Genus *Sorbus* L. Taxa in Baltic States and Some Results of Its Investigation in Lithuania

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Sorbus aucuparia L. is most widely spread in all the Baltic States. Although the volume of its timber is small and, thought to be of low value, the seeds are mostly liked by insectovorous birds. Yield taken from one tree makes up 348 kcal. This causes the role of this species played in forest phytosanitary.

In countries adjacent to Lithuania, spontaneous dendroflora contain rarer sweet-fruit species, with birds consuming not only seeds, but also their pulp. A calorific value of bird food (seeds and pulp) of one *Sorbus intermedia* (Ehrh.) Pers. tree spontaneous by growing in Estonia, Latvia and Poland is 6.3 times higher than that of *Sorbus aucuparia*. In this aspect the following species are worth attention: *Sorbus hybrida* L. (spontaneous in Latvia) and *Sorbus aria* (L.) Crantz (spontaneous in Poland).

Acid sandy soils of southern exposition are inappropriate for *Sorbus* plantations and bird feeding plots, and the gravel-rich soils with numerous cockchafers are disastrous for mountain ash.

Key words: Mountain ash autochthones, spontaneous, introduced species, phytosanitary

Introduction

The basic goal of this paper was to analyse the distribution of *Sorbus* L. genus species in the Baltic States and on the basis of some aspects make an evaluation of their influence on forest communities. As the most widely spread species in our region *S. aucuparia* frequently grows as a small admixture in the stands of other tree species. Moreover, the volume of its timber is small and it seems problematic to collect it and use rationally.

We have made an attempt to study the role of side products of this tree. *S. aucuparia* fruits, similarly to sunflower seeds and non-salted flitch pieces are considered to be the best food for birds (Juronis, Snieškienė 1998). Their role grew significantly in recent years, since due to draining of land, harvest of cranberry, and red bilberry dramatically decreased. Moreover, it is most actual to plant *S. aucuparia* (in open glades, 3-5 trees in a plot) hoping that they will give a harvest and birds will sow continuous undergrowth in the central and south-western pinewoods of Lithuania. It has been found that the worst ecological situation is south of the line Mažeikiai-Šiauliai-Kėdainiai-Kaunas-Jonava-Elektrėnai-Vilnius-Ignalina (Kairiūkštis, Ozolinčius, Skuodienė, et al. 1997), where pure pinewoods are regularly devastated by pest invasions.

S. aucuparia seeds or fruit of sweet-fruit species are consumed by insectivorous birds: *Dendrocopos leucotos* Bechst., *Dendrocopos major* L., *Dryocopus martius* L., *Dryocopus major* L., *Musicapa hypoluca* Pall., *Musicapa striata* Pall., *Pyrrhula pyrrhula* L., *Pyrus ater* L., *Pyrus cristatus* L., *Pyrus coeruleus* L., *Pyrus major* L., *Pyrus palustris* L., *Turdus philomelos* Brechm., *Turdus pilaris* L., *Turdus viscivorus* L. A titmouse is said to eat 20 g of insects per day – equal to its own weight (Kairiūkštis, Daraškevičius, Jakas et al. 1979), so a family of titmice can protect about 20 trees from pests (Juronis, Snieškienė 1998). The undergrowth of the *Sorbus* trees would improve the podzol soils considerably.

Although *Sorbus aucuparia* is best adapted to the environment conditions, the question is, whether it would be expedient to plant advective species, when often it is difficult to cultivate *S. aucuparia*.

