

PRODUCTIVE VALUE OF EIGHTEEN GOOSEBERRY (*Ribes grossularia* L.) CULTIVARS OF DIFFERENT ORIGIN EVALUATED IN CENTRAL POLAND

Stanisław Pluta, Agata Broniarek-Niemiec
and Edward Żurawicz

Research Institute of Pomology and Floriculture
Pomologiczna 18, 96-100 Skierniewice, POLAND
e-mail: Stanislaw.Pluta@insad.pl

(Received October 1, 2010/Accepted October 27, 2010)

A B S T R A C T

In 2007-2009, eighteen gooseberry (*Ribes grossularia* L.) cultivars were evaluated in the growing conditions of central Poland. They were 'White Smith', 'Captivator', 'Hinnonmaki Gelb', 'Hinnonmaki Rot', 'Invicta', 'Kamieniar', 'Krasnoslavianski', 'Laskovij', 'Macurines', 'Misorskij', 'Niesluhovski', 'Pax', 'Pixwell', 'Puszkinskij', 'Rochus', 'Rolonda', 'Ruskos' and 'Spine Free'. The following cultivar features were assessed: fruit yield (date of ripening, yield, size of fruits and colour of fruit skin), susceptibility to fungal leaf diseases: American powdery mildew *Sphaerotheca mors-uvae* (Schwein.) Berk. et Curt. and leaf spot *Drepanopeziza ribis* (Kelb.) Petrak, plant growth (the height and the width of bushes) and plant habit. Cultivars 'Niesluhovski', 'Hinnonmaki Gelb', 'Hinnonmaki Rot' and 'Invicta' were the earliest to ripen. Fruits of 'Captivator' and 'Spine Free' ripened the latest. The highest fruit yields were harvested from the cultivars 'Pixwell', 'Puszkinskij' and 'Laskovij', and the lowest were from 'Ruskos', 'Pax', 'Hinnonmaki Gelb' and 'Niesluhovski'. The various cultivars differed in the colour of the fruits. They produced green, yellow, light red, red, and dark red fruit skins. The most susceptible to American powdery mildew were 'White Smith' and 'Krasnoslavianski'. The remaining cultivars showed very little infection or they were not infected at all. The leaves of all cultivars were affected by leaf spot in the low or medium range, except for the cultivar 'White Smith', whose leaves were highly infected by this disease. The bushes of the cultivars 'Pixwell', 'Ruskos', 'Laskovij' and 'Misorskij' grew the most vigorously. 'White Smith', 'Niesluhovski' and 'Hinnonmaki Gelb' produced the smallest plants. Cultivars 'Macurines' and 'Puszkinskij' were characterized by the widest spreading plant habit.

Key words: cultivar, trial, small fruit, berry crop, yield, fruit size, resistance to fungal diseases

INTRODUCTION

The gooseberry (*Ribes grossularia* L.) has been grown in Poland for fruit production for many years. Currently, about 20 thousand tons are harvested annually (FAO, GUS, "Rynek Owoców i Warzyw" – Fruit and Vegetable Market, 2009). Poland is the top producer in the world in regard to the scale of gooseberry production. Developing the cultivation of gooseberries in Poland is conducive for several reasons. These reasons include the relatively small agricultural requirements of this plant, the fact that gooseberry plants are highly winter hardy, low costs of production, the fact that fruit harvesting can be conveniently done using harvesters for blackcurrants, and the big demand of fruit for the processing and frozen food industry. In recent years, the dynamics of the gooseberry cultivation progress have declined. The most important reason why this is happening is because of the lack of new high-yielding cultivars, which can produce high quality fruit and which can adapt to the climate in Poland. In gooseberry cultivation, the "old" English cultivar 'White Smith' has always dominated. This is a productive cultivar which has good quality fruit, however, both the plant (leaves, shoots) and fruit are susceptible to American powdery mildew *Sphaerotheca mors-uvae* (Schwein.) Berk. et Curt. On susceptible cultivars this fungal disease reduces shoot and leaf growth. The affected fruit lose their processing and sale values. Ad-

vanced protection of the plants against American powdery mildew is not always successful and is very expensive. It is also important to note that the European Union has now limited the number of pesticides admitted into EU countries which can be used to fight against this disease. Cultivation of new gooseberry cultivars which are more productive, and at the same time resistant to the pathogen are needed. For this reason, there are two kinds of research being done at the Research Institute of Pomology and Floriculture in Skierniewice, Poland. The first kind of research involves assessing gooseberry production value of new cultivars. This research focuses on gooseberry cultivars grown elsewhere; not necessarily European cultivars. The second kind of research involves genetic and breeding studies for the possibility of obtaining native gooseberry cultivars, which are better adapted to the Polish climate than foreign ones.

