INNER CONTENT AND PROCESSING INDUSTRIAL CHARACTERISTICS OF NEW HUNGARIAN BRED SOUR CHERRY CULTIVAR CANDIDATE

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ABSTRACT

The Hungarian bred sour cherry cultivars play an important role in the global sour cherry sortiment among the grown sour cherry cultivars because their are grown in the most important sour cherry growing countries. The Hungarian bred cultivars are suited not only for industrial purposes but for fresh consumption because of their good tastes.

During our trials we have examined IV-3/48 cultivar candidate was bred at Research Institute for Fruit Growing and Ornamentals Budapest-Érd for industrial purposes and amounced for examination and named 'Érdi ipari' at Central Agricultural Office in Budapest. The IV-3/48 has very early ripening time (late May). We examinated suitability of this cultivar candidate for shaking and for changing of its inner content value during the ripening time. The samples were collected three times during the ripening time in 2008, 2009 and 2010. We determined the suitability of choosen candidate for food industrial purposes which appoint a ripening time when the content of antioxidant compounds is the highest. Our aim was to determine the suitability of IV-3/48 sour cherry cultivar candidate for producing food industrial products.

Refraction, titrable acid content, watersoluble antioxidant capacity, total antocyanin and polyphenol content of fruits were measured under laboratorical conditions.

According to the results of inner content value the optimal shaking time of this cultivar candidate can stated in the last stage of ripening time. In this stage the watersoluble antioxidant capacity, anthocyanin and polyphenol capacity of IV-3/48 sour cherry candidate is suitable. On the grounds of our results this candidate neared or exceeded both watersoluble antioxidant capacity and anthocyanin as well as polyphenol content of standard cultivars. According to our results this candidate is suitable for food industrial purposes for producing both fruit juice concentrate and dried cherries. During the drying IV-3/48 saved its natural color therefore the food industry can use it for natural coloring material.

1. INTRODUCTION

Nowadays examination of antioxidants as well as slight of artificial materiels and its taking out possibilites with natural materials are in the lime-light of reserach. The tart cherry (*Prunus cerasus* L.) is such a food industrial raw material is suitable for taking out the artificial aggregates and plays an important role in the health-care nutrition because of its biological active substances (Stéger-Máté et al. 2010).

Tart cherry has remarkable vitamin content next to its extrem high polyphenol and antocyanin content. Its B_1- (50µ1g/100g), B_2- (20µg/100g), B_6- (0,05mg/100g) as well as biotin (0,8µg/100g) content are also extrem high. Its mineral content is well-balanced (Ficzek et al. 2008), its potassium (186mg/100g), its calcium (186mg/100g), its magnesium (15mg/100g), its iron (0,6mg/100g) and its phosphorus (50mg/100g) content are notable. Its copper content is one of the highest among the grown fruit species (Bíró,Linder, 1999).
The fruit juice concentrates contain the most valuable inner content of the fresh fruits and those can be used as natural coloring material at some areas of food industry (Espín et al. 2000).
The consumer layer is increasing who wants to live and feed knowingly therefore this layer needs such food industrial products contain the biological active substances in natural form means keystone of progressive nutration.
The Hungarian bred tart cherries play an unique role in the heath-care because those cultivars are suitable for fresh consumption. The Reserach Institute for Fruit Growing and Ornamentals Budapest-Érd has bred a lot of tart cherry cultivars with excellent inner content and antioxidant capacity. The Research Institute has amounced for examination a novel tart cherry candidate with early ripening time is suitable for shaking and for industrial purposes. Our aim was to measure inner content value and to show possibilities for food industrial usages of this novel candidate in this study.

2. MATERIAL AND METHODS

2.1 Research material

Fruit samlpes of the examined self-fertile tart cherry candidate were collected at the Experimental Farm Érd-Elvira major of the Reserach Institute for Fruit Growing and Ornamentals Budapest-Érd. The orchard was involved in this study during the sample collection was in the full bearing period in 9th-11th leaves. Soil of the orchard was calcareous chernozem. The average yearly sunny hours were 2 000 hours, the average temperature in the vegetation period was 16,8 °C, the average yearly preciptation was 550 to 570 mm at the experimental orchard. Fruits of self-fertile IV-3/48 tart cherry candidate ('Érdi bőtermő' x 'Meteor korai') are dark red, their average weight is 3 g, their average fruit diameter is 19 to 21 mm. The fruits have stainy juice.