Materials and methods

The goal of this work was to generalize the investigations carried out by Estonian and Latvian dendrologists and supplement them with the data from Poland and Finland, as well as select the species growing spontaneously in the neighbouring countries and cultivated successfully in Lithuania. Having in mind

that growing up of trees of introduced species in the forests was not successful and that the number of those opposing such an idea in Lithuania is high, we did not confine ourselves to proving good growth of spontaneous plants in other regions of Lithuania, parks and settlements. It was observed that birds consume only seeds of *S. aucuparia,* and we tried to evaluate the nutritive value of two species: *S. aucuparia* and *S. intermedia* and one sort *S.* 'Alaya Krupnaya' for birds. The analyses conducted at the *Anykščių Vynas Co.* laboratory, as well as the data presented by other authors (Grigas 1986, Pūrs 1999) and our own investigation results were put into three Tables.

We have also made an attempt to reveal the reasons for bad growth of *S. aucuparia* plantations established 13-20 years ago. We have chosen three plantations with some poor trees growing there, which are lower than 0.5 m.

Table 1. The data of planting *S. aucuparia* according to Project of the plots which were investigated

No of study plot	Location	Area ha	Year of planting	Soil	Distance m		Number of trees per 1 ha	Total number of trees in plantation
					Between rows	In row		
1	15 block of forester's district Stréva National Park of Stréva (by the road Trakai – Aukštadvaris)	0,5	1981	Sandy	3,0	1,2	2780	1390
2	Forester's district of the Lentvaris (late former the arable land of collective farm "Pergalė"	6,3	1981	Long fallow sandy land	3,0	1,2	2780	17510
3	Forester's district of the Lentvaris by the gravel pit of Sariciniškes	0,5	1988	Sandy gravel	3,0	1,2	2780	1390

We had to find answers to a question, why abnormal differentiation of upward growth of trees takes place in the same plots and under similar growth conditions. In order to find out the reason, we determined incline of the relie,f soil pH, measured height of all the trees in all three plots.

Having noticed a great number of leaf-eating cockchafers we dug pits, 1 square metre wide, for the studies of cockchafer larvae. By applying the forest sanitary methods (approved by Lithuanian Forestry Ministry, Forest Research Institute and Forestry Scientific Society, 1963), we have determined age and number of the larvae. The age was determined according to the width of their heads: the heads of one-year-old larvae were up to 2.5 mm wide, two-year 4.0-6.4 mm, and three-year 6.5 mm; and their permissible number is indicated in the afforestation norms.

In all plantations, except for the second plot's area of 1.6 ha, we have dug out saplings 0.5-0.6 m high and found out that their fine roots had been gnawed by cockchafer larvae, while the main root had been bent in a horizontal direction at the depth of 20-23 cm. No farther deepening of this root was observed.

Table 2. The data on *Melolontha melolontha* L. sample pit number in the plots

No of plot	Area ha	Sample pit number		
		Permitted to be dug out according the standard, unit/ha	Dug out in plot	Dug out in a plot after recalculation per 1 ha area
1	0,5	3	2	4
2	1,6	3	4	2,5
	0,6	3	2	3,3
3	0,5	3	2	4

Sorbus genus in the Baltic States

The *Sorbus* L. genus comprises 85 species and over 100 subspecies varieties, forms and sorts. There are 18 species in Europe (Flora Europaea 1968), 13 of which are more common (Elliku, Taam 2001). Five species and one sort are naturally distributed in the Baltic States (The flora of the Baltic Countries 1996; Cinovskis 2001).

Earlier in Latvia *S. rupicola* was described as *S. aria* (L.) Crantz. (Maurins 1973) since both species are similar.

One sort *S. aucuparia* 'Edulis' is naturalized on Saarema Island. About 45 taxa of spontaneous and introduced of *Sorbus* genus taxa are found in different parts of Estonia. The best collection of *Sorbus* genus is located in the Tallinn Botanical garden (25 species) and at Polli (18 sorts) in the Institute of Horticulture of Agricultural University of Estonia (Elliku, Tamm 2001; Paivel 1996, Pūrs 1999).

