LIMITE DE VARIABILITATE ALE UNOR INDICATORI BIOCHIMICI DE CALITATE AI FRUCTELOR LA DIFERITE SPECII DE POMI ŞI ARBUŞTI FRUCTIFERI

VARIATION LIMITS OF SOME BIOCHEMICAL INDICATORS FOR FRUITS QUALITY OF DIFFERENT TOP FRUIT AND BERRY SPECIES

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Abstract

The fito-pharmaceutical value of some biochemical compounds of the fruits is well known. This paper presents results regarding the biochemical fruits composition and its variability in some cultivars belonging to five fruit species and its variability. The main quality indicators analyzed were: total organic acids (%), total sugar content (%), soluble dry matter content (%) and sugar / acidity ratio. The study was conducted during three experimental years. Taking into account the results index values, it was remarket that soluble dry matter content range from 12% to 16%, sugar 9% to 13%, total organic acids 0.6% to 1.5%, sugar/acidity ratio 10 to 15. The fruits present a genetic conditioned variability which confers to them desirable quality attributes in concordance with the limits of the general requirements for industrial processing and/or for the fresh marketing. On the other hand, technological interventions as regards the fruit culture technology in the general category of food products for consumption. Phytonutrients and antiradical greenhouse substances were detected by qualitative and quantitative chemical methods.

Key words: fruits, organic acids, sugar content, soluble dry matter content, sugar/acid ratio, chemical methods, acyl, aglycon, glycosides, HPLC
Cuvinte cheie: fructe, acizi organici, conţinut de zahăr, substanţă uscată, raport zahăr/acid, medode chimice, acil, aglicon, glicozidă, HPLC

1. Introduction

The fruits contains a high quantity of antioxidants. The organism reaction to the tumor strikes are much more enhanced to the persons which consume fresh fruits and vegetables. Some of the fruits contain high sugar contents with rapid absorption, and for this reason the fruits must be consumed with moderation.

As a rule, the fruits are preferred by nutritionists because they are cholesterol free, very low contents of saturated fats, proteins, high contents of vitamins, minerals and fibers. According with registered biochemical composition indicators: soluble dry mater content 12-15,31%, total sugar content 9-12%, organic acids 0.5-1.5%, sugar/acids ratio 6.08-20.58, the cultivars correspond to the general requirements for industrial processing. (Muller W., 1988, Bodrova B., 1991, Mladin P. and colab.2009).

During the indicated limits, the fruits of the studied cultivars possess a genetic diversity of the biochemical indicators which indicate their direction for processing.

The anthocyans, pigments soluble in water, which give the red-purple and blue pigmentation in many fruits, vegetables and cereals, were dosed by classical quantitative and qualitative methods. Their analysis in useful for the base identification products "digital fingerprints", because the anthocians pattern is distinctive for many products.

It was demonstrated that anthocyans analysis might be effective applied to determine the authenticity of different anthocyanins present in the fruits juices.

For these fruits compounds identification the best method is the liquid chromatography or mass spectroscopy coupled with mass chromatography.

In the literature are described two primary methods for anthocyans separation with HPLC aid. The base protocol involves a shorter analysis in time and is adequate for a range of matrix containing simple glycosides belonging to the anthocyans. In the same time, the alternative protocol is more time consuming but more adequate for anthocyans with more complexe non-polar, acylated structures.

More over, a series of auxiliary procedures are presented which are very useful to characterize the peaks of the unknown anthocyan. First of the procedure is simplifying a chromatograme by acid hydrolysis eliminating a group of sugars and any acyl radicals attached to the anthocyan to form anthocyanidins.

Only six anthocyanidines are found in the nature, and consequently a chromatogram, might be simplified using this treatment. In addition, this can help for compound origin and identity confirmation or for aglycon identification.

A final technique to eliminate the acyl radicals attached to the anthocyans is the saponification. This procedure can often be realized together with an acid hydrolysis in order to fully characterize a certain compound.

Sugars identification can be raealised by HPLC, using absortion columns, filled with trimethilsilil derivates and acyled acids (Gao şi Mazza, 1994).

The protocols presented here permit the anthocyans analysis in natural fruit juices, pigments and extracts from different matrix containing anthocians. Such profiles are useful to identify species, cultivars, and for commercial product quality evaluations. These protocols are used to detect fruits mixtures with some other products containing fruits, juices and pigments (Giusti şi colab., 1999).

