Genetic resources of the genus *Ribes* in Vilnius University Botanical Garden: I. Resistance of currant and gooseberry cultivars to mildew (*Sphaerotheca mors-uvae* Berk. et Curt.) and leaf spot (*Pseudopeziza ribis* Kleb.) and fruitage in 1998–2001

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Researchers of the Pomology Department of Vilnius University Botanical Garden joined the program of investigation and protection of genetic resources in 1994. At the present time the collection of introduced plants contains plants of 12 genera, 113 species and 700 cultivars from 27 countries. The *Ribes* collection is the oldest and most abundant of those accumulated at the Pomology Department since 1975. It contains 158 black and 75 red and white currant cultivars, as well as 89 gooseberry cultivars. In 1998–2001, the currant and gooseberry collection has been studied for manifestation of the following diseases: *Sphaerotheca mors-uvae* Berk. et Curt. (mildew) and *Pseudopeziza ribis* Kleb. (leaf spot). Disease-resistant berry cultivars have been determined.

Key words: fruit plants, *Ribes,* cultivars, genetical resources

INTRODUCTION

Accumulation, investigation and conservation of genetic resources have become a prestigious task for the world countries. In 1993, at the Lithuanian Agriculture Institute the National Co-ordination Centre for Conservation of Plant Genetic Resources was established. Researchers of the Pomology Department of Vilnius University Botanical Garden joined the program of investigation and protection of genetical resources in 1994 [1]. The *Ribes* collection is the oldest and the most abundant of those accumulated at the Pomology Department since 1975. There are 158 cultivars of black, 75 cultivars of red and white currant, as well as 89 cultivars of gooseberry. In 1998–2001 the currant and gooseberry collection was studied for manifestation of the following diseases: *Sphaerotheca mors-uvae* Berk. et Curt. and *Pseudopeziza ribis* Kleb. Disease-resistance berry cultivars have been determined.

MATERIALS AND METHODS

Selection of cultivars resistant to such diseases as mildew and leaf spot (*Sphaerotheca mors-uvae* Berk. et Curt., *Pseudopeziza ribis* Kleb.) [2] involved 158 black and 75 red and white currant, as well as 89 gooseberry cultivars of the collection. The collection contains 3 to 7 plants of each cultivars. Plants are estimated on a 6-point scale according to descriptors [3] and subdivided into classes according to the mark manifestation degree. The results have been generalised by using the standard EXCEL computer program.

RESULTS AND DISCUSSION

Black currant. The observation results enabled us to attribute 158 black currant cultivars to 16 classes according to their resistance to mildew and leaf spot (Table 1). The first class comprises three cultivars not affected by mildew and leaf spot (Polli-pikk-kobar, Usuri, Vestra). The second class contains 7 cultivars not affected by mildew and slightly damaged by leaf spot: Dlinnokistnaya, Kolchoznaya, Lyra, Pamiat Vavilova, Pilot A. Mamkin, Titania, Ulybka. There are also 7 more cultivars (Class 3), which are resistant to mildew but slightly damaged by leaf sport: Erkcheiki – 7, Kantata – 50, Kirovskaya Ranniaya, Lepaan Valio, Ojebyn, Sovchoz-

Table 1. **Distribution of black currant cultivars according to resistance to mildew (*Sphaerotheca mors-uvae*) and leaf spot (*Pseudopeziza ribis*) and fruitage, 1998–2001**