The aim of the studies was to estimate the production value of different cultivars of gooseberries bred in the past few years in several foreign horticulture breeding centers. These are cultivars which were not yet tested or were not fully evaluated in central Poland. The most valuable of those cultivars will be recommended for commercial cultivation in Poland. They will also be used as parental forms and donors of valuable traits in the breeding program at the Research Institute of Pomology and Floriculture in Skierniewice, Poland. The goal of the program is to release new Polish gooseberry cultivars.

MATERIAL AND METHODS

The cultivar trial experiment was conducted in the years 2005-2009. It was established in spring 2005, on the fields of the Experimental Orchard in Dąbrowice near Skierniewice (central Poland). In the experiment, the plant growth and yielding of 18 cultivars of gooseberries, released in few horticultural breeding centers, were compared. The list of the studied cultivars and their origins are presented in Table 1. The characteristics of these cultivars can be found in the professional literature (Isachkin et al., 2001; Pomologia – Aneks 2004; Kulikov et al., 2009). The experiment was established using nursery plant material. The one-year-old gooseberry bushes were well rooted, qualified and met the relevant requirements. The bushes were produced in two commercial nurseries in Poland.

The experiment was established in a random block design, in 3 replications. Bushes of all cultivars were planted in a density of 3.0 x 0.75 m, with 3 bushes on a plot. In this experiment the standard cultivar was 'White Smith', which has been commonly known and cultivated in Poland for many years. No chemical protection for plants against fungal diseases was applied, so that the evaluation of shoot, leaf and fruit damage by powdery mildew and leaf spot could be assessed. The insect pests (aphid, spider mite, leaf-eating caterpillar) were controlled to a limited extent in order to monitor their prevalence. The years in which plant

growth and fruiting were carried out (2007-2009), were characterized by variable weather; different for each year. The years 2007 and 2008 were rather warm and dry. In the year 2009, after the spring drought that lasted till the middle of May, frequent and heavy rains occurred in the second half of May and lasted till the end of July. The vegetable season in 2008 was without spring frosts. Frosts did appear in 2007 and 2009, but they did not have a big impact on the yielding of the tested gooseberry cultivars.

Measurements and observations.

The evaluation/assessment was done in the years 2007-2009, when the bushes had reached yielding-age. The following features were taken into account:

1. Time of fruit ripening (75% of the fruit at the ready-to-be-consumed stage).
2. Yielding of cultivars (yield/bush, yield/plot in kg).
3. Size of fruit (the weight of 100 fruit picked randomly from each plot, in grams).
4. Color of fruit skin judged visually during harvest.
5. Growth intensity of the bush (the height and width, in cm).
6. Plant habit assessed 2 weeks before harvesting (measurement of the height and width of the bush and quotient of height to width).
7. Infection damage of plants from American powdery mildew *Sphaerotheca mors-uvae* (Schwein.) Berk. et Curt. and leaf spot *Dre-*

panopeziza ribis (Kelb.) Petrak was studied in mid July using a 5 grade ranking scale, where 1 = 3% (0-6%), 2 = 10% (6-15%), 3 = 20% (15-25%), 4 = 40% (25-55%), 5 = 80% (over 55%) The ranking scale took into account the surface of shoot, leaf and fruit covered with diseases symptoms

according to the method elaborated by Karolczak et al. (1973).

The obtained results were elaborated statistically using the method of analyzing single-factor variances. The significance of the differences between the means was assessed using the Duncan t-test, assuming a significance level at 5%.

Table 1. Time of fruit ripening (harvesting) of gooseberry cultivars (Dąbrowice, 2007-2009)

No.	Cultivar	Country of origin	Time of fruit ripening			
			average	2007	2008	2009
1	Niesluchowski	Ukraine	30.06	21.06	27.06	6.07
2	Hinnonmaki Gelb	Finland	2.07	25.06	27.06	9.07
3	Hinnonmaki Rot	Finland	2.07	23.06	30.06	9.07
4	Invicta	U.K.	2.07	23.06	27.06	9.07
5	Kamieniar	Ukraine	4.07	25.06	30.06	9.07
6	Krasnoslavianski	Russia	4.07	25.06	27.06	9.07
7	Misorskij	Russia	4.07	27.06	30.06	9.07
8	Pax	U.K.	4.07	3.07	30.06	9.07
9	Puszkinskij	Russia	4.07	27.06	3.07	9.07
10	White Smith	U.K.	5.07	25.06	27.06	10.07
11	Laskovij	Russia	6.07	27.06	30.06	9.07
12	Rochus	Germany	6.07	29.06	7.07	13.07
13	Ruskos	Russia	6.07	27.07	30.06	10.07
14	Macurines	Germany	8.07	29.06	3.07	12.07
15	Pixwell	U.K.	10.07	29.06	3.07	12.07
16	Rolonda	Germany	10.07	3.07	7.07	13.07
17	Captivator	Canada	16.07	11.07	22.07	17.07
18	Spine Free	U.K.	16.07	11.07	22.07	17.07

