

## CONTRIBUTIONS FOR HOMOLOGATION OF SOME SEA-BUCKTHORN VARIETIES (*HIPPÖPHAE RHAMNOIDES* L.) FOR EXPLOITATION IN ORGANIC FARMS

*Ioan Viorel Rați, Nicoleta Bădăluță, Dumitra Răducănu*

*Key words: sea-buckthorn, variety, UPOV sheet*

### INTRODUCTION

Sea-buckthorn (*Hippöphae rhamnoides* L.) can be considered the most complex and natural container of vitamins from our country's natural flora. It contains large amounts of vitamin A and vitamin E, the B complex vitamins in varying doses, vitamin C, F, PP, etc (Rați I.V., Rați Luminița, 2003, Bălășcuța N. et al., 1988).

Sea-buckthorn has become famous for its regeneration and immune regulatory effects which recommend it as adjuvant in a wide range of disorders: from recurrent infections to allergies, from premature aging to cancer.

Sea-buckthorn is also recommended in specific conditions for the elderly, in nervous disorders, infertility, deficiencies of vitamins and minerals. The list of disorders in which sea-buckthorn can be used as adjuvant is impressive – sea-buckthorn is a natural ingredient effective in more than 100 diseases and disorders (Beldeanu C., 1972).

This paper is the result of our study of the sea-buckthorn varieties homologated at Fructex Bacău (Diana, Silvia, Tiberiu, Auruș, Ovidiu, Serpenta and Victoria) and of an organically grown hybrid sea-buckthorn male called Star, proposed for patenting, their UPOV description, highlighting some qualitative characteristics of fruits resulted from morphological observations, biometric measurements (fruit diameter (mm), fruit weight (g), seed weight (g) shape index) and physiological features (dry matter %, sugar content %) (V. Cociu, Șt. Oprea, 1989).

Species and varieties cultivated in organic farming systems are selected according to their adaptability to local soil and climate conditions, and tolerance to pests and diseases. All the seed and planting must be organically certified, the plant varieties must be chosen so as to maintain genetic diversity. If organic seed and planting material is not available, conventional materials can be used only if

they have not been treated with pesticides banned by European standards.

If conventionally untreated seed and planting material is not available, there may be used chemically treated seed and planting material. The certification body will determine deadlines and conditions for exceptional cases that allow the use of any chemically treated seed and planting material ([www.bio-romania.org](http://www.bio-romania.org)).

### MATERIAL AND WORK METHODS

The biological material analysed comprised seven varieties of sea-buckthorn homologated at Fructex Bacău (Diana, Silvia, Tiberiu, Auruș, Ovidiu, Serpenta, Victoria), constituting the selection recommended for breeding in the region of Moldavia, and an organically grown hybrid male sea-buckthorn called Star, proposed for homologation. Buckthorn is a dioecious plant, requiring a male plant to ensure quality pollen during flowering and determine high-quality characteristics and performance at the fruits obtained from female plants (Botez M., Bădescu Gh. și Botar A., 1984).

The study was aimed at morphological observations of the analysed individuals in terms of plant aspect, fruit shape and colour, fruit distribution along the shoots, shape of leaves; biometric measurements in the laboratory using digital callipers (fruit diameter (mm), shape index), and analytical scales (fruit weight (g), seed weight (g)) and physiological measurements (dry matter content %, sugar content %) performed with the manual Zeiss refractometer. The morphological and phenotypic characterization of the buckthorn male individual Star was performed using the UPOV sheet imposed by OSIM (State Office for Inventions and Trademarks) and ISTIS (State Institute for Variety Testing and Registration), a sheet that comprises the description of

morphological traits, the reference variety and the obtained mark (<http://istis.ro>, [www.OSIM.ro](http://www.OSIM.ro)).

**The buckthorn germplasm culture** contains over 60 biotypes of sea-buckthorn that were selected from the spontaneous flora of 12 counties in Romania through an activity that was conducted within the project CEEEX 2006 Ecohipocarp.