2. Material and method

Five fruit species were selected: apples, cherries, sour cherries, currents, blueberries and five cultivars per species were analyzed during three years. The samples were taken from fresh fruits. The analyses were carried out upon classical methodology of RIFG Pitesti and ASAS for chemistry and biochemistry labs: gravimetric method for soluble dry matter content [%], the pH was determined using potentiometric method with a digital pH-meter, the total acidity was determined, the sugar content was determined using Fehling-Soxlet method.

As principle, HPLC methodology for fruits organic compounds dosing involves, the probes gathering early in the morning and their storage on cold ice till their transportation into the lab. Then, the samples must be prepared to be dosed as soon as possible in such way to avoid the organic compounds degradation (the oxidation or reduction of C vitamins, partial reduction or transformation in some other compounds).

The used HPLC method rely on the two protocols accomplishment for anthocians separation. The base protocol involves a short time consuming analysis, adequate for matrix which contain simples anthocians glycosides, but the alternative protocol is time consuming and more adequate for anthocians with complexe acylated non-polars structures.

Moreover, a series of auxiliary methods are presented which are useful to characterize the pecks of the unknown anthocian. First of them is simplifying the chromatogram by acid hydrolysis which eliminate a sugar radical attached to the anthocian to form antocyanidines.

Only six anthocyanidines are found in the nature, and consequently a chromatogram, might be simplified using this treatment. In addition, this can help for compound origin and identity confirmation or for aglycon identification.

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The protocols presented here permit the anthocyans analysis in natural fruit juices, pigments and extracts from different matrix containing anthocians.

3. Results and discussions

The results obtained reveal that the cultivars respects the general requirements for industrial processing of the fruits. Within the indicated limits, fruit varieties have shown biochemical indicators of genetic diversity that furthers certain products derived from them. Outcomes of the two species sour cherry on the varieties listed in Table 1, show normal levels of indicators remember. It is noted (Figure 1) increases directly proportional to the dissolved organic matter content (DM Brix) and minerals (ash%), total dry matter. Biochemical components of sour cherries, malic acid (titratable acidity or total), total sugar and other organic substances exist in fresh fruit juice, pH, and the sugar / acid ratio have shown that fruit quality is suitable for general consumption (Table 2, Figure 2). Regarding the fruit of Idared apple varieties, they were harvested from the experimental variants with factors as amount of water, solar radiation and light and were analyzed. Table 3 and Figure 3 sows the contents of organic substances and their relationship (ratio of total sugar / total acidity), within the variability of fruit quality indicators for biochemical components.

Berry fruit, currant and blueberry, they are rich in organic substances with proven anti radical effect (anthocyanins, vitamin C, organic acids and polyphenols). Table 4 and Figure 4 shows the composition of some of these components assayed quantitatively. Components values remember clearly shows the effect of these substances anti radical expressed by the total anthocyanin contents, organic acids, vitamin C. Among the polyphenols in these fruits were identified by qualitative analysis methods, using different staining reagents. They have shown the presence or absence of fruit polyphenols analyzed.

4. Conclusions

1. All fruits analyzed are within the range of variability for the biochemical components of quality.

2. Components with anti radical effect detected by qualitative and quantitative chemical methods clearly show the presence of active principles in all fruits examined.

3. Method of analysis established by analysis performed on samples of fresh fruit, following the protocols mentioned, it is essential to follow.

5. References

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Table 1. Biological characteristics of the fruits from RIFG Pitesti during three yars of experiments -mean values-

Nr. crt.	Species (Fresh fruit)	Cultivar	DM [%]	DM ºBrix	Ash [%]	pH
1	Cheries	Ponoare	12,77	15,80	1,82	3,65
2	Cheries	Sublim	12,8	17,20	1,90	3,60
3	Cheries	Viscount	14,88	16,5	2,20	3,45
4	Cheries	New Star	13,47	16,5	2,01	3,21
5	Cheries	Summit	12,41	14,02	1,75	3,20
6	Sour cheries	Ţarina	17,04	23,40	5,20	3,10
7	Sour cheries	Timpurii de Piteşti	15,30	20,10	3,31	2,93
8	Sour cheries	Erdi Noggy	10,86	14,80	0,91	3,10
9	Sour cheries	Mari timpurii	14,31	17,50	2,05	3,00
10	Sour cheries	Engleze timpurii	15,31	17,90	3,30	3,03

Table 2 Fruits biochemical characteristics from RIFG Pitesti during three years of experimentation

