

CONSIDERATIONS CONCERNING THE QUALITY CRITERIA OF THE SWEET CHERRIES DESTINED FOR INDUSTRIAL PROCESSING

CONSIDERAȚII PRIVIND CRITERIILE DE CALITATE ALE CIREȘELOR DESTINATE INDUSTRIALIZĂRII

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Abstract. *Due to the high contents of sugar and special sensorial qualities, sweet cherries are very appreciated for consumption in fresh state and also as raw material for industrial processing as marmalade, jam, natural juices, stew, and crystallized fruits. In this paper the authors present a bibliographical synthesis on the main features of cherries that are important when they are processed industrially.*

Rezumat. *Datorită conținutului ridicat în zahăr și a calităților organoleptice deosebite, cireșele sunt foarte apreciate pentru consum în stare proaspătă, dar și ca materie primă pentru prelucrare industrială sub formă de dulceață, gem, sucuri naturale, compot, fructe confiate etc. În această lucrare, autorii prezintă o sinteză bibliografică privind principalele însușiri ale cireșelor care sunt importante în vederea prelucrării lor industriale.*

The quality criteria of the sweet cherries intended for industrialization take into account numerous features of fruits depending on their processing manner (marmalades, stews, crystallized fruits, juices, nectar, jams or dry fruits etc.). Many features of the fruit that are important for consumption in fresh state are taken into consideration also for industrialization (Webster & Looney, 1996). They observe mainly: **the technological features** (the ripening date, resistance and skin colour, pulp firmness, adherence of the stone to pulp, easiness of peduncle separation, adaptability to the mechanized harvesting); **the morphological characters** (shape, size and uniformity of fruits, skin colour, pulp and juice colour, stone size); **senzorial features** (taste, flavour); **chemical composition** (sugar contents, total acidity, tanoid substances, pectic substances)

Ripening date. The species with an early ripening date are preferred for industrialization since they insure they favour the appearance on the market of new products and thus allow the obtaining of some important revenue (Webster & Looney, 1996). There is the greater risk of appearance of the phenomenon of fruit chapping at very early species, that is why they recommend the use of covers against rain during harvesting (Andersen et al., 2003). The early species used for processing for canning or frozen fruits in the United States are: *Cavalier T*,

Chelan, Hartland (Andersen et al., 2003), and from the Romanian cultivars they recommend *Cetățuia, Scorospelka, Muncheberge fruhe* (Petre, 1993).

In the same time, it is important to exist a large range of species with phased ripening of fruits, to insure both the continuous technological flow in the industrialization units and not to surpass the storage and processing capacities of these especially for the fruits intended for juices and nectars, fruits that must be processed immediately after harvesting.

Skin resistance. They recommend the species with thin skin for processing as stew such as: *Boambe de Cotnari, Bigarreau Drogan, Bigarreau Donissen, Bigarreau Napoleon, Marina, Simbol, Roze* (Petre et al., 2005; Beceanu & Chira, 2003).

But to obtain frozen, crystallized or glazed fruits they prefer the fruits species that present a greater skin resistance they having also a greater resistance to cracking during the rainy periods of harvesting (*Black Star, Chelan, Satin Sumele, Samba Sumste, Hudson, Izverna*) (Lugli, 2003, Budan & Gradinariu, 2000).

Pulp firmness is a feature pursued when processing fruits as deep frozen or crystallized fruits, glazed fruits, candied fruits for cocktail, stew and less for jams (Webster & Looney, 1996), recommending the harvesting during ripping (Beceanu & Chira, 2003) but for the processing as jams they recommend the harvesting before maturation for consumption when the pulp firmness is high enough to avoid the smashing to pieces of fruits in the syrup.