RESULTS AND DISCUSSION

Time of fruit ripening (fruit harvest date)

The time of the fruit ripening was recognized as the day in which 75% of the fruit reached the ready-for-consumption stage. Both the time of gooseberry fruit ripening each year, and the average time of fruit ripening for 3 years (2007-2009) are shown in Table 1. As it can be seen in the table, the cultivars varied at the time of fruit ripening. For this reason, the harvesting of the fruit was extended across a period of 17 days. The earliest to ripen was usually the Ukrainian cultivar 'Niesluhovski' (usually about June 30th), and the latest to ripen (usually about July 16th) were the fruit of the Canadian cultivar 'Captivator' and the English 'Spine Free'. Given the differences in the time of fruit ripening of the individual cultivars, the tested genotypes were divided into four groups: Group I – included the early type, in which the fruit ripen from June 30th- July 2. These were: 'Niesluhovski', 'Hinnonmaki Gelb', 'Hinnonmaki Rot', and 'Invicta'; Group II – included the mid-early types in which the harvest time was July 4-6. These were: 'Kamieniar', 'Krasnoslavianski', 'Misorskij', 'Pax', 'Puszkinskij', the standard cultivar 'White Smith' and 'Laskovij', 'Rochus' and 'Ruskos'; Group III – included those with a medium-ripening time in which the harvest was July 8-10. These were: 'Macurines', 'Pixwell' and 'Rolonda'; Group IV – included the late ripening cultivars in which the harvest time was July 16th. These were:

'Captivator' and 'Spine Free'. A similar classification giving the time of ripening can be found in literature (Pomologia, 1994; Pluta, 1996; Pluta and Hummer, 1996; Pomologia – Aneks, 2003). The received results confirm the theory, that in Poland, a large extension of the fruit ripening time and the harvesting of gooseberries is possible. This possibility can be achieved by planning for cultivation, noting that, for example, in the early Ukrainian cultivar 'Niesluhovski' ripening of the fruit takes place 6 days before the standard cultivar 'White Smith' and that in the Canadian cultivar 'Captivator' and English 'Spine Free' ripening of the fruit takes place 11 days after the standard cultivar 'White Smith'. These cultivars have already been added to the breeding program realized at the Research Institute of Pomology and Floriculture in Skierniewice, Poland. These cultivars are the source of genes for the early and late times of fruit ripening of gooseberries.

Yielding of cultivars

Yielding of the assessed cultivars for the 3 years of the study, as well as for each year separately (2007, 2008 and 2009), and also the average of 3 years of yielding (in kg per bush) is shown in Table 2. The results, from the average fruit yield obtained over a 3 year time period, showed that among all the studied cultivars the most productive was 'Pixwell'. The fruit yield from the 'Pixwell' bush (2.36 kg) was 65% higher than the fruit yield harvested

Table 2. Fruit yield of gooseberry cultivars (Dąbrowice, 2007-2009)