In this culture, there are organically grown 7 varieties homologated by Fructex Bacău (Diana, Silvia, Tiberiu, Auraș, Ovidiu, Serpenta and Victoria), patented and multiplied in the nursery for the production of certified seed material.

The description of the varieties mentioned above, recommended to be combined with the Star male, is detailed in the book “Cătina în exploatarea agricolă” Rați I.V., Rați Luminița, 2003 (Figures 1-7).

To ensure good pollination of these varieties, there was selected a sea-buckthorn biotype provisionally called Star, for the purpose of homologation (Fig. 8).

## RESULTS AND DISCUSSIONS

Biometric measurements were carried out on the fruit varieties recommended for selection in

Moldavia that were harvested at physiological maturity.

Measuring the sizes of fruits, the large and small diameter, of a significant number of samples, helped establish the shape index. Its value ranges between 1.08% for the Ovidiu variety (nearly round shape of the fruit) and 1.54% for the Serpenta variety (oblong shape) (Table 1).



Fig. 1. Serpenta varietie



Fig. 2. Diana varietie



Fig. 3. Silvia varietie



Fig. 4. Victoria varietie



Fig. 5. Auruş varietie



Fig. 6. Ovidiu varietie



Fig. 7. Tiberiu varietie



Fig.8. Star sea-buckthorn – pollinating male

The fruit weight of the seven varieties of sea-buckthorn registered values ranging between 0.22 g (Tiberiu variety) and 0.61 g (Diana variety). The seeds showed values ranging between 0.006 g (Serpenta variety) and 0.026 g (Diana variety). The seed percentage of the total fruit weight ranges between 1.97% (Serpenta variety) and 4.19% (Diana variety) (see Table 1).

The analysed fruits were collected only from the female individuals pollinated by the Star male. The highest dry matter and sugar content was found at the Tiberiu variety, namely 12.94% dry matter and 10.98% sugar content. The lowest content of the two biochemical compounds was found at the Silvia variety, respectively 8.81% dry matter and 7.41% sugars.

Table 1. Biometrical measurements of sea-buckthorn fruits

Sea-buckthorn Varieties	Large diameter (mm)	Small diameter (mm)	Shape index (%)	Fruit weight (g)	Seeds weight (g)	% seed
Diana	12,63	8,82	1,43	0,61	0,026	4,19
Silvia	8,52	7,34	1,16	0,30	0,007	2,24
Tiberiu	8,64	5,72	1,51	0,22	0,011	5,11
Auruş	10,15	8,49	1,20	0,46	0,013	2,92
Ovidiu	8,51	7,88	1,08	0,37	0,011	2,89
Serpenta	10,58	6,88	1,54	0,32	0,006	1,97
Victoria	9,74	7,85	1,24	0,43	0,010	2,33

Table 2. The dry matter and sugar content of sea-buckthorn varieties

Sea-buckthorn varietie	Dry substance (%)	Sugar (%)
Diana	10,99	9,39
Silvia	8,81	7,41
Tiberiu	12,94	10,98
Auraş	10,67	9,07
Ovidiu	12,22	10,40
Serpenta	9,07	7,65
Victoria	10,97	9,36

The morphological and phenotypic characterization of the buckthorn biotype Star – male

pollinator according to the UPOV sheet. The plant is tree-shaped like the varieties Maslichnaya, Novost'Altaya, Slovan, Vitaminaya, with the advantage of having an erect, high growth which can ensure good pollination through spreading (Table 3, Fig.10). The ramifications are erect (Fig. 11), similar to the German varieties Ascoli and Frugana from the world selection. (Table 3).

The plant has average vigour, which recommends it for higher densities with the exploitation of intensive culture technologies. Vigour also allows a reduction in manual labour force, having lesser cutting needs (Fig. 12).

The branches are dense (Fig. 13), similar to the varieties Maslichnaya and Slovan from the world selection, granting it the mark of 7.