From the category of cultivars with high firmness of pulp from the Romanian assortment we enumerate: *Bigarreau Napoleon, Germersdorfer, Boambe de Cotnari, Bigarreau Donissen, Bigarreau Drogan* (Petre & Petre, 2004; Budan & Grădinariu, 2000). The new cultivars created in Romania, *Cătălina, Marina, Golia, Bucium, Ștefan* and *Maria* (Petre et al., 2005) also have a great pulp firmness very appreciated by producers.

From the United States assortment they use the cultivars: *Bing, Windsor, Schmidt, Emperor Francis* (Way, 1974). In Italy, the cultivars with high firmness are recommended for processing as crystallized or frozen fruits are: *Dura, Durona, Don Antoni, Genovese, Minnulara, Napoletana, Toscana, Caddusa* (Raimondo et al., 2006). From those cultivated in France a great firmness is held by the cultivars *Folfer, Bigalise, INRA 3476, Fermina, Ferdiva, Fertard* (Simard, 2005) that may be used for processing as crytallized fruits, glazed fruits, fruits for cocktail or frozen fruits.

Adherence of pulp to stone. It is important to the cultivars intended for processing as crystallized fruits, jams where there is the need to eliminate the stone beforehand. From this viewpoint there are cultivars with non-adherent pulp, adherent and semi-adherent to stone (Ghena & Mihăescu, 1967; Beceanu & Chira, 2003), those with non-adherent pulp being preferred. From the new cultivars created in Iași, *Golia* has the pulp non-adherent to stone (Petre & Petre, 2004), representing a valuable raw material for industrialization. Other cultivars from the Romanian assortment with non-adherent pulp to stone recommended for processing are: *Daria, Severin, Rubin, Jubileu 30, Van* (Petre, 1993).

Adaptability to mechanized harvesting. By melioration programmes they pursue the creation of cultivars with adaptability to mechanized harvesting

intended for industrialization that have the feature to ripe simultaneously and uniformly.

These cultivars are recommended to occupy an entire specialized orchard for mechanized harvesting and for industrial processing, the cultivar *Napoleon* being the most frequently met (Brunner, 1999). The Italian meliorators created the cultivars *Enrica* and *Bargioni 137* (Lugli, 2003) that are adapted to mechanized harvesting having a simultaneous ripening, reduced vigor and good fruit qualities for processing as jams, marmelades and juices. The fruits of the cultivars harvested in a mechanized manner have the quality to separate easily from the peduncle without suffering damages in the peduncular cavity (Beceanu & Chira, 2003 ; Richardson et al. 1998).

Fruit size. For processing as stew, crystallized fruits, frozen fruits, mix dry fruits or sweet cherries for cocktail (maraschino) the cultivars with big and medium fruit are important. From the Romanian assortment the fruits with size between 7 and 9 g are: *Ulster, Van, Bing, Vista, Sam, Boambe de Cotnari, Jubileu 30, Cerna, Daria, Severin* (Budan & Grădinariu, 2000), and from the new creations *Cătălina, Maria, Golia, Bucium, Tereza, Ștefan* and *Iașirom* (Petre, 2006; Petre & Petre, 2004; Petre, 1993). In the world there are more and more cultivars with big and very big fruits. Thus in Canada the cultivars *Celeste Sumpaca, Samba Sumste, Sonata Sumleta, Summer Charm Staccato, Selah* (Lugli, 2003) have big fruits and in Italy the cultivars *Giulietta, Sweet Early, Early Star, Black Star* și *Grace Star* (Lugli, 2003) are new creations with fruits between 9 and 12 g. The French assortment also has fruits of big and very big calibre: *Fertard, Duroni 3, Summit, Folfer, Giant Red, Bigalise* with sizes between 26 and 32 mm in equatorial diameter (Simard, 2005).

Uniformity. To process sweet cherries, the uniformity in size is more important than the size itself (Webster & Looney, 1996). The Italian meliorators created the cultivars *Enrica* and *Bargioni 137* (Lugli, 2003) especially for mechanized harvesting having simultaneous maturity but also fruits of uniform size to facilitate the mechanized calibration (Allauzen et al., 1995).