Table 3. Spontaneous taxa of *Sorbus* genus in the native flora of Baltic States

Species, sort	Estonia	Latvia	Lithuania
Sorbus aucuparia L.	++	++	++
Sorbus aucuparia L. **'Edulis'**			
Sorbus hybrida L.		*	
Sorbus intermedia (Ehrh.) Pers.	+	+	
Sorbus rupicola (Syme.) Hedl	*	*	
Sorbus teodorii Liljefors		*	

++ - widespread in the whole territory of the country
+ - distributed rarely on the islands of the Baltic Sea and in the south and south western coastal regions
* - distributed very rarely in nature, only in one island or only in one point of the western part of country at the coast of the Baltic Sea
° – naturalized on one island of the Baltic Sea.

Genus *Sorbus* in Estonia are introduced from the following areas: Europe, the Caucasus, Asia Minor and North Africa – 13, East Asia and Siberia – 18, Central

Asia – 1, North America – 2 taxa, hybrids and sorts – 11 (Elliku, Tamm 2001).

The biggest collection in all the three Baltic States of World and Latvian national significance developed in the Arboretum of the National Botanic garden at Salaspils. The collection contains 120 taxa Mountain Ash, Rowan and its relatives.I in 1984 the new apomict species of *Sorbus teodorii* Liljefors and notomorph ones were found by specialists of Dendroflora laboratory of the National Botanical Garden between Ventspils and Mazirbe (Cinovskis 2001). This species is a result of spontaneous hybridization in Latvia (at first it was described as a natural hybrid in the Gotland island). This shrub was 80 years old and 3 m high (Cinovskis 1986). The big collection *Sorbus* genus species (72 taxa) is in Kalsnava arboretum of the Forest Experimental Station (in Jaunkalsnava, Kalsnava parish of Madona district) (Kaškure, Šmaukstelis 2001). The best collection of sorts is located in the Experimental station of Horticulture of Latvia at Pure (Друдзе 1996). The aim of the arrangement of the collection of plants in Kalsnava arboretum is in the future, to provide the basis (greatest number of seeds, cuttings, grafts) of propagation material for plant growing, greenery and forestry purposes (Kaškure, Šmaukstelis 2001). In Latvia, *S. intermedia* and *S. hybrida* are rare; they are brought to its western Kurzeme region from Scandinavia, especially Gotland Island, and grow up to 6-10 m high (Buivids 1988).

The most common in all three countries is mountain ash (*S. aucuparia* L.) which grows as a tree mainly 10-17 m high in open spaces of forests on rich, fully drained soils of moderate moisture. In the undergrowth of shadowy broadeaved, coniferous or mixed tree associations it grows as a shrub. These biggest trees were described: at Toolse (Lääne-Viru) two trees of 20,5 m high, at Raekūla (Lääne-Viru) – 18,0 m (in Estonia) (Elliku, Tamm 2001).

S. aucuparia is very widespread in Latvia too. The dimensions of biggest trees are up to 17 m high, 50 cm in diameter of stem and 4-5 m in perimeter of crown (Cinovskis 1986, 2001). From 1972 in Latvia, monumental trees have been investigated and Didzkoki database created with all the data accumulated on assortment of *Sorbus* genera species and sorts, their habitats and tree measurements. Estonians have published the List of Taxa Genus *Sorbus* L. (Elliku, Tamm, 2001).

In Lithuania only park and private collections are studied, whereas inventory in the agrarian and urban landscapes has not started yet. Therefore, we have no summarized database, and our appendix given at the end of the paper contains only the list of *Sorbus* genus species and sorts collected by the author of the paper at the Vilnius University Botanical Garden (Appendix 1).

Moreover, the resources of autochthonous vegetation are investigated in Lithuania. *S. aucuparia* plants growing in the stands of lower than 0.6 maturity are considered to be most productive; while those growing in denser and higher than 0.6 maturity stands make up a reserve. Growing outside the forests, on the river banks and forest outskirts, *S. aucuparia* crowns cover more than 20 percent of the area and are attributed to the yield category 1, while those covering smaller than 20 percent areas, least 1 hectare, belong to the category 2. Usable resources of *S. aucuparia* fruits are thought to make up 80 percent of their biological resources, and each year 75 percent of the yield are allowed to be harvested (Ministry of the Environment of Lithuania, 2000).