Table 3. UPOV description of the Star variety (sea-buckthorn male pollinator)

No. UPOV	Character	Expression of character	Reference varieties	Mark
1(*) (+) QL	Plant: sex	Female	Bojan, Leikora, Slovan	1
		Male	Pollmix 1	2
2(*) (+) QL	Plant: growth type Shrub type	Tree type	Maslichnaya, Novost' Altaya, Slovan, Vitaminaya	1
			Bojan, Dorana, Terhi	2
3(*) PQ	Plant: position of ramifications	Erect	Ascola, Frugana	1
		Semi-erect	Leikora, Slovan, Vitaminaya	2
		Horizontal	Bojan, Maslichnaya	3
		Arched	Hergo	4
4(+) QN	Plant: vigour	Weak	Dorana, Maslichnaya	3
		Average	Bojan, Hergo	5
		Strong	Ascola	7
		Very strong	Leikora	9
5 QN	Plant: branch density	Rare	Pollmix 3, Vitaminaya	3
		Average	Bojan	5
		Dense	Maslichnaya, Slovan	7
6 QL	Plant: position of inflorescence	Only on 1-year branches	Leikora, Pollmix 1, Pollmix 2	1
		On 1-year branches and older branches	Ascola, Dorana, Frugana	2
7 QN	1-year branch: thickness	Thin	-	3
		Average	Bojan, Slovan	5
		Thick	Leikora, Maslichnaya	7
8(*) QN	Branch: number of trichomes (from middle to top)	Absent or very small	Obil'naya, Yantarnaya	1
		Small	Pollmix 1, Vitaminaya	3
		Average	Slovan	5
		Large	Bojan, Leikora, Pollmix 2	7
9 (+) QN	Branch: length of trichomes	Short	Silvia, Tiberiu	3
		Average	Auras, Victoria	5
		Long	Diana	7
10(*) (+)PQ	Leaf: shape	Very narrowly elliptical	Bojan, Dorana, Maslichnaya, Vitaminaya	1
		Narrowly elliptical	Slovan	2
		Narrowly oblong	Frugana	3
11(*) QN	Leaf: size	Small	Dorana, Maslichnaya	3
		Average	Hergo, Slovan	5
		Large	Bojan, Leikora, Vitaminaya	7
12 QL	Leaf: margin serration	Absent	Bojan, Dorana, Maslichnaya, Slovan, Vitaminaya	1
		Present	Frugana	9
13 (*) QL	Leaf: colour of upper surface	Green	Dorana, Leikora, Pollmix 1	1
		Silver	Bojan, Maslichnaya, Slovan, Sprite	2
14 QN	Leaf: intensity of the green colour of the upper surface	Light	Dorana	1
		Average	Leikora	2
		Dark	Polmix 1	3
15 (*) QN	Leaf: pubescence of lower surface	Rare	Bojan, Diana, Ovidiu, Slovan, Tiberiu	3
		Average	Auras, Serpenta, Victoria	5
		Dense	Silvia	7



Fig. 9. Buds with pollen – the Star variety male pollinator



Fig. 10. 3-year tree plant



Fig. 11. Erect ramification – the Star variety male pollinator



Fig. 12. Male plant close-up – production farm



Fig. 13. Dense branches – the Star variety male pollinator



Fig. 14. The Star variety – large folded buds, brown-reddish colour



Fig. 15. Young shoots with average thickness



Fig. 16. Shoots with no trichomes



Fig. 17. Star trichome close-up



Fig. 18. Narrowly elliptical leaf



Fig. 19. Leaf margin serration close-up



Fig. 20. Lower leaf pubescence close-up

The buds are large, folded up, reddish brown with yellowish shades. They contain much pollen (Fig. 14). Inflorescences may occur on one-year as well as two-year branches, like at the Ascola, Dorana, Frugana varieties from the global selection, being given mark 2 (Table 3). The one-year branch is characterized by medium or average thickness, marked with 5 points (Fig.15), like the Bojan and Slovan varieties from the assortment. It was analysed the upper part of the shoot, from middle to top, observing the absence of thorns. It can be said that this variety does not have trichomes on top of annual branches. It was appreciated with mark 1 (Table 3) and is part of the same group as Obil'naya, Yantarnaya from the world selection (Fig. 16).