No.	Cultivar	Fruit yield [kg/bush]				
		2007	2008	2009	sum	average
1	Niesluchowski	1.14 d-f*	0.35 ab	0.50 a-c	1.99	0.66 ab
2	Hinnonmaki Gelb	0.98 de	0.34 ab	0.64 a-d	1.95	0.65 ab
3	Hinnonmaki Rot	2.70 i	0.79 c-f	0.83 c-f	4.32	1.44 cd
4	Invicta	1.23 e-g	0.98 e-g	0.75 b-e	2.96	0.99 a-c
5	Kamieniar	0.93 c-e	0.51 a-d	1.66 i-k	3.10	1.03 bc
6	Krasnoslavianski	0.15 a	0.17 a	0.55 a-c	0.87	0.29 a
7	Miorskij	1.71 h	1.27 gh	1.78 jk	4.76	1.59 cd
8	Pax	0.39 ab	0.65 b-e	0.36 a	1.40	0.47 ab
9	Puszkinskij	3.49 k	1.02 fg	1.17 f-h	5.67	1.89 de
10	White Smith	1.37 f-g	1.29 hg	1.62 i-k	4.28	1.43 cd
11	Laskovij	2.97 ij	1.39 h	1.03 e-g	5.39	1.80 de
12	Rochus	1.35 f-h	0.67 b-f	1.08 e-g	3.10	1.03 bc
13	Ruskos	0.58 bc	0.35 ab	0.41 ab	1.34	0.45 ab
14	Macurines	1.43 f-h	0.76 c-f	1.36 g-i	3.55	1.18 b-d
15	Pixwell	3.24 jk	1.93 i	1.93 k	7.09	2.36 e
16	Rolonda	0.96 de	0.87 d-f	0.92 d-f	2.75	0.92 a-c
17	Captivator	1.59 gh	0.48 a-c	1.04 e-g	3.11	1.04 bc
18	Spine Free	0.81 cd	0.44 a-c	1.45 h-j	2.69	0.90 a-c
	<i>Average</i>	<i>1.50</i>	<i>0.77</i>	<i>1.06</i>	-	<i>1.11</i>

*Means in the columns marked in the same letter do not differ significantly according to Duncan's t-test (5%)

from the standard cultivar of 'White Smith' (1.43 kg). The fruit yield of 'Pixwell' was about 30% higher than those yields harvested from the other cultivars, which were in 2nd and 3rd place after 'Pixwell'. In 2nd place was 'Puszkinskij' with 1.89 kg fruit per bush. In 3rd place was 'Laskovij' with 1.80 kg fruit per bush. From the remaining cultivars only two – 'Miorskij' (1.59 kg of fruit per bush) and 'Hinnonmaki Rot' (1.44 kg of fruit per bush) produced a fruit yield similar to the standard cultivar

'White Smith'. Cultivars 'Invicta', 'Kamieniar', 'Rochus', 'Macurines', 'Rolonda', 'Captivator' and 'Spine Free' produced less yield than the standard cultivar 'White Smith', but those differences were not proved statistically. The remaining cultivars yielded much less than the standard one. Low yields were harvested from the bushes of 'Niesluchowski' (0.66 kg of fruit per bush) and 'Hinnonmaki Gelb' (0.65 kg of fruit per bush). The fruit yields of these cultivars were over 50% lower than

the fruit yield of the standard cultivar. The weakest yielders were the Russian cultivar 'Krasnoslavianskij' (0.29 kg of fruit per bush) and 'Ruskos' (0.45 kg of fruit per bush) and the English cultivar 'Pax' (0.47 kg of fruit per bush). Those 3 last cultivars, as well as 'Niesluchovski' and 'Hinnonmaki Gelb' should not be recommended for growing in central Poland, because of their low yielding. In assessing the yielding of the gooseberry bushes, the speed of the bushes to produce a crop is very important. The size of the harvested yield already in the first year, is used to judge value. A high yield gained early, points to a fast increase in the return of costs in an investment for establishing a plantation. The cultivars that provided a high early yield, much more than the standard cultivar 'White Smith', appeared to be 'Puszkinskij', 'Pixwell' and 'Laskovij'. When it came to yielding for the whole period of the assessment Puszkinskij, 'Pixwell' and 'Laskovij' were also the best. It should be pointed out that the standard cultivar 'White Smith' was strongly attacked by American powdery mildew and leaf spot, which undoubtedly had an effect on its yielding. An interesting exception is the Finnish cultivar 'Hinnonmaki Rot', which had 62% of its fruit yield in the first year of yielding (2.7 kg in the first year out of 4.32 kg in the whole period of the assessment).

Fruit size

The size of the fruit, in an average weight of 100 fruit for each of

the studied cultivars over 3 years of fruiting, is presented in Table 3. As it can be seen, the cultivars produced fruit of different sizes, which varied over the years. Over the average of 3 years of evaluation, the standard cultivar 'White Smith' had the largest fruit (434.3 g). The fruit of this cultivar, however, were not significantly larger than the fruit of the 'Invicta' (420.7 g) and 'Pax' (406.9 g). When considering the weight of 100 fruit over 300 grams, 'Macurines' (389.7 g), 'Niesluchovski' (367.0 g) and 'Ruskos' (338.9 g) also had quite large fruit. Following right after this group in size, were the cultivars 'Puszkinskij', 'Rolonda', 'Captivator', 'Spine Free', 'Kamieniar', 'Hinnonmaki Gelb' and 'Krasnoslavianski. These cultivars produced fruit about 45% smaller than the standard cultivar 'White Smith'. The remaining cultivars produced small fruit. Their fruits were about 50% smaller than the standard 'White Smith', and even smaller, as with 'Pixwell' (35% of the standard cultivar size).