-mean values-

Nr. crt.	Species (Fresh fruit)	Cultivar	Titrable acidity [%]	Total sugar [%]	Sugar /acidity ratio
1	Cheries	Ponoare	0,50	10,17	20,34
2	Cheries	Sublim	0,56	11,53	20,58
3	Cheries	Viscount	0,62	10,05	16,20
4	Cheries	New Star	0,61	11,58	18,98
5	Cheries	Summit	0,63	10,54	16,73
6	Sour cheries	Ţarina	1,17	11,68	9,98
7	Sour cheries	Timpurii de Piteşti	1,45	8,82	6,08
8	Sour cheries	Erdi Noggy	1,06	7,52	7,09
9	Sour cheries	Mari timpurii	1,14	7,20	6,31
10	Sour cheries	Engleze timpurii	0,81	9,40	11,60

Tabel 3. Agrochemical characteristics of Idared cultivar fruits from RIFG Pitesti during three years of experimentation -mean values-

Nr. crt.	Variants	pH (Replicates I)	pH (Replicates II)	pH (Replicates III)	Titrable acidity [%]	Total sugar [%]
1	Row1Tree22	3,70	3,80	3,78	0,59	10,55
2	Row1Tree23	4,6	3,91	4,04	0,38	10,32
3	Row4Tree36	3,72	3,78	3,75	0,38	11,58
4	Row9Tree28	3,80	3,60	3,70	0,37	9,69
5	Row17Tree20	3,72	3,72	3,79	0,29	9,13
6	Row21Tree28	4,10	3,98	3,79	0,39	9,69
7	Row1Tree21	3,93	3,73	4,04	0,41	11,87
8	Row4Tree38	3,80	3,73	3,73	0,41	8,18
9	Row6Tree28	3,92	3,84	3,82	0,40	8,33
10	Row17Tree24	3,97	3,72	3,81	0,38	8,05

Table 4. Biochemical characteristics of currants and blueberries from RIFG Pitesti, during three years of experimentation

-mean values-

Nr. crt.	Species (Fresh fruits)	Cultivar	Vitamin C on mg/100g edible part	Anthocians on mg/100g edible part
1	Currants	Tines	132,00	1,002
2	Currants	Tisel	158,40	1,005
3	Currants	Ruben	127,6	1,002
4	Currants	Ben Hope	140,8	1,003
5	Currants	Titania	154,00	1,001
6	Blueberries	Bluetta	17,6	1,001
7	Blueberries	Delicia	20,24	1,001
8	Blueberries	Darow	8,8	1,002
9	Blueberries	Bonifacy	7,92	1,001
10	Blueberries	Patriot	7,92	1,001

Tabel 5. Antiradicals characteristics expressed in polyphenoli
-mean values-

Nr. crt.	Species (Fresh fruits)	Soiul	Pelargonidina 3,5-dimonozidă	Malvidină
1	Currants	Tines	Not analysed	Not analysed
2	Currants	Tisel	Not analysed	Not analysed
3	Currants	Ruben	Not analysed	Not analysed
4	Currants	Ben Hope	Not analysed	Not analysed
5	Currants	Titania	Not analysed	Not analysed
6	Blueberry	Bluetta	absent	present
7	Blueberry	Delicia	absent	present
8	Blueberry	Darow	absent	present
9	Blueberry	Bonifaco	absent	present
10	Blueberry	Patriot	absent	present