Cultivar		Resistance to (points, average)		Fruitage (points)		
No.	%	Mildew	Leaf spot	Average	Min	Max
3	1.88	0.25 ± 0.15	0.47 ± 0.03	1.53 ± 0.52	0.61 ± 0.11	2.42 ± 0.11
7	4.41	0.26 ± 0.06	0.96 ± 0.06	2.37 ± 0.41	0.62 ± 0.11	3.540 ± 0.22
7	4.41	0.28 ± 0.05	1.84 ± 0.08	2.56 ± 0.24	1.63 ± 0.41	3.51 ± 0.23
1	0.62	0.51 ± 0.20	2.72 ± 0.40	1.81 ± 0.41	1.81 ± 0.41	1.81 ± 0.41
9	5.67	0.99 ± 0.10	1.28 ± 0.05	2.21 ± 0.27	1.42 ± 0.41	3.61 ± 0.22
32	20.12	1.12 ± 0.05	2.18 ± 0.05	2.42 ± 0.17	0.63 ± 0.11	0.61 ± 0.11
34	21.39	1.09 ± 0.04	3.03 ± 0.04	2.33 ± 0.13	0.82 ± 0.31	3.92 ± 0.12
12	7.55	1.17 ± 0.06	3.81 ± 0.07	2.09 ± 0.18	1.01 ± 0.42	3.11 ± 0.21
2	1.25	1.10 ± 0.30	4.95 ± 0.05	1.45 ± 0.35	1.11 ± 0.51	1.81 ± 0.30
6	3.77	1.67 ± 0.03	2.21 ± 0.14	2.57 ± 0.35	1.11 ± 0.32	3.43 ± 0.21
13	8.19	1.87 ± 0.06	3.19 ± 0.06	2.00 ± 0.18	1.41 ± 0.42	3.41 ± 0.21
19	11.95	2.01 ± 0.05	4.14 ± 0.06	1.95 ± 0.19	1.11 ± 0.61	3.84 ± 0.33
4	2.51	2.11 ± 0.15	4.75 ± 0.09	2.20 ± 0.24	1.51 ± 0.52	2.51 ± 0.51
5	3.15	2.76 ± 0.05	3.12 ± 0.12	1.74 ± 0.20	1.11 ± 0.61	2.41 ± 0.41
2	1.25	2.75 ± 0.15	3.60 ± 0.01	2.05 ± 0.05	2.01 ± 0.41	2.11 ± 0.21
3	1.88	2.73 ± 0.03	4.67 ± 0.03	1.90 ± 0.06	1.81 ± 0.71	2.01 ± 0.41
Tota n = 158	100	1.40 ± 0.22	2.93 ± 0.02	2.09 ± 0.24	0.61 ± 0.11	3.92 ± 0.12

Note. Resistance to diseases assessment points: undamaged 0, very small damages 1, slight damage 2, medium damage 3, high damage 4, and very high damage 5.
Harvest assessment points: no harvest 0, single fruits 1, rare fruits 2, medium harvest 3, high harvest 4, and very high harvest 5.

naya, Triton. The fifth class embraces 9 cultivars slightly damaged by mildew and leaf spot: Alfa, Albos, Brodtorp, Katun, Mulgi Musta, Paulinka, Partizanka, Rus', Topach. The most numerous is the sixth class (32 cultivars) comprising plants very slightly damaged by mildew and slightly damaged by leaf spot. Six cultivars of the seventh class show equal damage (low) by both diseases. The rest 10 classes with 94 cultivars are notable for the disease rate varying from medium to high. The following general tendencies have been determined. Firstly, each group contains cultivars giving different fruitage; moreover, there is no correlation between resistance to the above diseases and fruitage ($K_{M/F} = –0.05$, $K_{LS/F} = –0.14$). There is a relationship between resistance to mildew and leaf spot is ($K_{LS/M} = 0.63$), but there is also a tendency that, independently of damage degree, all cultivars are more susceptible to leaf spot than to mildew. The summarised four-year investigation results showed that 64 of 158 cultivars are valuable according to resistance to mildew and leaf spot.

Table 2. **Distribution of read and white currant cultivars according to resistance to leaf spot (*Pseudopeziza ribis*) and their fruitage, 1998–2001**

Class	Cultivar		Resistance to leaf spot (average, points)	Fruitage (points)		
	No.	%		Average	Min	Max
1	9	12	1.16 ± 0.07	3.99 ± 0.17	3.11 ± 0.11	4.51 ± 0.22
2	6	8	1.88 ± 0.14	4.01 ± 0.06	3.01 ± 0.41	4.45 ± 0.21
3	22	29	3.07 ± 0.06	2.77 ± 0.22	1.11 ± 0.11	4.40 ± 0.11
4	23	31	4.24 ± 0.06	1.74 ± 0.16	0.61 ± 0.11	3.11 ± 0.11
5	15	20	4.91 ± 0.04	1.28 ± 0.16	0.61 ± 0.11	3.01 ± 0.21
Total	75	100	3.08 ± 0.03	2.66 ± 0.06	0.61 ± 0.11	4.51 ± 0.22

Note. Resistance to diseases, points: undamaged – 0, very low damage – 1, slight damage – 2, medium damage – 3, high damage – 4, and very high damage – 5.
Harvest assessment points: no harvest – 0, single fruits – 1, rare fruits – 2, medium harvest – 3, high harvest – 4, and very high harvest – 5

Table 3. **Distribution of gooseberry cultivars according to resistance to mildew (*Sphaerotheca mors-uvae*) and leaf spot (*Pseudopeziza ribis*) and fruitage, 1998–2001**

