STUDIUL BIOTIPURILOR AUTOHTONE DE ARBUSTI FRUCTIFERI
THE STUDY OF NATIVE SMALL FRUITS BIOTYPES

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Abstract

The breeding programs of the European countries are based on biotypes from wild flora, because they are the true sources of genes. These genes are able to print in the future cultivars resistance to diseases, pests and climatic stress, and also fruits with the best flavor and phytoterapeutic resources. In this aim, Research Institute for Fruit Growing Pitesti-Maracineni conducted numerous studies of exploring the wild flora in different areas of the country. Following these expeditions were identified numerous biotypes of cornelian cherry, rosehip and seabuckthorn. All these native biotypes were subjected to studies of phenology, productivity, and quality of fruits. These researches identified the highest productivity in the following biotypes: MS-40 (cornelian cherry), RC-CN (rose hip) and MPR2P3 (seabuckthorn).

Keywords: cornelian cherry, rose hip, seabuckthorn
Cuvinte cheie: corn, maces, catina

1. Introduction

In this paper work we present the results from a study during a three-year period, on the rosehip, cornelian cherry and seabuckthorn biotypes selected from the Romanian wild flora, but the plants were planted and studied in an experimental plot of RIFG Pitesti. Finn (2009) says that selecting the biotypes with the largest fruits, the most productive and with good taste is an activity as old as humankind, our ancestors selected their favorite genotypes to plant near their homes. On the other hand the development of modern agriculture was based on natural biodiversity, the actually cultivars are the result of a long process of identifying, handling and improving wild biotypes (Sen,1996; Hornero, 2000;Celik, 2009).

Although these species studied in this paper are known since antiquity, finding new sources of genes able to print in the future cultivars higher productivity and high quality fruit remains valid Ulrich (2009).

In Europe, the largest collections and breeding programs to cornelian cherry and seabuckthorn have recently been established in Ukraine, Bulgaria, Slovakia, Austria, Yugoslavia, France, Germany, Poland and Turkey (Klimenko, 2004).

In Romania at RIFG Pitesti there are currently 44 biotypes of cornelian cherry, 8 biotypes of seabuckhtorn and 9 biotypes of rosehip, all come from the wild flora, following selection expeditions carried out in different areas of Romania (Mladin et al., 2006).

The purpose of this paper is to identify native small fruits biotypes, i.e. cornelian cherry, rosehip and seabuckthorn in the Romanian sub-mountainous area, and to study their phenology, productivity, and quality of fruits.

2. Material and methods

The study regarding the phenology, productivity, and quality of fruits was performed in the experimental fields of the Small Berry Department of the Research Institute for Fruit Growing Pitesti, during 2009 – 2011. From a lot of 9 biotypes of rosehip we have chosen four biotypes (RP-1, RC-24, RC-32, RC-CN); for cornelian cherry five biotypes (SM-4, TGJ-9, TGJ-20, MS-40, MH-7) and for seabuckhtorn four biotypes (MPR2P3, MG 1, DGR1P1, DGR1P5). On these biotypes the following determinations were made: the monitoring of the main vegetative phenophases (onset of vegetation, flowering time, fruit ripening time). The fruit quality characteristics were evaluated by the following determinations: average weight, flesh ratio and average weight of flesh of fruit; determined by gravimetric method, then fruit length and width were determined by measuring with the calliper. The index size was calculated by formula: (height +large diameter +small diameter)/3, and shape index by the formula: (larger diameter + smaller diameter)/ 2 height (Botu, 1997). The fruit firmness was determined with a SHIMPO DFS. Soluble solids content was determined in berry juice by means of digital refractometer (PR Series). The results were statistically calculated by Duncan´s Test at a significance level= 0.05.

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1. Results and discussions

For the rose hip biotypes, the three vegetation phenophases evolved as follows: the onset of vegetation occurred in the last ten days of April, flowering broke in the last ten days of May (the latest was RP-1, May 31) and fruit ripening began in the mid of September and continued until the end of September. The biotype RC-CN was earlier with 5 to 10 days compared to all biotypes studied in all three vegetation phenophases analyzed (Tab. 1.).

For all cornelian cherry biotypes the onset of vegetation began within the first five days of March in four of the five biotypes studied (Fig. 2), the flowering began in the first decade of April in all biotypes, and fruit ripening was triggered from the third decade of August. From the blooming until fruit ripening passed 110-120 days (Tab. 2).

