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WINTER-HARDINESS AND SOME YIELD COMPONENTS OF SEA-BUCKTHORN (*Hippophaë rhamnoides* L.) IN BELORUSSIA

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Introduction

Decrease in the natural plants genofound made it necessary to necessity of look for and introduce new species.

Sea-buckthorn, possessing unique biochemical content, stable yielding and plasticity, has attracted special attention of researchers in the last decade [BERNATH, ZOLDESI 1992; YAO, TIGERSTEDT 1994; LI, SCHROEDER 1996].

Hippophaë rhamnoides L. is cultivated introduced plant in Beloruss which, introduction was started in the 30-th by the Central Botanical Garden of the National Academy of Sciences, demonstrating possibility of successful cultivation aphthous species [GARANOVICH 1992].

At present, the species consists of introduced varieties selected by the M.A: Lisavenko Research Institute of Horticulture and by the Botanical Garden of M.V. Lomonosov Moscow State University. The former are insufficiently winter-hardy, the latter are more like thorh-bush and toller.

It is necessary to select cultivars with valuable characteristics adapted to the conditions of Beloruss.

Creation of highly productive varieties is one of the main tasks of breeders. Yield depends on biological properties, climatic conditions, etc.

The task of the present study was to estimate winter-hardiness, yielding and its components (fruit mass, one-year shoot length, number of buds per 10 cm of shoot, number of fruits from one bud) of different varieties and to choose the best for further breeding work.

Materials and methods

Eight varieties from the Botanical Garden of Moscow State University (Botanitcheskaya, Vorob'jovskaya, Lomonosovskaya, Mendelejevskaya, Nivelena, Otradnaya, Trophimovskaya), 2 varieties from the Nizni Novgorod Agricultural Academy (Mariya, Priokskaya) and 5 Dr. Phephelov's hybrids were studied.

Trees were planted on the experimental field of the Belorussian Research Institute for Fruit Growing in 1992 on the 4.2 x 2.5 m plot. All varieties came into fruiting in 1995.

The study of winter-hardiness and yield components was carried out by generally accepted methods [ANONYMOUS 1980]. The freezing of buds was determined as by described Tsarkova [TSARKOVA 1982]. The statistical treatment of the data was made by using „Dispasn" program.

Results and discussion

The main sowices of damage are strong frosts, sharp drop in temperature after thawing and frosts during flowering. The yield influences on the development of winter-hardiness components also.

As the results of the study on winter-hardiness no significant differences between the Moscow's varieties were found. At the same time, the freezing degree of the hybrids and Priokskaya was generally lower. Mariya and 29/88 hybrid had the same winter-hardiness as Moscow's varieties (Tab. 1). These results confirm the conclusion that varieties received on the bases of Baltic climatype are superior to those obtained on the basis of other than the conditions of Beloruss.

Table 1; Tabela 1

The winter-hardiness of sea-buckthorn
Zimotrwałość rokitnika

Varieties Odmiana	Freezing degree of fruit buds Stopień wymarzania pąków owocowych		General freezing degree Ogólny stopień wymarzania	
	average średnio	1998	average średnio	1998
Botanitcheskaya	0.8	1.0	0.9	1.0
Vorob'jovskaya	0.8	1.0	0.9	1.0
Lomonosovskaya	0.8	1.0	0.8	1.0
Mariya	1.5	2.0	1.2	2.0
Mendelejevskaya	0.8	1.0	0.8	1.0
Nivelena	1.0	2.0	0.8	1.0
Otradnaya	0.8	1.0	0.8	1.0
Podarok sadu	1.0	2.0	0.8	1.0
Priokskaya	2.0	3.0	1.6	2.0
Trophimovskaya	0.8	1.0	0.8	1.0
10/86	2.3	4.0	1.8	2.0
4/87	2.0	3.0	1.8	2.3
15/88	2.3	3.0	2.0	3.0
20/88	2.8	5.0	2.3	3.0
29/88	1.5	2.0	1.1	
$LSD_{0.5}$; $NIR_{0.5}$	0.9		1.1	

Winter-hardiness decreased from 1995 to 1998, reaching the lowest level in 1998. It can be explained by the unfavorable climatic conditions during autumn

and winter and by the fact that the freezing degree decreased with the plant's age [TIURINA, GOGOLEVA 1978]. The winter-hardiness of buds was lower than that of the vegetative parts of plant. Depending on the variety, it varied from 0.8 to 2.8. The buds in the lower part of the shoot are frozen more than at the top. These data agree with those of other researchers [BORODACHEV et al. 1982; TRUSHECHKIN et al. 1983].

The length of a one-year shoot influences yield. Moreover, the multiplication coefficient depends on this parameter. The length of shoot was characterized by a high coefficient of variation (24–63%). The high variability to change makes selection based on this parameter difficult. Depending on the cultivar the length of shoot varied from 25.9 to 40.5 cm, but these differences were non significant (Tab. 2).