S. intermedia, *S. hybrida* and *S. aria* species in Lithuania are successfully grown in greeneries, while other introduced species are cultivated only in the botanical gardens, arboreta and private dendrologic collections. The biggest *S. intermedia* of 13 m high and 40 cm in diameter of stem is at the Beržotas dendropark (in the Panevėžys district).

In Poland five *Sorbus* genus species grow spontaneously, but in contrast to Estonia and Latvia, Polish forests contain, although scarce, both species: *S. aucuparia* and *S. torminalis* L. Crantz. (Seneta, Dolatowski 1997).

Mountain ash is one of the most common trees in Finland. They have very wide distribution, but usually grow singly or in clumps. Forest research in the Aulanko forest park focuses on the seed crops of *S. aucuparia* and other species. This particular stand originated through natural seeding and has been maintained as a Mountain ash plot by repeated removals of competing faster - growing species and holdovers. At its best *S. aucuparia* reaches the height of 15 metres. The largest trees in this stand are 10 metres tall, and the volume is 43m^3/ha (Saarnio, Oksanen, Heiramo 1990).

Results

Calculations of fruit nutritional and calorific values for three *Sorbus* taxa are given in Tables 4-6.

Table 4 shows that seed oil consumed by birds in a 1000 batch of 'Alaya Krupnaya' and *S. intermedia* fruits exceeded that in *S. aucuparia*, 2 and 3 times, respectively. Moreover, the amount of starch and carbohydrates was 2.3 and 3.7 times higher, respectively. However, we did not take them into account, since these substances are not digested by birds and removed from their body unchanged.

Table 4. Nutritive value of the Mountain ash, sort 'Alaya Krupnaya' and Swedish Whitebeam seeds used by birds

	Sorbus aucuparia L.	*Sorbus* 'Alaya Krupnaya'	*Sorbus intermedia* (Ehrh.) Pers.
Average weight of one fruit (in g of green mass)	0,4	1,30	0,98
Total weight of 1000 fruits (in g of green mass)	400	1300	980
Average number of seeds in one fruit	2,5 (2-3)	2,5 (2-3)	1,5 (1-2)
Percent of the quantity of seeds in the total mass of fruit	2,7	2,1	4,2
Weight of 1000 seeds (in g of green mass)	4,3	10,9	27,4
Weight of 1000 fruit seeds (in g of green mass)	10,8	27,3	41,1
Percent of dry matter in seeds	17,8	16,3	17,5
Weight of 1000 fruit seeds (in g of dry matter)	1,9	4,4	7,2
Percent of seed oil in seeds	18,5 (15-22)	16,0	18,5
Weight of seed oil in 1000 fruits (in g)	0,35	0,70	1,33
Percent of starch and other carbohydrates (in green mass of seeds)	57	57	56
Total mass of starch and other carbohydrates of 1000 fruits (in g of green weight)	6,16	15,56	23,07
Total mass of starch and other carbohydrates of 1000 fruits (in g of dry matter)	1,10	2,54	4,04

Table 5. Nutritive value of the fruit pulp of the Mountain ash, sort 'Alaya Krupnaya' and Swedish Whitebeam

	Sorbus aucuparia	*Sorbus* 'Alaya Krupnaya'	*Sorbus intermedia*
Average weight of 1000 fruits (in g of green mass)	400	1300	980
Quantity of 1000 fruits pulp in % of green mass)	97,3	97,9	95,8
Total weight of 1000 fruits pulp (in g of green mass)	389,2	1272,7	938.8
Percent of dry matter of pulp	17,3	15,1	17,3
Total weight of dry matter of 1000 fruits (in g)	67,33	192,18	162,41
Percent of sugar in the pulp of dry mass	5,4	8,3	6,94
Total quantity of 1000 fruits sugar (in g)	3,64	15,95	11,27
Mg % of C vitamin in the pulp mass	53	32	28,16
Total weigh of C vitamin in the pulp of 1000 fruits (in g)	0,04	0,06	0,05