Skin colour. It is an important indicator for the correct choice of harvesting date for the cultivars intended for processing both for the cultivars with red fruits and those with yellow or white yellowish fruits (Webster & Looney, 1996). In all cultivars, regardless of skin colour, the contents of antocians and xanthophyll increases as ripening.

This external feature determines the choice of a processing destination, the cultivars with white, yellow and bicolor fruits being destined for stew, jam or marmelade (*Bigarreau Drogan, Bigarreau Donissen, Amar Galata, Napoleon*) (Petre et al., 2005). The cultivars with light red, crimson red or dark red fruits (*Ulster, Hedelfingen, Schmidt, Sam, Van, Kristin, Germersdorfer*) are intended for crystallization, freezing or liqueurs (Andersen et al., 2003; Budan & Grădinariu, 2000).

High quality sweetness are also obtained from the cultivars with dark or black pigments, their light bitter taste being also very important: *Amara*, *Silva*, *Amar Maxut* (Beceanu & Chira, 2003; Petre et al., 2005; Budan & Grădinariu, 2000).

Pulp colour. The cultivars whose pulp is white, yellow or weakly colored in pink recommended for processing as stew (Beceanu & Chira, 2003) are: *Bigarreau Donissen*, *B. Napoleon*, *B. Droagan* (Budan & Grădinariu, 2000), *Marina* (Petre & Petre, 2004). The cultivars with pink, red or dark red pulp that may be used in industrial processing (juices, crystallized fruits, jams) are: *Germersdorf*, *Pietroase Mari Negre*, *Pietroase Negre Pitz*, *Golia*.

In the case of processing sweet cherries, the stability of antocians or other pigments is more important than their quantity (Beceanu & Chira, 2003; Webster & Looney, 1996). Thus in the moment of cutting the fruit or keeping it in a pulps form, for their processing in the future, antocians have the tendency to degrade leading to the fruit scald (Beceanu & Chira, 2003; Webster & Looney, 1996). Then the fruits must not be damaged so as not to degrade their colour by pigment oxidation and must use solutions to conserve the pigments.

Juice colour. Most of the cultivars have the same juice colour as the skin or pulp colour this aspect being important when establishing the fruit destination. Thus, the cultivars with a colourless juice or a weakly coloured juice are not recommended for industrial processing as juices or stews, jams, liqueurs, natural juices or natural colorants for confectionery. Conversely, the cultivars highly coloured are very appreciated for this purpose such as the Yugoslavian cultivar *Crnica* (Nicolic et al., 1998), or the cultivars of bitter cherry from the Romanian assortment *Silva*, *Amar Maxut* and *Amara* (Petre & Petre, 2004).

Stone size. There is no direct correlation between the fruit size and the stone size (Webster & Looney, 1996). There are some cultivars (*Maria*, *Amar Maxut*) that have a big fruit and a small stone and which are preferred for this reason (Petre & Petre, 2004). The cultivars with small stone are more advantageous for industrialization especially when they remove the stone to obtain the final product.

Flavour may be improved or even added during the sweet cherry processing (Beceanu & Chira, 2003).

It is defined by taste and smell specific to the cultivar and depends on the contents of volatile organic substances: aromatic hydrocarbons, alcohols, aldehydes, cetones, acids or esters (Webster & Looney, 1996). Since these substances are volatile the technological solutions for processing cherries must prevent their loss (Webster & Looney, 1996). For jams and marmelades the raw materials the most appreciated are those where taste and flavour are obvious (Beceanu & Chira, 2003) such as: *Summit*, *Coralise Gardel*, *Satin Sumele* (Charlot, 2003) from the French assortment, *Lala Star* from the Italian assortment (Sansavini & Lugli, 2005) or *Van*, *Bing*, *Sam*, *Bigarreau Donissen* from all assortments.

