,** 1995 **–** *Determination of juice colour and stability among sour cherry selecțions at michigan State University,*Tehnologii şi soiuri noi în cultura cieşului şi vişinului, Bistrița.
7. **Istrate M., Beceanu D., Grădinariu G., Petre L., Anghel Roxana, Zlati Cristina,** 2006 **-** *The technological feature assessment of the fruits at some sour cherry varieties cultivated in N-E Romanian ecological condition*, 36th Anual Meeting (ESNA), Iaşi.
8. **Petre L., Iurea Elena, Pitorac Dorina,** 2006 **–** *Studiul agroproductivității unor soiuri noi de cireş create la SCDP Iaşi,* Lucr. Şt. UŞAMV, seria Horticultură, vol. 49, Iaşi.
9. **Radu I.F., Pandele Iuliana, Enăchescu Georgeta,** 1957 **–** *Proprietăți fizice, chimice şi tehnologice ale fructelor principalelor specii pomicole cultivate în R.P.R.,*Editura Academiei RPR, Bucureşti.
10. **Rudi Evelina,** 1992 **–** *Compoziția chimică a fructelor unor soiuri şi hibrizi de cireş şi vişin din sortimentul cultivat,* Mapa documentară nr. 22, ICPP Piteşti-Mărăcineni.