Class	Cultivar		Resistance to (average, points)		Fruitage (points)		
	No.	%	Mildew	Leaf spot	Average	Min	Max
1	3	3.37	0.11 ± 0.01	0.27 ± 0.14	3.73 ± 0.21	3.31 ± 0.11	4.02 ± 0.19
2	17	19.09	0.11 ± 0.04	1.25 ± 0.07	3.48 ± 0.14	2.11 ± 0.31	4.52 ± 0.31
3	18	20.21	0.10 ± 2.07	2.07 ± 0.12	3.41 ± 0.12	2.11 ± 0.12	4.02 ± 0.04
4	7	7.86	0.17 ± 0.08	3.01 ± 0.09	3.76 ± 0.15	3.31 ± 0.32	4.51 ± 0.22
5	1	1.12	0.09 ± 0.01	3.71 ± 0.91	3.51 ± 0.31	3.51 ± 0.31	3.51 ± 0.31
6	4	4.49	0.77 ± 0.02	1.32 ± 0.06	3.62 ± 0.16	3.42 ± 0.21	4.41 ± 0.12
7	4	4.49	1.12 ± 0.19	1.85 ± 0.15	2.67 ± 0.54	1.61 ± 0.12	3.83 ± 0.11
8	5	5.61	1.01 ± 0.13	3.06 ±0.15	3.51 ± 0.17	3.01 ± 0.31	4.01 ± 0.02
9	4	4.49	1.21 ± 0.12	3.78 ± 0.07	2.92 ± 0.19	2.51 ± 0.21	3.41 ± 0.11
10	3	3.37	2.10 ± 0.21	1.33 ± 0.09	3.37 ± 0.35	2.81 ± 0.61	4.01 ± 0.41
11	7	7.86	1.96 ± 0.11	2.01 ± 0.11	2.63 ± 0.30	1.41 ± 0.12	3.62 ± 0.13
12	4	4.49	2.05 ± 0.13	3.07 ± 0.11	2.47 ± 0.16	2.11 ± 0.11	2.91 ± 0.41
13	4	4.49	1.71 ± 0.11	3.71 ± 0.15	1.21 ± 0.90	0.31 ± 0.11	2.11 ± 0.31
14	2	2.24	3.02 ± 0.21	2.15 ± 0.15	2.45 ± 0.65	1.80 ± 0.50	3.10 ± 0.51
15	1	1.12	2.81 ± 0.91	3.02 ± 0.61	3.11 ± 0.11	3.11 ± 0.11	3.11 ± 0.11
16	2	2.24	2.95 ± 0.15	3.70 ± 0.10	1.71 ± 0.32	1.41 ± 0.61	2.01 ± 0.51
17	2	2.24	3.71 ± 0.10	3.15 ± 0.35	1.41 ± 0.42	1.01 ± 0.01	1.81 ± 0.42
18	1	1.12	3.81 ± 0.51	4.21 ± 0.61	3.01 ± 0.62	3.01 ± 0.62	3.01 ± 0.62
Total	89	100	1.58 ± 0.32	2.59 ± 0.26	2.88 ± 0.05	0.31 ± 0.11	4.52 ± 0.31

Note. Resistance to diseases, points: undamaged – 0, very low damage – 1, slight damage – 2, medium damage – 3, high damage – 4, and very high damage – 5.
Harvest assessment points: no harvest – 0, single fruits – 1, rare fruits – 2, medium harvest – 3, high harvest – 4, and very high harvest – 5

Red and white currant. Table 2 presents generalised four-year data on the resistance of red and white currant cultivars to leaf spot and their fruitage. All the cultivars are grouped into 5 classes. Of the 75 cultivars studied, 9 were very slightly damaged by leaf spot, 6 were affected weakly, 22 to a medium degree, 23 strongly and 15 very strongly. The majority of cultivars were affected by leaf spot at a medium and high degrees. The most valuable 15 cultivars are those unaffected or very slightly affected by leaf spot: Belaya Smoljaninovoj, Dekorativnaya, Heinemanns Rote Spatlese, Erstling aus Vierlander, Fertodi 56 Piros, Gloire de Sablons, Gordouin Rouge, Jonkheer van Tets, London Market, Punnapisar, Raudonieji (Samuolio), Raudonieji (Balteno), Rore Hollandische, No. 1–8 Viola, Nr. 1–20 Vira. Although each class contains cultivars with different fruitage, there is a general tendency that cultivars more resistant to leaf spot are less productive ($K_{LS/F}$ = –0.79).