The color of the fruit skin

The color of the gooseberries is determined by the color of the fruit skin. The tested cultivars were very diversified in this feature (Tab. 3). They were green ('Rochus' and 'Macurines'), yellow ('Hinnonmaki Gelb', 'Invicta', 'Puszkinskij' and 'White Smith'), light-red ('Hinnonmaki Rot', 'Kamieniar' and 'Pixwell'), red ('Captivator', 'Pax', 'Laskovij', 'Rolonda' and 'Spine Free') and even dark red

Table 3. Fruit size (weight of 100 fruit in grams) and the color of fruit of different gooseberry cultivars, (Dąbrowice, 2007-2009)

No.	Cultivar/clone	Weight of 100 fruit [g]				Fruit color
		2007	2008	2009	average	
1	Niesluchowski	346.5 ij*	362.2 i	392.4 j	367.0 hi	dark red
2	Hinnonmaki Gelb	310.8 gh	250.9 c-e	213.8 b	258.5 cd	yellow
3	Hinnonmaki Rot	234.7 cd	227.0 c	234.5 bc	232.1 bc	light red
4	Invicta	359.8 jk	408.5 j	493.9 l	420.7 jk	yellow
5	Kamieniar	298.6 fg	287.9 gh	309.4 fg	298.6 ef	light red
6	Krasnoslavianski	259.7 de	270.9 e-g	288.0 ef	272.9 de	dark red
7	Misorskij	249.7 d	200.5 b	244.1 c	231.5 bc	dark red
8	Pax	422.2 j	362.6 i	435.8 k	406.9 jk	red
9	Puszkinskij	332.2 hi	261.7 d-f	360.6 i	318.2 fg	yellow
10	White Smith	446.2 lm	418.4 j	438.4 k	434.3 k	yellow
11	Laskovij	221.5 bc	192.3 b	249.1 cd	220.9 b	red
12	Rochus	203.4 ab	241.8 cd	240.2 c	228.5 bc	green
13	Ruskos	373.0 k	310.1 h	333.5 gh	338.9 gh	dark red
14	Macurines	448.7 m	377.7 j	342.8 hi	389.7 ij	green
15	Pixwell	193.9 a	135.8 a	147.7 a	159.1 a	light red
16	Rolonda	281.7 ef	300.9 h	357.6 hi	313.4 fg	red
17	Captivator	370.7 jk	267.2 d-g	300.6 f	312.8 fg	red
18	Spine Free	307.5 f-h	286.9 f-h	272.8 de	289.1 d-f	red
	<i>Average</i>	<i>314.5</i>	<i>286.9</i>	<i>314.2</i>	<i>300.7</i>	

*Explanations, see Table 2

(‘Krasnoslavianski’, ‘Misorskij’ and ‘Ruskos’). Under these circumstances the obtained results coincide with the information in the literature referring to the color of fruit skin.

Plant growth

The results of plant bush growth of the tested cultivars are given in Table 4. As it can be seen, the bushes of these cultivars vary in the amount of plant growth, both in height and width. The tallest bushes were not always the widest. According to the

height of the bushes tested genotypes can be divided into three groups: 1 – the tallest bushes are ‘Pixwell’, ‘Rochus’, ‘Laskovij’ and ‘Misorskij’; 2 – bushes of medium height are ‘Captivator’, ‘Spine Free’, ‘Rolonda’, ‘Krasnoslavianski’, ‘Macurines’, ‘Invicta’, ‘Pax’ and ‘Kamieniar’; 3 – the shortest bushes were the remaining cultivars. Their bush heights were significantly different than those already mentioned above. The widest bushes (over 100 cm wide) were ‘Pixwell’, ‘Rochus’, ‘Misorskij’

Table 4. Growth and plant habit of different gooseberry cultivars (Dąbrowice, average for 2007-2009)