Table shows that in the pulp of 1000 fruits, contents of sugar in *S.* 'Alaya Krupnaya' and *S. intermedia* respectively are 4,4 and 3,1 times higher than in *S. aucuparia*, but they contain less vitamin C (0,53-0,6). However, birds do not eat *S. aucuparia* pulp, and from *S.* 'Alaya Krupnaya' and *S. intermedia* they get additionally sugar, vitamin C and other vitamins.

Table 6 shows the results of calculations about the quantity of matter assimilated by birds its calorific value per 1 kg of fruit from one tree yield. We can see that bird food calorific value of *S.* 'Alaya Krupnaya' and *S. intermedia* fruits was 6,3 and 6,7 times higher than that of *S. aucuparia*.

The spontaneous and introduced *Sorbus* species blossom and give fruit not every year. In Vilnius University Botanical Garden, Latvian National Botanical Garden and Belarussian Research Institute for Fruit Growing, the Mountain ash gave good yield in 1998 and 2000, but it was absolute failure in 1999 and 2001.

Table 6. Calorific rate of the fruit pulp and seeds of Mountain ash, sort 'Alaya Krupnaya' and Swedish Whitebeam

	Sorbus aucuparia	*Sorbus* 'Alaya Krupnaya'	*Sorbus intermedia*
Quantity of sugar in 1000 fruits (in g)	3,64	15,95	11,27
Quantity of sugar in 1 kg fruits (in g)	9,10	12,69	11,50
Quantity of seed oil in 1000 fruits (in g)	0,35	0,70	1,33
Quantity of seed oil in 1 kg fruits (in g)	0,87	0,54	1,36
Rate of sugar calorific (in kcal/g)	3,90	3,90	3,90
Rate of seed oil calorific (in kcal/g)	10,0	10,0	10,0
Rate of sugar calorific in 1 kg fruits (in kcal)	35,49	49,49	44,85
Rate of seed oil calorific in 1 kg fruits (in kcal)	8,7	5,4	13,6
Total quantity of kcal in 1 kg fruits (of feed for birds)	8,7	54,89	58,45
Crop capacity of 1 tree (in kg)	40,0	40,0	40,0
Total quantity of kcal in 1 tree (of feed for birds)	348,0	2195,6	2338,0

The data of investigations carried out in three *S. aucuparia* plots in the Trakai National Park and Trakai forest enterprise are given in the tables 7 and 8.

Table 7. *Melolontha melolontha* L. registration data

No of plot (area)		Age of cockchafers larva			
		One year-old	Two year-old	Three year-old	Cockchafers
1 (0,5 ha)	Found on average, unit/m^2	12,5	4,0	2,5	
	Permissible standard unit/m^2	12,0	6,0	2,0	
	Found units after recalculation per one tree nutrition area 5,6 m^2	70,0	22,4	14,0	
2 (1,6 ha)	Found on average unit/m^2	9,0	2,25	1,25	
	Permissible standard unit/m^2	12,0	6,0	2,0	
	Found units after recalculation per one tree nutrition area 3,75 m^2	33,75	8,44	8,44	
2 (0,6 ha)	Found on average unit/m^2	19,5	1,5	3,0	1
	Permissible standard unit/m^2	12	6,0	2	
	Found units after recalculation per one tree nutrition area 7,2 m^2	140,4	10,8	21,6	7,2
3 (0,5 ha)	Found on average unit/m^2	25,0	3,5	3,5	2
	Permissible standard unit/m^2	8	3	1	
	Found units after recalculation per one tree nutrition area 5,9 m^2	147,5	20,65	20,65	11,8

We can see extraordinarily highly differentiated heights of the contemporaneous mountain-ash and uneven distribution according to height groups.