2.2 Sample collection

The samples were collected with hand from 15 trees, from four cardinal points of the trees. Fruit flash of 15 kg average sample was shaked and storaged in the deep fridge till the meansurings to determine inner content value of the samples. Refraction, titrable acid content watersoluble antioxidant capacity, total antocyanin and polyphenol content of fruits were measured under laboratorical conditions at the Department of Pomology of CUB in 3 replications.
Adaptibility of the choosen candidate for drying and producting fruit juice concentrate was examined at the Department of Food Preservation of CUB.

2.3 Refraction

Determination of water-soluble dry matter content (refraction) was carried out according to the regulation Codex Alimentarius 3-1-558/93 by a Zeiss-Abbé refractometer.

2.4 Titriable acid content

Total acid content of the sampes was determined by 0.1N NaOH titration by adding bromothymol blue indicator, according to MSZ 3619-1983 Hungarian regulation.

2.5 Determination of anthocyanin content

Examinations of colouring materials were made by the method of Füleki and Francis (1968) using hydrochloric acid and ethanol for colour extraction, at 530 nm with a U-2800A spectrophotometer.

2.5 Determination of polyphenol content

Polyphenol content was determined in the presence of Folin-Ciocaltens agent at 765 nm using spectrophotometry, on the base of a calibration curve made from gallic acid, according to the method of Singleton and Rossi (1965).

2.6 Ferric reducing/antioxidant power (FRAP)

The ferric reducing/antioxidant power (FRAP) assay was carried out according to Benzie and Strain (1996). The FRAP assay is based on the reduction of the Fe3+-2,4,6-tripyridyl-S-triazine complex to the ferrous form (Fe2+) and the intensity of the reaction is monitored by measuring the change of absorption at 593 nm.

2.7 Fruit juice concentrate and drying

The samples were dryed in the atmospheric (60 °C, 5 hours) and vacuum (60 °C, 5 hours, 10 mbar) dryers. The samples were taken out every hour to determine the above mentioned parameters.

Fruit juice samples were made from the candidate to determine its adaptibility for producting fruit juice concentrate. The fruit juice samples were prepared on the following way: washing, pulping, handling with enzyme (40-45°C, Fruktozym-P pectindecoupling enzyme 0,1ml/kg, standing time: 1 hour), pressing, handling with pectindecoupling enzyme (Fruktozym-P pectindecoupling enzyme 0,05 ml/ l, standing time: 20-25 minutes), settling (silica 0,5 ml, standing time: 30 minutes, gelatine 0,1 g/l, stanind time: 30 minutes), filtration, evaporation (Rotadest vacuum evaporator, 100 mbar). Filtered fruit juice, semi fruit juice concentrate (29-32 ref%) and ready fruit juice concentrate (66-68 ref%) were made from every samples.

3. RESULTS AND DISCUSSION

3.1 Changing of inner content value of fresh fruits during the ripening time

According to 3 years study it can be statemented that the examined variety and the 'Érdi bőtermő' has excellent inner content and was used as controll showed the highest antioxidant content at the end of ripening period, between the 2nd and 3rd picking time in 80 to 90 % of mature (Table 1). There wasn't any effect of vintage on the tendency of antioxidant compounds but there was effect of vintage on quantity of them. The IV-3/48 candidate exceeded the inner content value of 'Érdi bőtermő'. This candidate contained extreme high antocyanin and polyphenol content.