Sugar contents. The moment when most of the fruits of a cultivar have a sugar contents of at least 15⁰ Brix is considered to be the optimum date for harvesting (Brunner, 1999; Beceanu & Chira, 2003). The cultivars *Bellise Bedel*, *Coralise Gardel*, *Bigalise Enjidel*, *Summit* (Charlot, 2003) are new French

creations with very sweet fruits that may be used for processing. In Romania at S.C.D.P. Iași we created the cultivars *Marina*, *Golia*, *Cetățuia*, *Cătălina*, with very sweet fruits recommended for the food industry (Petre & Petre, 2004).

Total acidity. For sweet cherries, the total acidity is between 0,3 - 0,8% the highest values being registered at the cultivars *Amara*, *Izverna*, *Sam*, *Stella*, *Silva* (Rudi, 1992). The level of acidity is considered optimum when there is a contents of 7 and 8 g/l malic acid and it is important when processing cherries as natural juices or stew.

The tanoid substances conditioned the taste and conservation period, in contact with air determin the scald of the sectioned, broken or smashed fruits, a very unpleasant feature when the respective fruits are to be cut in pieces and stay in direct contact with air for a certain time (Beceanu & Chira, 2003). Sweet cherries have a contents of tanoid substances between 0,05 (*Boambe de Cotnari*, *Roz de Mărculești*) and 0,30% (*Negre zaharoase*) (Rudi, 1992). The contents of tanoid substances is higher for the cultivars with bitter and black fruits (eg. the cultivars *Bigarreau Napoleon* with 0,257% and *Amara* with 0,267%) (Rudi, 1992).

Pectic substances have the properties brought together with sucrose and organic acids - citric, tartaric, malic – form gels. This feature lies at the bottom of preparing marmelades, gels, jams etc. (Beceanu & Chira, 2003). Sweet cherries have a reduced contents of pectines ranging between 0,06% and 0,82 % (Rudi 1992), the highest contents (0,36 and 0,39%) being found at the cultivars *Boambe de Cotnari*, *Clos* and *Mare de Trăineii* (Rudi, 1992).

CONCLUSIONS

For sweet cherry processing take into account all these criteria, but on the utilization directions groups.

For **sweetness** is necessary cultivars with white or black skin colour, with sweet or bitter taste, firm pulp and good fruit size. The cultivars *Bigarreau Napoleon*, *Amara*, *Bigarreau Donissen*, *Amar Maxut*, *Bing*, *Windsor* are very appreciated. For **stewed** fruits is necessary a very firm pulp, intense colour and good sweet acidity balanced taste, like cultivars *Amara*, *Izverna*, *Sam*, *Stella*, *Silva*, *Crnica*, *Bigarreau Drogan*, *Bigarreau Donissen*, *Amar Galata*, *Marina*, *Golia*, *Napoleon*. For **jam** the fruits must have a uniform skin colour, intense flavour and very good taste, an higher pulp stone ratio with adaptability to mechanized harvesting. Are preferred *Daria*, *Severin*, *Schmidt*, *Sam*, *Van*, *Kristin*, *Enrica*, *Bargioni 137*, *Golia*, *Marina*. **Crystallized** fruits needs an higher firmness, a good skin resistance and a great fruit size, such as cultivars *Germersdorf*, *Pietroase Mari Negre*, *Pietroase Negre Pitz*, *Golia*, *Schmidt*, *Sam*, *Van*, *Durona*, *Don Antoni*, *Genovese*, *Kristin*. For **syrup, juice or liqueurs** are necessary cultivars with diverse pulp and juice colour, from pink to red purple even dark red and also good succulence like *Amar Maxut*, *Amara*, *Silva*, *Black Star*, *Chelan*, *Satin*. The cultivars destined for **distillation drinks** must have fruits

very sweet and good yields with adaptability to mechanized harvesting, such as *Ponoare, Jubileu 30, Rubin, Bing, Schmidt, Sam, Van*.

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