An exceptionally large number of cockchafer larvae in the experimental plots are seen in Table 8, where the observation data are summarized. If the age of larvae of any age exceeds the permissible one, the methodology applied recommends to avoid using such areas for afforestation. The larvae numbers exceeding the permissible level were found in the following plots: No. 1 contained 104.2% and 125% of one- and three-year-old larvae, plot No. 2 (in 0.6 ha area) – 162.3% and 150% one- and three-year-old larvae, and plot No. 3 contained 312.5 one-year-old, 116.7% two-year-old, and 350% of three-year-old larvae. Only a 1.6 ha part of plot No. 2 contained larvae not exceeding the permissible level, if the larvae were taken according to separate age groups; but taken together the number

Table 8. Inventory data of *S. aucuparia* plantations

No of study plot	Area ha	Relief, incline	pH of soil	Number of trees in area	Percent of survived trees	High of trees in m		
						Medium	Max	Min
1.	0,5	plain	6,5	887	63,8	3,37	6,0	0,5
2.	4,1	Destruction through pasturage						
	1,6	SW: 7°	6,7	4267	96	4,10	7,0	1,5
	0,6	S, SE: 8	7,0	833	46	0,89	1,8	0,2
3	0,5	S: 5,5	6,2	848	61	0,49	1,8	0,2

Note: There are 32 birches of 3-12 m high in the first plot.

of larvae was dangerous for planting a forest. Since the trees were planted in the sample plots rarely, moreover, later the plantations got even more rare, the number of larvae present in a nutritive area of one tree would be ruinous for some mountain ash trees. Especially bad forecast is for the year 2003, when the one-year-old larvae will be three years old.

To assess the impact of cockchafers and other unfavourable factors on mountain ash growth we have formed Table 8 and Figures 1-4.

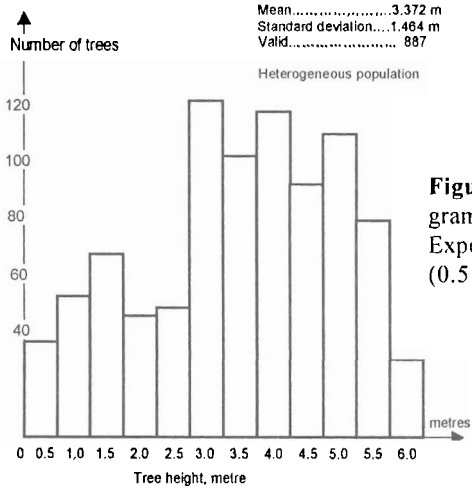

Figure 1. A histogram of tree height. Experimental plot 1 (0.5 ha, 887 trees)

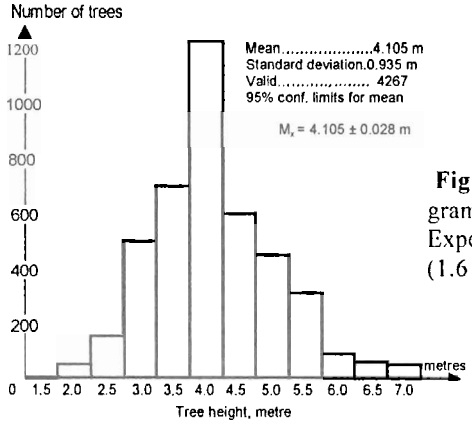

Figure 2. A histogram of tree height. Experimental plot 2 (1.6 ha, 4267 trees)