Table 1. Results of raw material

IV-3/48					
Picking time	**Antocyanin (mg/l)**	**Polyphenol (mg/l)**	**Refraction (%)**	**Titrable acid (%)**	**Frap (mM/l)**
26.05.2008	180.17 ± 7.76	232.84 ± 20.62	13.3 ± 0.01	1.18 ± 0.01	5.44 ± 0.09
29.05.2008	250 ± 18.87	305.23 ± 25.54	12.9 ± 0.01	1.13 ± 0.23	5.96 ± 0.02
03.06.2008	417.5 ± 69.69	475.74 ± 24.65	15.2 ± 0.01	1.03 ± 0.01	7.50 ± 0.04
19.05.2009	150 ± 7.5	244.1 ± 10.05	10 ± 0.2	1,23 ± 0.03	5.85 ± 0.07
25.05.2009	107.5 ± 18.87	449.2 ± 22.42	12.5 ± 0.1	1.04 ± 0.03	7.42 ± 0.04
28.05.2009	215 ± 26.34	527.22 ± 22.12	12 ± 0.1	1.01 ± 0.01	6.11 ± 0.04
26.05.2010	107.5 ± 4.33	158.04 ± 2.41	9.1 ± 0.1	0.92 ± 0.02	4.47 ± 0.06
02.06.2010	167.5 ± 3.12	284.31 ± 24.41	9.7 ± 0.1	0.81 ± 0.01	5.95 ± 0.03
08.06.2010	420.5 ± 27.26	511.13 ± 59.81	11.5 ± 0.1	0.71 ± 0.01	6.98 ± 0.15
Érdi bőtermő					
Picking time	**Antocyanin (mg/l)**	**Polyphenol (mg/l)**	**Refraction (%)**	**Titrable acid (%)**	**Frap (mM/l)**
05.06.2009	115 ± 15.6	203.9 ± 12.4	16.5 ± 0.01	1.81 ± 0.12	3.64 ± 0.05
11.06. 2009	197.5 ± 11.45	296.9 ± 17.8	17.5 ± 0.1	1.65 ± 0.16	5.09 ± 0.04
22.06.2009	211.1 ± 6.76	422.3 ± 16.93	19.5 ± 0.2	1.26 ± 0.02	6.29 ± 0.03

3.2 Changing of antioxidant compounds during producting fruit juice concentrate

The watersoluble dry matter content of fruit juice was created the above described method was 15,35 % but the semi fruit juice concentrated contained 31,42 % and the filtered juice had 68,14 %. Anthocyanin and polyphenol content as well as the antioxidant capacity of the samples increased during the compression. We published data on 10 ref% to have a real picture about the changing (Table 2). According to Table 2nd's data the polyphenol content didn't change so the candidate's pressed fruit juice was tolerant to temperature was arose during the evaporation. The brauning processes are connected to the synthesis of polyphenols weren't characteristics for the examined cultivar (as against other cultivars e.g. 'Érdi Jubileum'), the antocyanin content remained stabil. Those parameters are important if the aim is to produce functional food (e.g. natural color material, producting products with high antioxidant contenct).

Table 2. Results of fruit juice concentrates

	Filtered juice	**Semi fruit juice concentrate**	**Fruit juice concentrate**
Refracio (ref%)	15.35	31.42	68.14
Antocyanin (mg/l) Antocyanin (mg/l) (for 10ref%)	466 303	1038 330	2415 355
Polyphenol (mg/l) Polyphenol (mg/l) (for 10ref%)	1665 1081	3786 996	7588 1031
FRAP mMAS/l) FRAP (mMAS/l) (for 10ref%)	10,52 6.83	17 5.41	15.5 2.28

3.3 Examination for drying

The original moisture content of the IV-3/48 candidate was 72,34 % it was decreased by 4,84 % at the end of atmospheric drying but by 10,5 % after vacuum drying (Table 3). Polyphenol content of the samples increased significantly (by 18,7 %) among atmospheric conditions but their antocyanin content decreased (by 10,5%). It was an opposite change in the vacuum drying: the polyphenol content decreased but the antocyanin content remained stabil. According to our results the vacuum drying method can suggest for processing IV-3/48 candidate so the quantity of antocyanin can be saved and the important polyphenolic brouning won't appear.

Table 3. Results of drying

	raw	1st hour		2nd hour	3rd hour	4th hour	5th hour
Moisture content (%)							
atmospheric	72.34	34.37		52.49	29.44	16.18	4.84
vacuum	72.34	-		17.4	-	15.2	10.1
Polyphenol (mg/l)							
atmoszférikus atmospheric (for 14ref%)	1045 1150	1368 1080		1956 1100	3240 1160	3891 1190	4930 1241
vacuum (for 14ref%)	1045 1150	- -		3602 1090	- -	4733 1010	5758 1102
Antocyanin (mg/l)							
atmospheric atmospheric (for 14ref%)	603 603	771 600		940 524	1595 550	1676 500	2145 520
vacuum (for 14ref%)	603 603	- -		2140 602	- -	2644 620	3238 640

4. CONCLUSIONS

The IV-3/48 was amounced for examination contained both fresh and in processed form extrem high antioxidant compouns are important in the health-care. According to our results the examined candidate is suitable for taking out the artificial coloring material as well as producting food products have functional effects.

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