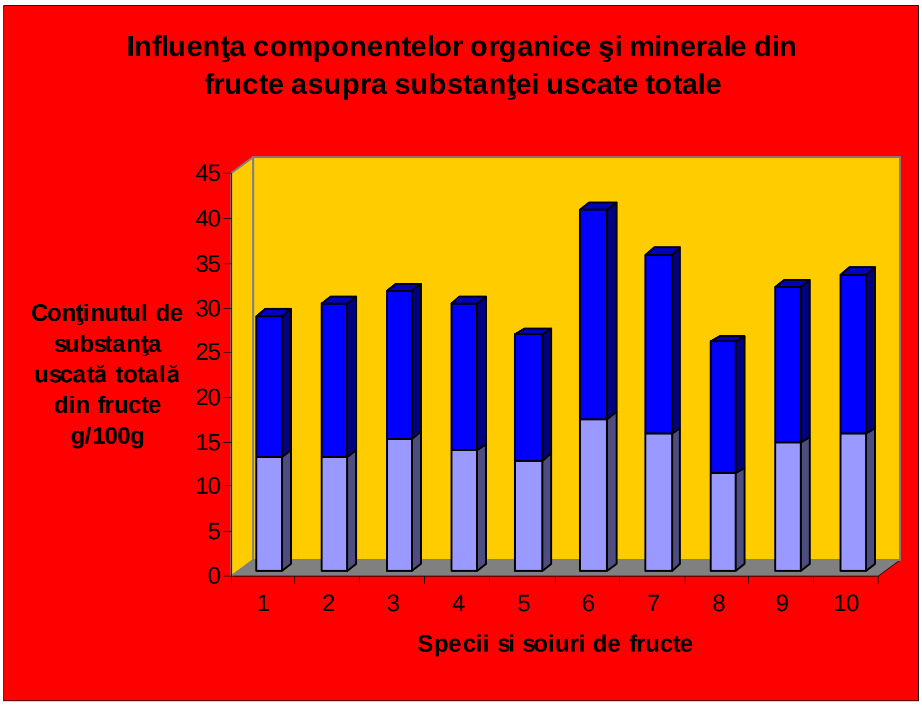

Figure 1. Influence of the fruits organic and mineral compounds on total dry matter.