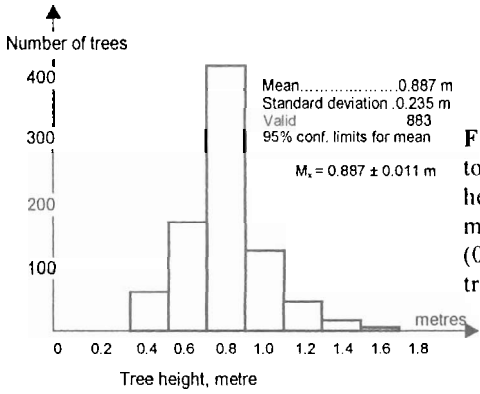

Figure 3. A histogram of tree height. Experimental plot 2 (0.6 ha, 833 trees)

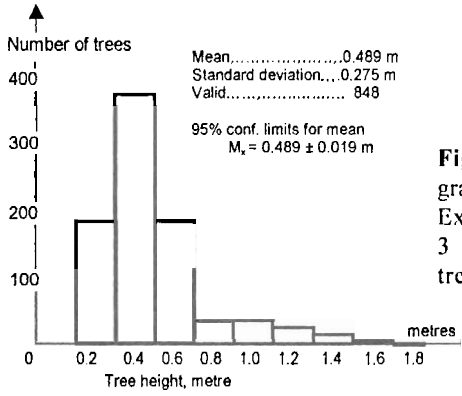

Figure 4. A histogram of tree height. Experimental plot 3 (0.5 ha, 848 trees)

Discussion

Rather impressive data on advantages of sweet-fruit *Sorbus* species and sorts against *S. aucuparia* in bird feeding enables us to recommend avoiding cultivation of stands of advent species. However, we think that in the cases of pure contemporary coniferous stands with observed defoliation and related invasion of harmful beetles or in the case of such danger in open areas, it is expedient to arrange small 3-9 feeding places for birds, where not only *S. aucuparia*, but also its sweet-fruit sorts and some other species, e.g., *S. intermedia.*, *S. hybrida, S. aria* and *S. rupicola* grow.

In sand, gravel-rich and infertile sandy loam soils it is expedient to add humic (compost) soil. So, we would form a seed basis for insectivorous birds to feed and "sow" in the forest glades. We have observed that in the neighbouring countries the spontaneous plantations, or cultural ones in Lithuania grow successfully and they avoid invasion of pests and diseases (Navys 2001).

We did not find any case, when species composition of the communities above trees was shifted from local plants or reduced their stability. Therefore, they cannot be considered as being invasive species.

We managed to define the reasons for slow growth in *S. aucuparia* plantations as follows:

Mass distribution of cockchafers - their larvae especially like small roots of *S. aucuparia* near the soil surface, as it was seen for the specimens dug out by us. Undoubtedly it was the main reason for failure to raise a plantation. Figures 1-4 show that although the trees are of the same age, they can be grouped according to their height into two groups. In plots Nos. 1 and 3 the trees of different height grow mixed, while plot No. 2 contains trees from 0.2 to 1.8 m and from 1.5 to 7.0 m high, which have been grown in different parts of the plot, therefore, separate histograms are presented. The permissible standard of rhizosphere infection by cockchafer larvae was slightly exceeded, but the histograms show that the trees up to 2.5 m high are mostly damaged by larvae, while these higher than 3 m are less susceptible (a sudden increase in their number). In plot No. 2, that was least infected, there are no trees lower than 1.5 m, and the trees are distributed nearly in a regular way. In a 0.6 ha part of this plot the number of cockchafer larvae was especially large, but the number of mountain ash trees higher than 1 m is small, moreover, with increasing (to 1.8 m) height their number gradually decreases. Plot No. 3 contains the largest numbers of larvae, the histogram of tree heights is similar to that described above, but the most abundant group consists of trees 0.2-0.6 m high, while the number of trees 0.8-1.7 m high is small.

