

---

# Investigation of biological peculiarities of the genus *Sorbus* species and cultivars in the Botanical Garden of Vilnius University

---

**E. Navys**

*Botanical Garden of  
Vilnius University,  
Kairėnų 43, Vilnius  
LT-2040, Lithuania  
E-mail: hbu@gf.vu.lt*

The article deals with investigation of the following biological peculiarities of the genus *Sorbus* species and cultivars: sugar, acid and vitamin C content, connection between the sugar content and taste of fruits, types of fruitstalk and resistance to winter frosts.

**Key words:** mountain ash, genefund, species, sort, group of sorts, fruitstalk

---

## INTRODUCTION

There are known about 85 species and over 100 subspecies, varieties, forms and sorts of the mountain ash and rowan (*Sorbus* L.). The collection of the Botanical Garden of Vilnius University contains 68 taxa. All they are important and interesting as taking part in metabolism, improving soil, forest sanitary state and by their sugar, vitamin C and acid content, morphologic types of fruitstalk and resistance of plants to winter frosts [1–9]. The author of this article studies their quality under local conditions with the aim to select species and sorts fit to grow in Lithuania [8, 9].

## MATERIALS AND METHODS

Studies of the mountain ash genus *Sorbus* L. taxa as well as of *Sorbus aucuparia* L. species in Lithuania are among the sparsest on local arboreal plants. In the collection of the Botanical Garden of Vilnius University we have studied the content of sugar, acids and vitamin C in the fruits. Analyses of sugar and acids were done by the AB “Anykščių Vynas” laboratory. Since the laboratory analyses were done once, we have generalised them by comparing with the published data from abroad (calculated averages).

We studied the morphological features of the crown structure. Applying methods worked out by Prof. Dr. Habil. J. Galvydis [1], we have defined the types of fruit stalks and their distribution in the crown for 2 species and 12 varieties.

In the Botanical Garden of Vilnius University and Latvian National Botanical Garden we have assessed the influence of various temperature factors on 14 *Sorbus* species and 19 varieties during the resting phase from the end of the arboreal plant vegetation to the start of bud swelling; consequences of such an impact in the present paper are called winter damage. For this purpose we have applied a 10-point scale for assessment of deciduous trees and shrubs.

## RESULTS AND DISCUSSION

Sugar content in the fruits is a variable parameter depending not only on biological features of a variety, but also on the ecology, in particular on insolation degree, geographical zone and climatic changes during vegetation. The generalised data are given below (Table 1).

Comparison of the data obtained to sugar content in *S. aucuparia* (5.8%) showed that the sorts studied were really the sweetest – sugar content in their fruits was considerably (1.2–2.1 times) higher [2–5].

In the opinion of 50 persons that took part in tasting the fruits of 15 species and sorts covered by tasting, the taxa of ‘Edulis’ and ‘Rossica’ groups were the best (from 8 to 10 points), followed by slightly less tasty ‘Rossica Major’ group sorts.

Comparison of the data obtained to acid content in *S. aucuparia* (2.3%) showed that in the sorts studied the acid content in fruits was considerably (1/2–1/4 times) lower [2–6] (Table 2).

Sort	Locality				Average
	Lithuania Botanical garden of Vilnius university [2]	Estonia, Polli [3]	Russia		
			Michurinsk [4]	Moscow [5]	
'Alaya Krupnaya'	8.3	5.2	(4–8) 6	(7–9) 8	6.88
'Burka'	8.9	5.4	(6–10) 8		7.43
'Granatnaya'	9.6	6.0	(5–6) 5.5		7.03
'Nevezhenskaya'	10.0		(10–12) 11		10.5
'Nevezhenskaya Oranzhevaya'	12.0				12.00
'Titan'	9.4	5.9	(6–9) 7.5		7.6

Sort	Locality					Average
	Lithuania Botanical garden of Vilnius university [2]	Estonia, Polli [3]	Russia		Lithuania [6]	
			Michurinsk [4]	Moscow [5]		
'Alaya Krupnaya'	1.42	2.7	(1.8–2.6) 2.2	(2–2.5) 2.25		2.14
'Burka'	1.08	1.7	(0.8–1.4) 1.1	–		1.29
'Granatnaya'	1.6	1.8	(1.5–2) 1.75	–		1.72
'Nevezhenskaya'	1.66	–	(0.6–0.7) 0.65	–	2.13	1.48
'Nevezhenskaya Oranzhevaya'	1.88	–	–	–		1.88
'Titan'	1.92	1.9	(1.5–1.8) 1.65,	–		1.82
						1.72

Comparison of vitamin C content in variety fruits with that of wild *S. aucuparia* (58.1 mg %) showed that only 'Nevezhenskaya' fruits contained vitamin C at 1.9-fold higher concentrations, whereas other varieties had less vitamin C by a quarter or a half (Table 3).

We tried to evaluate the important morphological features – we have classified the fruitstalls into three above types and calculated the number of fruitstalk in the tree. We have calculated 7-row branches (including the main) for the mountain ash and its sorts. Fruitstalks formed on the secondary bran-

ches of the crown can be small, peaked or twig-like. Small fruitstalks are 1–5 cm long and have from 2 to 10 dense leaves and one terminal flower bud. Peaked fruitstalks with terminal flower bud and lateral vegetative buds are 5–15 cm long. The twig-like fruitstalk with terminal flower buds is longer than 15 cm. We have observed that fruitstalk types differ with mountain ash species and sorts (Table 4).