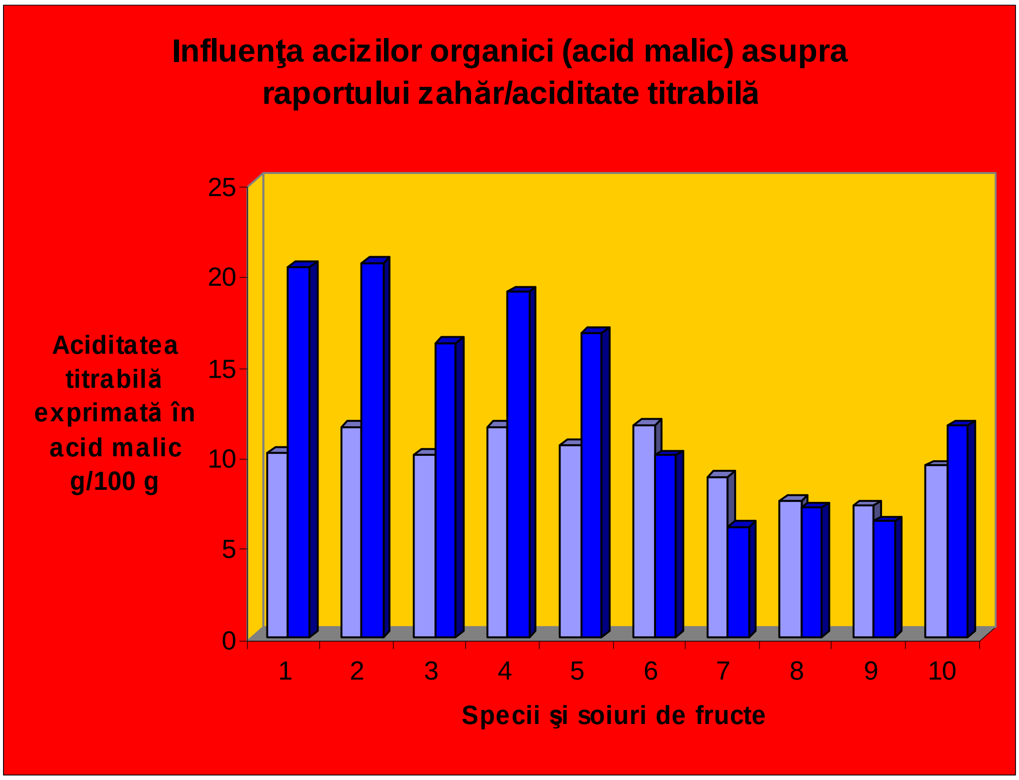

Figure 2. Influence of the organic acids on the sugar/acidity ratio

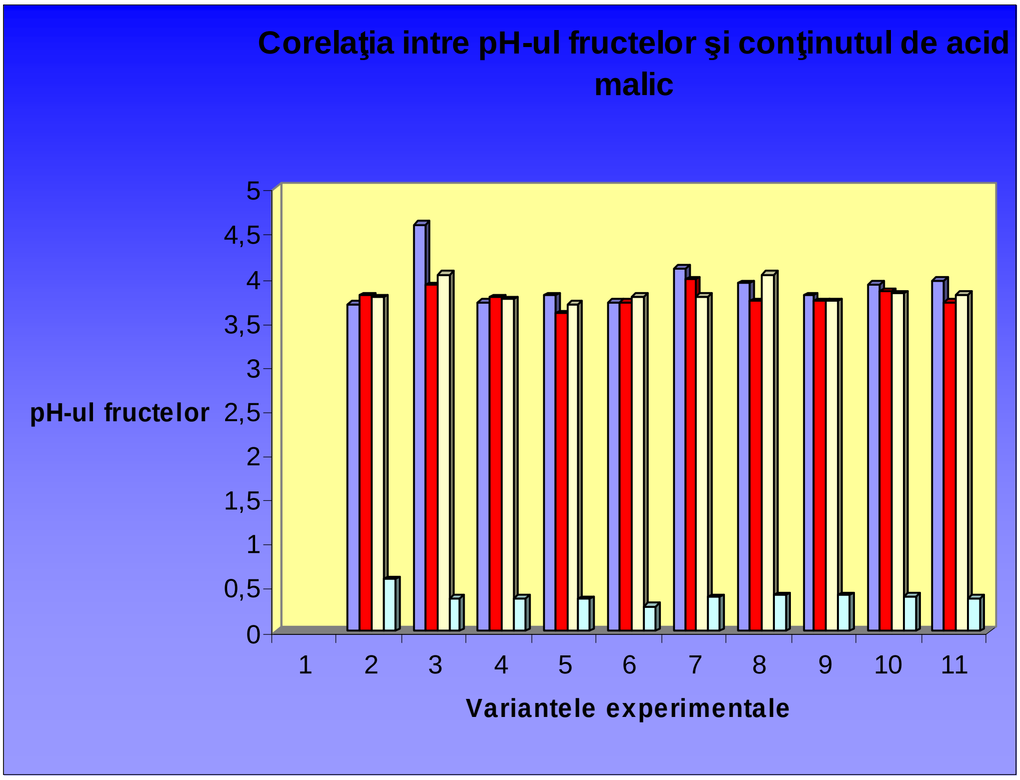

Figure 3. Correlation between fruits pH and malic acid content

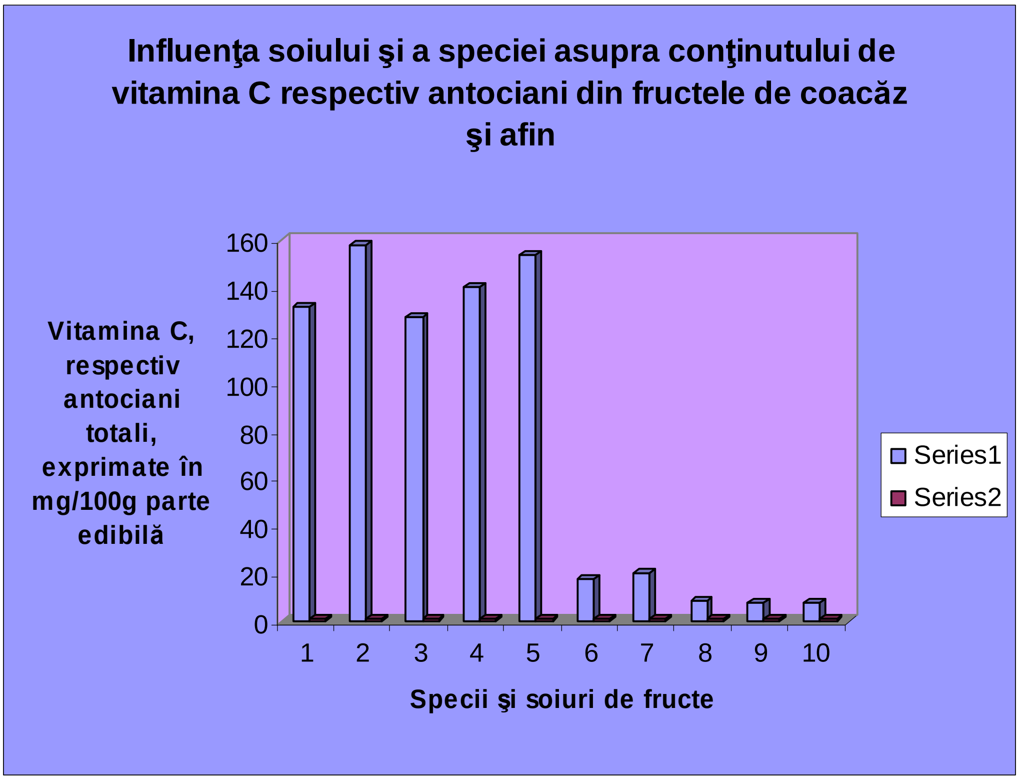

Figura 4. Influence of the species and varieties on the C vitamin content, respectively fruit anthocians content of blackcurrant and blueberry