No.	Cultivar	Plant growth [cm]		Indicator of the plant habit**
		height	width	
1	Niesluchowski	49.1 bc*	55.2 ab	0.91 b-d
2	Hinnonmaki Gelb	44.1 ab	54.2 ab	0.83 a-d
3	Hinnonmaki Rot	62.9 de	77.7 c-e	0.82 a-d
4	Invicta	65.1 d-f	84.6 c-f	0.77 a-c
5	Kamieniar	61.3 c-e	63.7 bc	0.96 d
6	Krasnoslavianski	70.0 e-f	77.0 c-e	0.96 d
7	Misorskij	90.1 h-j	113.5 g-i	0.80 a-d
8	Pax	62.1 de	68.1 bc	0.93 cd
9	Puszkinskij	54.8 b-d	79.6 c-e	0.69 a
10	White Smith	35.8 a	41.2 a	0.89 b-d
11	Laskovij	93.2 i-k	117.9 hi	0.80 a-d
12	Rochus	98.4 jk	118.8 hi	0.83 a-d
13	Ruskos	54.7 b-d	71.8 b-d	0.76 ab
14	Macurines	69.8 e-g	104.9 f-h	0.67 a
15	Pixwell	104.3 k	127.0 i	0.83 a-d
16	Rolonda	77.2 fg	94.0 e-g	0.83 a-d
17	Captivator	82.1 g-i	91.3 d-f	0.90 b-d
18	Spine Free	78.2 gh	83.7 c-f	0.95 d

*Explanation, see Table 2

** Indicator of the bush size = quotient of height/width of the bush

and 'Macurines'. Those bushes that were less than 65 cm wide were 'White Smith', 'Hinnonmaki Gelb' and 'Niesluchowski'. The small plant growth of the standard cultivar 'White Smith' was doubtlessly an effect of the high infection of its shoots and leaves by fungal leaf diseases. Bushes of the remaining cultivars were of medium width (65-100 cm). The plant growth of gooseberries is an important factor to consider when using a harvester for fruit picking. Not only the growth of the bush

measured by their height and width needs to be taken into account. The plant habit must also be taken into account. The plant habit is the outcome of the ratio of the height and width of the bush. The ratio of the height and width of the bush is the indicator of the plant habit. The indicator 1,0 means that the plant habit is ball-shaped. An indicator of under 1.0 means that the plant habit is wide-spread. An indicator of over 1.0 means the plant habit is elevated. The harvester usually picks the fruit

more precisely from medium wide-spread bushes. All the assessed gooseberry cultivars produced bushes that were wide-spread or close to being wide-spread in shape. The most wide-spread bushes were 'Macurines' and 'Puszkinskij'.

Plant susceptibility to fungal diseases (American powdery mildew and leaf spot)

None of the studied cultivars of gooseberries were resistant to both assessed diseases. As the results showed in Table 5, they were differentiated in their susceptibility to the pathogens which caused these diseases. Unfortunately, the most susceptible was the standard cultivar 'White Smith'. The pathogen, which caused the American powdery mildew attacked the shoots, leaves and fruit of this cultivar at a very high level (over 4 in a 5 grade ranking scale). The leaves of 'White Smith', like no other cultivar, were infected by leaf spot at a similar level (3.8 in a 5 grade ranking scale). In Poland, the high susceptibility of 'White Smith' to both diseases is commonly known to gooseberry producers, and well described in Polish professional literature (Gwozdecki et al., 1990; Broniarek-Niemiec et al., 1997; Gwozdecki, 1998; Broniarek-Niemiec and Pluta, 2001, 2005; Broniarek-Niemiec and Bielenin, 2003). It is not only in Poland that these diseases are also a big obstacle in the fast development of this production (Gwozdecki et al., 1990; Gwozdecki, 1998; Beyer and Roser, 1989; Carron, 2002; Mage, 2002; Broniarek-Niemiec and

Bielenin, 2003). The other cultivars were not affected by American powdery mildew, or had a very small amount of symptoms, which did not significantly influence their plant growth or fruiting ability.

None of the studied cultivars was completely resistant to leaf spot. 'Misurskij' showed the least amount of leaf spot (1.5 in a 5 grade ranking scale). The remaining cultivars were affected to a greater level, but the differences were not significant. The most infected by leaf spot was the standard cultivar 'White Smith' (3.8 in a 5 degree ranking scale).

CONCLUSION

1. The examined gooseberry cultivars differ widely in terms of all the studied traits determining their production value in Central Poland.
2. From among all the examined cultivars, 'Pixwell' is the most productive. Its strong plant growth makes it suitable to be grown on commercial plantations, where fruits are picked by a harvester.
3. 'Puszkinski', 'Laskovij', 'Misorskij' and 'Hinnomaki Rot' are slightly less suitable for commercial cultivation. They are equal in fruit production to the standard cultivar 'White Smith', but they absolutely exceed this cultivar in terms of plant growth and resistance to fungal diseases.