At sea buckthorn, information on phenological events is quite limited. However, for a crop or fruit tree, the most important phenological events are time of flowering and maturity, which are important agronomic traits and directly related to yield level (Wallace 1985). These two analyzed phenological events, the flowering and the fruit ripening started with the DGR1P5 biotype (Tab. 3).

On average for the three years of investigation, the rose hip biotypes showed significant differences between them for all the six characteristics studied (Tab.4).

The RC-24 biotype showed the biggest fruit weight, over 3.7 g / fruit and the biggest fruit width (19.36 mm), for these two fruit characteristics this biotype is significantly greater by 21.7% than all rose hip biotypes (Tab.4). The RP-1 and RC-CN rose hip biotypes showed the biggest fruits length values (26.80) mm and 25.07 mm, respectively, versus all biotypes.

The evaluation on the fruits diameter showed that the RC-24 biotype had the biggest fruit width (19.36 mm) value; this was significantly bigger versus all biotypes studied where the limits of fruit diameter was about from 18.42 to13.87 mm (Table.4).

The analysis of the fruits quality based on the number of seeds/fruit showed that the biotype RP-1 showed the smallest number of seeds/fruit (3.9 seeds/fruit), and it was significantly differed versus all other rosehip biotypes studied. In the three years of study the rose hip biotype RP-1 had the highest value of flesh ratio (89.91%). The lowest value of flesh ratio was found in the RC-32 (62.80%), this value was significantly lower by 31% versus RP-1 (Tab.4). The highest yield/ bush was found in RC-CN (Foto. 1) biotype.

For the rose hip biotypes the climatic conditions grom every year affected significantly yield/bush values and fruit qualitative characteristics of biotypes.

On average for three research years the SM-4 (Foto 1.), cornelian cherry biotype showed a significant increase by 13.3-14% in fruit weight, by 10.0-12.0 % in fruit length, by 11.5-17.4% in average weight of flesh, by 9.7-19.4% in yield/bush versus the other four studied cultivars (Tab. 5).

Climatic conditions from year to year did not affected yield/tree values and any qualitative characteristics of cornelian cherry biotypes. Lowest fruit yields were recorded in the biotype TG-J-20 (4.1 kg / tree) and 2-fold higher in selections MS-40 (8.13 kg / tree), closely followed by MS-4 (7.96 kg / tree (Tab. 5).

On average for three research years the SM-4 cornelian cherry biotype produced the highest value in four from the six fruit characteristic analyzed. It had a significant increase by 13.3-14% in fruit weight, by 10.0-12.0 % in fruit length, by 11.5-17.4% in average weight of flesh, by 9.7-19.4% versus the other studied biotypes (Tab. 5) The biggest yield / bush value was recorded in two cornelian cherry biotypes: SM-4 (7.96 kg/bush) and MH-7 (7.80 (kg/bush) (Tab. 5).

The analysis on three years of study on seabuckthorn biotypes showed that the MPR2P3 and MG1 produced the highest yield/bush values, and this was significantly higher versus the other biotypes studied (Tab.6).

4. Conclusions

For the rose hip and seabuckthorn biotypes, the climatic conditions of every year affected significantly yield/bush values and fruit qualitative characteristics of biotypes.

On average for the three experimental years the biggest yield/bush value was recorded in RC-CN (*Rosa canina* L) with 6.31kg, SM-4 (*Cornus mas L*) (7.96 kg/bush) and MPR2P3 (H. rhamnoides var. carpatica L)(7.49 kg/bush).

5. References

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Tables and figures

Table. 1. Phenological growth stages to rosehip biotypes

Biotypes	Beginning of bud swelling	leaf tips above the bud scales: first leaves separating	Beginning of flowering- first flowers open	Full flowering : at least 50% of flowers open,	End of flowering all petals fallen	90% of fruits formed	Beginning of ripening
RP-1	April 25	April 30	May 29	June 23	July 10	July 26	September 24
RC-CN	April 11	April 27	May 20	June 22	July 03	July 18	September15
RC-24	April 12	April 28	May 26	June 18	July 05	July 24	September 22
RC-32	April 15	April 24	May 24	June 24	July 07	July 21	September 10

Table. 2. Phenological growth stages to cornelian cherry biotypes

Biotypes	Beginning of bud swelling	Beginning of flowering- first flowers open	Full flowering : at least 50% of flowers open, first petals falling	End of flowering all petals fallen	leaf tips above the bud scales: first leaves separating	90% of fruits formed	Beginning of ripening
MH7	March 15	March 18	March 29	April 11	April 15	April 29	August 23
TG.JIU-9	March 03	March 15	March 22	April 05	April 11	April 29	August 23
TG.JIU-20	March 01	March 08	March 18	April 03	April 12	April 22	August 20
MS-40	March 04	March 15	March 24	April 07	April 15	April 21	August 01
SM-4	March 06	March 15	March 22	April 07	April 20	April 21	August 29