Drying of the soil surface and its warming on south and south-east exposition slopes (plot 2) and plains with birch admixture (plot 1). Birch root system lies also near the surface; therefore it evaporates large amounts of water (Bauer, Weinitschke, 1967). We have also noticed that *S. aucuparia* leaves in winter crumble and decay in a year (at the highest rate among the trees); therefore the plantations are absolutely without a dead litter that could cover the soil surface and protect it from drying. As for *S. aucuparia*, it is a tree of upper mountain belt watered with cold snow-melt water. Hence, *S. aucuparia* on the sites observed by us always grew better than other species on the north-exposed slopes, which are cooler and moister (Друдзе, 1996).

However it should be taken into account that very poor low, bird-spread specimens giving no fruits are very important for improvement of the soil, especially in pinewoods.

Plant protection experts have placed emphasis on the role of insectivorous birds in fighting against cockchafers. They indicate birds: goatsuc (*Lanius cristatus* L.), ker (*Caprimulgus europaeus* L.), starling (*Sturnus vulgaris* L.), hoope (*Upupa epops* L.), roller (*Coracias garrulus* L.), which peck these large beetles (Ivanauskas, Navasaitis, Skuodis 1971), and affirm that a family of starlings feeding their nestlings consumes up to 8 thousand cockchafers (Juronis, Snieskiene 1998).

Conclusions

1. Five autochthonous species of S. genera are detected in the Baltic region, however only one species - *S. aucuparia* - is distributed in the forests of all three Baltic States. Seeds of its fruits are very useful for bird nutrition (348 kcal a tree), while its leaves improve the soil (decay in a year) and neutralize acids (pH = 8 in leaves' sap).

2. For feeding of insectivorous birds sweet-fruit species and sorts are even more important than *S. aucuparia*. It is recommended for bird feeding in the forest glades to try cultivation of *S. intermedia* (calorific value of 1 tree for bird feeding is 2195,6 kcal), *S. hybrida* (spontaneous in Estonia and Latvia), and/or *S. aria* (spontaneously spread in Poland).

3. Main failure to form plantations of *S. aucuparia*. is caused by high density of cockchafers. The greatest damage is caused by cockchafer larvae exceeding the permissible standard for young trees, of which in 13-20 years no one grew higher than 1.7 m (part No. 2 in a plot No. 2, and plot No. 3) and one third of trees did not reach 2.7 m height when the number of larvae was close to the permissible standard (plot No. 1).

4. Since the mountain ash trees give fruits not every year the bird feeding clearings should be planted with saplings of other fruit-tree and shrub species.

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ТАКСОНЫ РОДА *SORBUS* L. В СТРАНАХ БАЛТИИ И НЕКОТОРЫЕ РЕЗУЛЬТАТЫ ИХ ИССЛЕДОВАНИЯ В ЛИТВЕ

Э. Навис

Резюме

В регионе Балтии описаны 5 автохтонных видов рода *Sorbus* L. В Литве распространен только один вид - *Sorbus aucuparia* L. Семена его яблоков являются ценной пищей (348 kcal с дерева) для птиц поедающих вредных насекомых, а листья характеризуются почву улучающим (разлагаются в течении года) и её кислотность нейтрализирующим (их сока pH - 8) действием.

Сладкоплодных сортов и видов: *S. intermedia* (Ehrh.) Pers. *S. hybrida* L., and *S. aria* (L.) Crantz. птицы клюют не только семена, но и мягкоть яблоков, получая с одного *S. intermedia* дерева 2195,6 kcal.

На некоторых плантациях в Тракайском Национальном Парке и в Тракайском лесхозе (уредии) *Sorbus aucuparia* L. растет плохо, и большая часть в 15-20 летнем возрасте находится на грани гибели. Основные причины неудачных культур: сухая и неплодородная почва, черезмерное высыхание земляной поверхности в откосах ориентированных на юг и юговосток и в равнинах в смешанных с березой насаждениях. Особенно губительно действует на рябину майский жук, который охотно поедает поверхностные тонкие корни и приводит дерево до полного истощения либо гибели.

Ключевые слова: рябина, автохтон, спонтанный, интродуцированный вид, фитосанитария.