The remaining cultivars are not very suitable to be grown commercially in Poland. This is due to their low fruit

Table 5. Susceptibility of gooseberry plants to fungal diseases (Dąbrowice, average for 2006, 2008 and 2009)

No	Cultivar/clone	American powdery mildew**		Leaf spot**
		shoots	fruits	
1	Niesluchovski	1.3 a*	1.2 a	2.2 b
2	Hinnonmaki Gelb	1.3 a	1.2 a	3.0 d
3	Hinnonmaki Rot	1.3 a	1.4 a	2.1 b
4	Invicta	1.0 a	1.0 a	2.3 b
5	Kamieniar	1.0 a	1.0 a	2.2 b
6	Krasnoslavianski	2.4 b	1.4 a	2.2 b
7	Misorskij	1.0 a	1.0 a	1.5 a
8	Pax	1.0 a	1.0 a	2.9 cd
9	Puszkinskij	1.4 a	1.4 a	2.4 b-d
10	White Smith	4.2 c	4.4 b	3.8 e
11	Laskovij	1.0 a	1.0 a	2.4 b-d
12	Rochus	1.0 a	1.0 a	1.9 ab
13	Ruskos	1.3 a	1.2 a	2.3 bc
14	Macurines	1.2 a	1.1 a	2.4 b-d
15	Pixwell	1.0 a	1.0 a	2.1 b
16	Rolonda	1.0 a	1.0 a	2.1 b
17	Captivator	1.3 a	1.2 a	2.1 b
18	Spine Free	1.2 a	1.2 a	1.9 ab

* Explanations, see Table 2

** – ranking scale 1-5, 1 – no infection, 5 – very severe infection of plants

productivity. They can, however, be recommended for the amateur cultivation in garden plots and in home gardens, because of their low susceptibility to fungal diseases.

REFERENCES

- Beyer E., Roser I. 1989. Resistant gooseberry cultivars for cultivation. *OBST UND GARTEN* 108/7: 404-405.
- Broniarek-Niemiec A., Pluta S., Bielenin A. 1997. Ocena polowej odporności porzeczki czarnej i agrestu na podstawowe choroby grzybowe w hodowlanych kolekcjach roboczych ISK. *Mat. Ogólnopol. Konf. Ochrony Roślin Sadow.* 11-12.02.1997, Skierniewice, p. 135.
- Broniarek-Niemiec A., Pluta S. 2001. Ocena polowej odporności wybranych genotypów agrestu na główne choroby grzybowe. *Ogólnopol. Nauk. Konf. Ochrony Roślin Sadow.*, Skierniewice, pp. 120-125.
- Broniarek-Niemiec A., Bielenin A. 2003. Skuteczność wybranych fungicydów w zwalczaniu amerykańskiego mączniaka agrestu i opadziny liści na plan-

- tacjach agrestu. PROGRESS IN PLANT PROTECTION / POSTĘPY W OCHRONIE ROŚLIN 43 (2): 545-547.
- Broniarek-Niemiec A., Pluta S. 2005. Ocena polowej odporności genotypów agrestu (*Ribes grossularia* L.) na choroby grzybowe. Zmienność genetyczna – utrzymywanie, tworzenie i wykorzystywanie w hodowli roślin. Monografia. In: Michalik B. i Żurawicza E (ed.), pp. 333-337.
- Carron R. 2002. Variety trial with gooseberry. Revue Suisse de Viticulture, ARBORICULT. HORT. 34/2: 133-135.
- FAO – Food and Agriculture Organization of the United Nations, www.faostat.fao.org
- Gwozdecki J. 1998. Nowe odmiany roślin jagodowych wpisane do rejestru. Mat. XXXVII Ogólnopol. Nauk. Konf. Sadow., pp. 151-154.
- Gwozdecki J., Chlebowska D., Pierzga K., Smolarz K., Szczurek J., Trojszczak T. 1990. Ocena wartości produkcyjnej dwóch fińskich odmian agrestu. PR. INST. SADOW. KWIAK. Ser. A 29: 35-40.
- GUS – Główny Urząd Statystyczny. Rocznik Statystyczny Rzeczypospolitej Polskiej 2008. Rok LXV, Warszawa, Zbiory owoców, tab. 11 (384), p. 466.
- Isachkin A.V., Vorobiev B.N., Aladina O.N. 2001. Sortovoj katalog. Jagodnyje kultury. Izdatelstvo EKSMO – press, Izdatelstvo Lik, 416 p.
- Karolczak W., Cimanowski J., Puchała Z. 1973. Ochrona porzeczki czarnej przed chorobami. Cz. 1: Zwalczanie amerykańskiego mączniaka agrestu (*Sphaerotheca mors-uae* Schw./Berk. et Curt.) na porzeczce czarnej. PR. INST. SAD. Ser. A 17: 189-195.
- Kulikov I.M., Girichev V.S., Marchenko L.A., Sashko E.K. 2009. Gene pool of fruit and berry crops of the All-Russian Breeding Technology Institute of Horticulture and Nursery Management and its use in breeding. RUSSIAN AGRI. SCI. 35(1): 24-25.
- Mage F. 2002. A comparison of seven gooseberry cultivars with respect to yield components and fruit quality. ACTA HORT. 585: 481-487.
- Pluta S. 1996. Zeszyty pomologiczne „Porzeczki i agrest”, ISK Skierniewice, 89 p.
- Pluta S., Hummer K. 1996. *Ribes* collection at the ARS-USDA NCGR in Corvallis, Oregon, USA – sources of genes used in black currant breeding program in Poland. „Problems of Fruit Plant Breeding”, 30-31.05. 1996, Jelgawa. Lotwa 1, pp. 78-84.
- Pomologia – Odmianoznawstwo Roślin Sadowniczych 1994. Praca zbiorowa pod red. prof. Dr A. Rejmana, PWRiL, Warszawa.
- Pomologia – Odmianoznawstwo Roślin Sadowniczych – Aneks. 2003. Praca zbiorowa pod red. E. Żurawicza, PWRiL, Warszawa.
- Rynek Owoców i Warzyw. 2009, nr 35, listopad 2009.