Gooseberry. According to resistance to mildew and leaf spot, 87 gooseberry cultivars are grouped into 18 classes (Table 3). There are three cultivars attributed to the first class absolutely resistant to mildew and leaf spot: Captivator, Izabella, Malopolski. The second class contains 17 cultivars resistant to mildew but with very low damage by leaf spot (Aamisepa, Belorusskij Krasnyj, Kirdeikiai, Kurshu Dzintars, Koknese, Houghton, Malakhit, Mazershkota, Red Jacket, Rekord, Resistenta, Robustenta, Sikora-287, Slivovij, Smena, Start, No. 0-274). Class 6 contains has 4 cultivars, which are a bit more susceptible to mildew (Bajorai, Hinnonmaki Strain, Hinnonmaen Keltainen, Pioner). The rest cultivars can be affected by both diseases at different levels. The following general tendencies have been observed. Firstly, each class contains cultivars differing in harvest. A negative correlation between disease resistance and harvest is stronger in the case of mildew ($K_{M/F}$ = –0.60, $K_{LS/F}$ = –0.31). Of 89 cultivars investigated independently of damage degree, 68 cultivars were more resistant to leaf spot than to mildew, 10 cultivars were damaged to the same degree, 11 were damaged more by leaf spot than by mildew. The correlation coefficient for general resistance to both diseases is $K_{LS/M}$ = 0.42. Thus, of 89 cultivars 24 are valuable according to resistance to mildew and leaf spot.

CONCLUSIONS

1. Disease-resistance of the berry cultivars has been determined to be as follows: 64 of 158 black currant cultivars are valuable according to resistance to mildew and leaf spot, 15 of 75 red and white currant cultivars are valuable according to resistance to leaf spot, 24 of 89 gooseberry cultivars are valuable according to resistance to mildew and leaf spot.

2. Disease-resistant berry cultivars are notable for different fruitage. The collection of black currant showed no correlation between resistance to the above diseases and fruitage ($K_{M/F}$ = –0.05, $K_{LS/F}$ = –0.14); red and white currant cultivars, though more resistant to leaf spot, are less productive ($K_{LS/F}$ = –0.79); in the collection of gooseberry, a negative correlation between disease resistance and harvest is more pronounced in the case of mildew than of leaf spot ($K_{M/F}$ = –0.60, $K_{LS/F}$ = –0.31).

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RIBES GENTIES GENETINIAI RESURSAI VILNIAUS UNIVERSITETO BOTANIKOS SODE: I. SERBENTŲ IR AGRASTŲ VEISLIŲ ATSPARUMAS MILTLIGEI (VALKČIUI) (*SPHAEROTHECA MORS-UVAE* BERK. ET CURT.), DEGULIAMS (*PSEUDOPEZIZA RIBIS* KLEB.) IR DERĖJIMAS 1998–2001 METAIS

S a n t r a u k a

1998–2001 metais Vilniaus universiteto Botanikos sodo serbentų ir agrastų kolekcijoje vertintas 158 juodųjų, 75 raudonųjų ir baltųjų bei 89 agrastų veislių atsparumas miltligei (valkčiui) ir deguliams, taip pat derėjimas. Požymiai vertinti pagal aprašus balais, veislės suskirstytos į klases pagal požymių pasireiškimo laipsnį. Atrinktos šioms ligoms atsparios veislės. Iš 158 juodųjų serbentų veislių atrinktos 64, kurios atsparios ir miltligei, ir deguliams, iš 75 raudonųjų serbentų veislių – 15, kurios labai mažai (9) arba silpnai (6) pažeistos degulių. Iš 89 agrastų veislių 24 nepakenktos valkčio ir nestipriai degulių.

Miltligei ir deguliams atsparios veislės yra tiek gausiai, tiek mažai derančios. Juodųjų serbentų veislėse nėra koreliacijos tarp atsparumo šioms ligoms ir derėjimo ($K_{M/F}$ = = –0,05, $K_{LS/F}$ = –0,14), deguliams atsparesnės raudonųjų ir baltųjų serbentų veislės yra mažiau derlingos ($K_{LS/F}$ = = –0,79); agrastų veislėse neigiama atsparumo ligoms ir derėjimo koreliacija ryškesnė valkties atveju ($K_{M/F}$ = = –0,60, $K_{LS/F}$ = –0,31).