Table. 3. Phenological growth stages to sea buckthorn biotypes

Biotypes	Beginning of flowering	Beginning of ripening
MPR2P3	April 16	September 27
MG-1	April 19	September 30
DGR1P1	April 19	September 26
DGR1P5	April 10	September 21

Table 4. Fruit characteristics of rose hip biotypes (means of 2009-2011)

Biotypes	S pecies	Fruit weight (g)	Fruit length (mm)	Fruit width (mm)	No. seeds/fruit	Flesh ratio (%)	Yield (kg/bush)
RP-1	R. pendulina L	1.71 d*	26.80 a	13.87 b	4.00 d	89.91 a	2.88 b
RC-24	R. canina L	3.72 a	22.60 b	19.36 a	31.88 b	65.06 c	1.96 d
RC-32	R. canina L	3.55 b	20.58 b	18.42 a	38.53 a	62.80 d	2.30 c
RC-CN	R. canina L	2.19 c	25.07 a	14.02 b	26.02 c	71.01 b	6.31 a
Fruit characteristics of rosehip biotypes (mean of all biotypes in every year)							
2009		3.72 a	24.76 a	19.15 a	35.02 a	75.14 a	3.47 a
2010		3.75 a	22.98 b	18.42 a	35.23 a	75.11 a	3.31 b
2011		3.58 a	24.53 ab	18.96 a	35.24 a	74.85 a	3.16 c

***Duncan's multiple range test (p≤0.05)**

Table 5. Fruit characteristics of cornelian cherry biotypes (means of 2009-2011)

Biotypes	Species	Fruit weight (g)	Fruit length (mm)	Fruit width (mm)	Average weight of flesh (g)	Flesh ratio (%)	Yield (kg/bush)
SM-4	C. mass L	2.80 a*	22.12 a	12.58 bc	2.21 a	86.06 a	7.96 ab
TGJ-9	C. mass L	2.09 b	17.96 b	13.24 b	1.92 b	80.06 a	6.26 c
TGJ-20	C. mass L	1.88 c	17.36 b	12.36 c	1.41 c	74.22 a	4.09 d
MS-40	C. mass L	1.80 d	17.67b	14.24 a	1.42 c	78.31 a	8.13 a
MH-7	C. mass L	1.69 e	18.37 b	12.43 c	1.27 d	87.1 a	7.80 b
Fruit characteristics of cornelian cherry biotypes (mean of all biotypes in every year)							
2009		2.04 a	19.50 a	13.45 a	1.65 a	78.53 a	6.83 a
2010		2.06 a	18.37 b	12.78 b	1.64 a	78.65 a	6.86 a
2011		2.05 a	18.19 b	12.68 b	1.65 a	79.82 a	6.86 a

***Duncan's multiple range test (p≤0.05)**

Photo 1. Cornelian cherry (SM-4) and (RC-CN) rose hip biotypes

Table 6. Fruit characteristics of seabuckthorn biotypes (mean of 2009-2011)

Biotypes	Species	Fruit weight (g)	Fruit length (mm)	Fruit width (mm)	Size index (cm)	Flesh ratio (%)	Yield (kg/bush)
MPR2P3	H. rhamnoides var. carpatica L	0.49 b*	12.21 a	7.41 c	0.89 c	92 a	7.49 a
MG 1	H. rhamnoides var. carpatica L	0.37 c	10.45 d	6.90 d	0.84 d	93 a	6.85 b
DGR1P1	H. rhamnoides var. carpatica L	0.61 a	11.11 c	8.79 b	0.94 b	92 a	5.61c
DGR1P5	H. rhamnoides var. carpatica L	0.52 b	11.42 b	9.01 a	0.98 a	92 a	5.57c
Fruit characteristics of of seabuckthorn biotypes (mean of all biotypes in every year)							
2009		0.48 b	11.25 a	8.10 a	0.92 a	91 a	3.71 c
2010		0.49 ab	11.30 a	8.02 a	0.92 a	92 a	7.37 b
2011		0.51 a	11.34 a	7.96 a	0.91 a	92 a	8.05 a

***Duncan's multiple range test (p≤0.05)**