At the base of two-year shoots and on thicker wood there are thorns with average length, appreciated with mark 5 (Table 3). This length makes the plant non-aggressive since the thorns are flexible and soft. This feature is found at females of the Auraş and Victoria varieties (Fig.17).

The leaf is narrowly elliptical (Fig. 18), of large size, with margin serration (Fig.19). The colour of the upper surface is green, of average intensity, like at the Leikora variety, the pubescence of the lower surface is dense, being marked with 7 (Table 3, Fig. 20).

### CONCLUSIONS

The productivity indicators highlighted for the studied sea-buckthorn varieties confirm that the Star variety is a very good pollinator.

The morphological and phenotypic features presented according to the UPOV sheet were used in OSIM inspections.

The sea-buckthorn male pollinator Star is characterized by high size, shoots with no trichomes and the ability to ensure good pollination for all the studied varieties.

By making a selection of varieties for the studied species, there may be obtained certified seed material, which allows the establishment of green plantations by accessing European funds.

### ABSTRACT

Sea-buckthorn is a dioecious species, therefore the planting scheme in a culture is recommended to have one male individual followed by seven female individuals to provide optimal pollination and to get as rich a harvest as possible.

The study proposes observations and measurements on the varieties of sea-buckthorn homologated at Fructex Bacău (Diana, Silvia, Tiberiu, Auraş, Ovidiu, Serpenta and Victoria) and of a hybrid male sea-buckthorn entitled Star proposed for patenting, grown organically, as well as their description according to the UPOV sheet.

### REFERENCES

1. BĂLĂŞCUȚA N., STĂNESCU V., PETROVICI I., ELENA STUPARU, TEODORA DAMIAN, 1988 - Zonarea, selecția și cultura intensivă a speciilor și soiurilor de arbuști fructiferi în fondul forestier, Redacția de propagandă tehnico-agricolă, București;
  2. BELDEANU C., 1972 - Cercetări privind creșterea fructelor de cătină albă, Buletinul Universității Brașov. Seria B. Economie forestieră -vol XIV;
  3. BOTEZ M., BĂDESCU GH. ȘI BOTAR A., 1984 - Cultura arbuștilor fructiferi, Editura Ceres, București, pag.168;
  4. COCIU V., OPREA ȘT., 1989 - Metode de cercetare în ameliorarea plantelor pomicele, Editura Dacia, Cluj Napoca;
  5. RAȚI IOAN VIOREL, RAȚI LUMINIȚA, 2003 - *Cătina Albă în Exploatații Agricole*, Ed. Fundația Națională "Satul Românesc" sub egida ANCA – MADR, București;
- \*\*\*<http://istis.ro/scurt-istoric>;
- \*\*\*<http://www.bio-romania.org>;
- \*\*\*<http://www.constientizarerurala.ro/dezvolta>
- \*\*\*[re-durabila/17-concept-dezvoltare-durabila](http://www.re-durabila/17-concept-dezvoltare-durabila) ;
- \*\*\*<http://www.OSIM.ro/despre/despreo.htm>;

### AUTHORS' ADDRESS

RAȚI IOAN VIOREL, BĂDĂLUȚĂ NICOLETA, RADUCANU DUMITRA - "Vasile Alecsandri" University of Bacău, Faculty of Sciences, Department of Biology and Environmental Protection, Mărășești Street no. 157, Bacau, e-mail: [ratioanviorel@yahoo.com](mailto:ratioanviorel@yahoo.com); [dumitra\\_manea@yahoo.com](mailto:dumitra_manea@yahoo.com); [nicoletadogaru@yahoo.com](mailto:nicoletadogaru@yahoo.com)