WARTOŚĆ PRODUKCYJNA ODMIAN AGRESTU (*Ribes grossularia* L.) RÓŻNEGO POCHODZENIA OCENIANA W WARUNKACH CENTRALNEJ POLSKI

Stanisław Pluta., Agata Broniarek-Niemiec
i Edward Żurawicz

S T R E S Z C Z E N I E

W latach 2007-2009 w warunkach Polski centralnej badano 18 odmian agrestu ('Biały Triumf', 'Captivator', 'Hinnonmaki Gelb', 'Hinnonmaki Rot', 'Invicta', 'Kamieniar', 'Krasnoslawiański', 'Laskovij', 'Macurines', 'Misorskij', 'Niesłuchowski', 'Pax', 'Pixwell', 'Puszkinskij', 'Rochus', 'Rolonda', 'Ruskos' i 'Spine Free'). Oceniano następujące cechy odmian: plonowanie (termin dojrzewania, plenność, wielkość owoców i barwa skórki owoców), podatność roślin na choroby liści: amerykańskiego mączniaka agrestu *Sphaerotheca mors-uvae* (Schwein.) Berk. et Curt. i antraknozę liści *Drepanopeziza ribis* (Kelb.) Petrak, siłę wzrostu (wysokość i szerokość krzewów) oraz pokrój krzewów. Najwcześniej dojrzewającymi odmianami były: 'Niesłuchowski', 'Hinnonmaki Gelb', 'Hinnonmaki Rot' i 'Invicta', najpóźniej dojrzewały owoce odmian 'Captivator' i 'Spine Free'. Najwyższy plon owoców zebrano z odmian: 'Pixwell', 'Puszkinskij' i 'Laskovij', a najniższy z odmian 'Ruskos', 'Pax', 'Hinnonmaki Gelb' i 'Niesłuchowski'. Odmiany różniły się barwą owoców, wytwarzały owoce o zielonej, żółtej, jasnoczerwonej, czerwonej i ciemnoczerwonej skórce. Najbardziej podatnymi na amerykańskiego mączniaka agrestu były 'Biały Triumf' i 'Krasnoslawiański', pozostałe krzewy odmian były porażone w stopniu minimalnym lub w ogóle nie były porażone. Liście wszystkich odmian były w niskim lub średnim stopniu porażone przez antraknozę liści, z wyjątkiem odmiany 'Biały Triumf', której liście były porażone w stopniu silnym. Najsilniej rosły krzewy odmian: 'Pixwell', 'Ruskos', 'Laskovij' i 'Misorskij', a najsłabiej odmian 'Biały Triumf', 'Niesłuchowski' i 'Hinnonmaki Gelb'. Najbardziej rozłożystym pokrojem odznaczały się odmiany 'Macurines' i 'Puszkinski'.

Słowa kluczowe: odmiana, doświadczenie odmianowo-porównawcze, rośliny jagodowe, plon, wielkość owoców, odporność na choroby grzybowe