Branching of the varieties from the 'Edulis' and 'Rossica' groups resembles that of *S. aucuparia*. The morphology of branches for 'Rossica Major' group was close to that of *S. hybrida*. During blossom and

Sort	Locality			Average
	Lithuania [6]	Estonia, Polli [3]	Russia, Michurinsk [4]	
'Alaya Krupnaya'		32	(40–60) 50	41
'Burka'		22	(26–40) 33	27.5
'Granatnaya'		21	(25–30) 27.5	24.25
'Nevezhenskaya'	102		(100–130) 115	108.50
'Titan'		28	(35–42) 38.5	33.25

Table 4. Distribution of fruitstalk numbers in mountain ash

Species, groups of sorts, sort	Number of fruitstalks, %			
	Twig-like	Peaked	Small	Total
<i>S. aucuparia</i> (local species)	93.75	3.91	2.34	100
'Edulis' group sorts ('Konzentra', 'Moravskaya Krupnoplodnaya', 'Rosina')	95.43	2.35	2.22	100
'Rossica' group sorts ('Krasnaya Krupnaya', 'Nevezhenskaya Oranzhevaya', 'Rossica')	95.05	2.90	2.05	100
'Rossica Major' group sorts ('Alaya Krupnaya', 'Burka', 'Granatnaya', 'Likernaya', 'Titan')	8.97	4.83	86.20	100
<i>S. hybrida</i>	4.06	4.05	91.89	100

fruit developing, the mountain ash with twig-like fruitstalks of wild species, 'Edulis' and 'Rossica' group sorts have a greatly magnificent look (flower and fruit racemes outside).

Resistance to winter damage is the most important factor determining success in plant introduction [7]. We proposed a scale for evaluation of frost damage in deciduous trees and shrubs [8, 9]. All the 'Rossica' group varieties studied are frost-resistant, and some varieties of other groups are just slightly less frost-hardy, *i.e.* there are no trees with their overground part and roots damaged by frost (70% and more).

## CONCLUSIONS

1. Comparison of the data on *S. aucuparia* sugar content (5.8%) showed that the sorts studied were really the sweetest – sugar content in their fruits was considerably higher.

2. The acidity of fruits of 'Edulis' and 'Rossica' group varieties differs from that of *S. aucuparia* only slightly. Fruits of 'Rossica Major' group contain organic acids titrated at 25–50% lower levels than those of *S. aucuparia*.

3. Branch morphology for spontaneous and created varieties within the *S. aucuparia* species is similar to that of the type species: twig type fruit stalks prevail in the crown, whereas 'Rossica Major' group varieties possess few fruit stalks of such a type, while small fruit stalks dominate.

4. We obtained the following frosting data for 19 *Sorbus* sorts: 57.8% were found to be absolutely frost-resistant, 26.3% were affected slightly and rapidly regenerated, whereas severe damage and long regeneration was observed in 15.8% of sorts.

## References

- Galvydis J. Sodninko patarėjas. Vilnius, 1999.
- Navys E. Šermukšnio (*Sorbus* L.) genties rūšys ir veislės Lietuvos sodininkystei ir miško ūkiui. Vilnius, 2001.
- Pūrs R. Pilādžis kā augļkokks. Augļkopība (Rīga) 1999; 3–5: 6–7, 2–5, 10–13.
- Нетрадиционные садовые культуры. Мичуринск, 1994.
- Миганова Т. Энциклопедия садовода. Москва, 1999.
- Kontrimas J, Urbonas A. Naujesnieji vitaminingi vaisiniai augalai. Vilnius, 1969.
- McAllister HA. The rowan and its relatives (*Sorbus* spp.), Ness Series I Neston, 1986.
- Navys E. International scientific conference "Plant Genefund Accumulation, Evaluation and Protection in the Botanical Gardens", Vilnius, July 1–2, 1999. Vilnius: 20–22.
- Navys E. Baltic botanical gardens in 1998/1999. Vilnius, 2000: 47–50.

## Evaldas Navys

### ŠERMUKŠNIO (*SORBUS* L.) GENTIES RŪŠIŲ IR VEISLIŲ BIOLOGINIŲ SAVYBIŲ TYRIMAS VILNIAUS UNIVERSITETO BOTANIKOS SODE

#### S a n t r a u k a

Vilniaus Universiteto Botanikos sodo kolekcijoje yra 68 *Sorbus* L. genties rūšių ir veislių taksonai. Tirtas 6 veislių vaisių cukringumas ir rūgštingumas, C vitaminingumas (5 veislių), testuotas skonis. Lyginant su *S. aucuparia* L. tipine rūšimi, tirtų veislių vaisių minkštume rasta 1,2–2,1 karto daugiau cukraus, visų kitų gerokai mažiau. Ištyrus vaisines šakutes, paaiškėjo, kad veislių grupių 'Edulis' ir 'Rossica' lajose vyrauja (per 95%) trumposios, kaip *Sorbus aucuparia* L., o 'Rossica Major' grupės – ilgosios (per 86%), panašiai kaip *Sorbus hybrida*, o vytelinių šakelių skaičius kinta nedaug (2,35–4,83%).

Sudaryta originali, pašalimą įvertinanti lentelė. Nustatyta, kad 57,8% veislių visiškai išvermingos žiemą, 26,3% nedaug apšąla, bet greitai atsistato, o 15,8% veislių nukenčia labiausiai.