Table 2; Tabela 2

Some yield components of sea-buckthorn, average data for 1995–1997
Wybrane składniki plonu rokitnika, średnie z lat 1995–1997

Warieties Odmiany	Number of buds per 10 cm of shoot Liczba pędów na 10 cm pędu	Number of fruits in one bud Liczba owoców w jednym pąku (g)	Fruit mass Masa owoców (g)	One-year shoot length Długość jednorocznego pędu (cm)	Yield (kg per plant) Plon (kg z rośliny)
Botanitcheskaya	13.3	7.8	0.75	28.6	14
Vorob'jovskaya	13.2	6.4	0.69	30.9	21
Lomonosovskaya	11.5	5.3	0.62	36.5	7
Mariya	12.5	4.9	0.73	33.8	5
Mendelejevskaya	13.5	5.1	0.57	32.8	7
Nivelena	13.0	6.1	0.72	40.5	19
Otradnaya	11.4	7.5	0.75	32.6	17
Podarok sadu	13.3	5.7	0.70	38.1	16
Priokskaya	12.8	5.8	0.86	25.9	5
Trophimovskaya	11.7	5.9	0.78	34.5	16
10/86	10.9	3.9	0.57	31.1	3
4/87	11.4	4.9	0.66	28.1	5
15/88	9.6	3.7	0.77	32.2	3
20/88	10.7	3.1	0.73	32.2	2
29/88	11.6	7.3	0.77	35.2	17
$LSD_{0.5}$; $NIR_{0.5}$	1.7	1.0	0.07	$F_t < F_{0.5}$	8

Number of fruits from one bud was characterized by a high coefficient of variation (15–29%), too. When evaluating this parameter, significant differences were found. Botanitcheskaya, Otradnaya and 29/88 hybrid were better than Trophimovskaya (the citrate variety); 10/86, 15/88 and 20/88 hybrids were worse than one and the other hybrids were the same.

Fruit mass and number of buds per 10 cm of the shoot were characterized by the lowest coefficients of variation (1–3% and 7–18% respectively), therefore these features are the most reliable for selection. This conclusion corresponds to that of Dr. Kondrashov [KONDRASHOV 1986].

Not such large differences were observed in the number of buds per 10 cm of shoot. Mendelejevskaya was the best (13.5) and 15/88 hybrid was the worst (9.6) according to this parameter.

The fruit weight is one of the main components of yield. It is necessary to notice that all varieties had average (0.5–0.7 g) and big (more than 0.7 g) fruit. Priokskaya was the best cultivar (0.86 g) and 10/86, 4/87, Mendelejevskaya, Lomonosovskaya, Vorob'jovskaya were the worst. Some shoots with 1.4–2.3 g fruits were found. The appearance of such fruits was a result of polyploidy or somatic mutation.

The results probably indicated that yield of sea-buckthorn varied to a great extent. Not such large differences were observed for the Moscow's cultivars (14–21 kg per plant). The only exceptions were Lomonosovskaya and Mendelejevskaya (7 kg per plant) and that could be explained by the small seniportance of the main yield components. The low yield of 10/86, 4/87,15/88, 20/88 hybrids and Priokskaya could be explained by their low winter-hardiness. Besides, these varieties have a limited growth (up to 2 m).

Conclusions

1. The varieties received on the base of Baltic climate are the most readily adaptable for Beloruss.
2. Fruit weight and number of buds per 10 cm of shoot are the most reliable characters for selection towards high yielding since these parameters have the smallest coefficients of variation.
3. As the sources of high yielding varieties: Botanitcheskaya, Vorob'jovskaya, Nivelena, Otradnaya, Podarok sadu, Trophimovskaya and 29/88 hybrid have been selected out for further breeding work.

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Key words: *Hippophaë rhamnoides* L., winter-hardiness, yield components

Abstract

The study on yield components and winter-hardiness of 10 varieties and 5 hybrids of *Hippophaë rhamnoides* L. was carried out in 1995–1998.

It was found that winter-hardiness of the varieties obtained under Siberian climate conditions was lower than those received in the Baltic climate. Generative buds were more frozen than the vegetative parts of plants.

Fruit mass and number of buds per 10 cm of shoot were characterized by the least coefficients of variation (1–3% and 7–18%, respectively), therefore these features are the most reliable basis for selection. We did not find significant differences in one-year shoot length between the varieties.

Considerable differentiation of other parameters (number of fruit per one bud, yielding) maks the selection on their basis difficult.

As a result of the research the Vorob'jovskaya, Nivelena, Podarok sadu, Botanitcheskaya, Otradnaya, Trophimovskaya varieties and 29/88 hybrid have been selected out for further breeding work.

ZIMOODPORNOŚĆ I WYBRANE SKŁADNIKI PLONU ROKITNIKA ZWYCZAJNEGO (*Hippophaë rhamnoides* L.) NA BIAŁORUSI

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Słowa kluczowe: *Hippophaë rhamnoides* L., zimoodporność, składniki plonu

Streszczenie

W latach 1995–1998 przeprowadzono badania nad składnikami plonu i zimoodpornością 10 odmian i 5 mieszańców *Hippophaë rhamnoides* L. Stwierdzono, że zimoodporność odmian otrzymanych w warunkach klimatu syberyjskiego była niższa w porównaniu z odmianami otrzymanymi na podstawie klimatu bałtyckiego. Odmrożenia częściej stwierdzano na pąkach generatywnych niż częściach wegetatywnych. Najniższe współczynniki zmienności odnotowano w odniesieniu do masy owoców i liczby pąków (odpowiednio 1–3% i 7–18%), dlatego te dwie cechy plonu stanowią najbardziej rzetelna podstawę do dalszej selekcji. Nie stwierdzono istotnych różnic między odmianami co do długości jednorocznych

pędów. Duże zróżnicowanie w obrębie pozostałych cech (liczba owoców z pęku, plon) utrudnia prowadzenie selekcji na ich podstawie. Zgodnie z wynikami przeprowadzonych badań do dalszych prac hodowlanych wybrano następujące odmiany: Vorob'jovskaja, Nivelena, Podarko sadu, Botanitchewskaya, Otradnaya, Trophimovskaja oraz mieszaniec 29/88.

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