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BREEDING ESTIMATION OF RED CURRANT HYBRID FAMILIES

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S u m m a r y

The author has analyzed the progenies of red currant varieties from the purposeful crossings and from the open pollination. The valuable families for selection seedlings with the complex of breeding characters have been found (Valentinovka x Osipovskaya, Asya x 1368-12-57, Vika — open pollination). The crossing combinations prospective for selection of seedlings have been se-lected (Niva × 111-19-81, 44-5-30 × 1368-12-57) according to large size of berries and (1044-20-80 × Bayana) according to taste qualities. Selected seedlings are of interest as initial material for fur-ther breeding and for variety investigation.

Keywords: red currant, breeding family, crossing combination, productivity, long clusters, large berry size, taste qualities of berries.

Red currant is a high-yielding hardy berry crop traditionally cultivated in various soil and climatic conditions (1-3). Red currant berries and products of their cooking preparations contain organic, mineral and biologically active substances providing nutritional and medicinal value of the plant.

Red currant is the second berry (after strawberry) that opens a season of fresh berry products. This period is longer in red currant than in blackcurrant, as ripening terms of early and late red currant varieties are separated by more than a month. Among the red currant varieties approved for use in the Central Chernozem Region (the 5th), medium-ripening varieties are predominant (4), while the assortment of early-ripening varieties needs a substantial improvement. Berries of early-ripening red currant are served raw and should have good taste and high marketable properties. This group has no albino varieties.

The varieties with white and red berries both belong to the subgenus *Ribesia* Berl. with an only difference in color of berries (5, 6). M.A. Rozanova (1935) has reported about intraspecific variability of berry color (from white to dark red) in the initial wild species *Ribes vulgare* Lam., *R. rubrum* L. and *R. petraeum* Wulf. (7). The forms with pink berries were allocated during the study of intraspecific variability of *R. glabellum* grown in the Botanical Garden of the Institute of Biological Problems of Cryolithozone (Yakutsk) (8). The most familiar cultivar with pink berries – Gollandskaya Rosovaya (Dutch Pink) is the descendant of *R. vulgare* Lam. (9).

The purpose of this research was identification of valuable families giving the seedlings with a complex of economically valuable features or genotypes with particular outstanding characteristics.

Technique. The observations were carried out in 2009, in the experimental field of the All-Russia Research and Development Institute of Fruit Crop Selection (VNIISPK, Orel province). The objects of study were 415 seedlings from 15 families originated from intervarietal crosses and the open pollination of red currant varieties of complex genetic origin. The seedlings were planted in the field in autumn 2005. Accountings of productivity, terms of ripening and description of seedlings (length of clusters, color and size of berries, taste evaluation) were performed according to methodological instructions for selection of fruit, berries and nut crops (10).

Results. The seedlings with medium term of ripening were isolated in progenies of all the studied families except the descendants from open pollination of the form 68-3-134. The greatest number of medium-ripening forms resulted the open pollination of varieties with medium (Roza - 80,0%, Belka - 66,7%) and early ripening (Niva - 73,5%), as well as the combination Valentinovka × Osipovskaya (75,0%), whose parental forms originated from the early-ripening variety Jonkheer Van Tets and the medium ripening Minnesota (Table 1).

1. The frequency of isolation of red currant seedlings with different terms of ripening depending on their origin (All-Russia Research and Development Institute of Fruit Crop Selection, Orel province, 2009)

Number of a family	Origin	Number of seedlings, pcs.	Term of ripening				
			early	medium-early	medium	medium-late	late
1895	44-5-30 × 1368-12-57	16	40,0	20,0	40,0	0	0
2003	Asya × 1368-12-57	17	0	50,0	50,0	0	0
2007	Niva × 111-19-81	16	40,0	20,0	40,0	0	0
2039	Valentinovka × Osipovskaya	23	0	0	75,0	16,7	8,3
2041	1044-20-80 × Bayana	22	0	0	28,6	42,8	28,6
2047	79-1-89 × 1439-23-139	31	0	0	22,2	22,2	55,6
2049	Orlovskaya zvezda × 1440-25-37	18	0	0	26,7	13,3	60,0
2059	Asya (open pollination)	36	20,0	30,0	50,0	0	0
2060	Niva (open pollination)	54	26,5	0	73,5	0	0
2064	Viksne (open pollination)	30	17,6	52,9	35,3	0	0
2052	Belka (open pollination)	27	11,1	0	66,7	22,2	0
2062	Roza (open pollination)	40	0	0	90,5	9,5	0
2063	Vika (open pollination)	32	0	31,8	40,9	27,3	0
2054	Bayana (open pollination)	29	0	0	62,5	25,0	12,5
2066	68-3-134 (open pollination)	24	0	0	0	62,5	37,5

The higher proportion of early-ripening seedlings was obtained from crossing in pairs of early-ripening parental forms – 44-5-30 (Chulkovskaya × Minnesota) and 1368-12-57 (I_2 Jonkheer Van Tets), Niva (Minnesota × Chulkovskaya) and 111-19-81 (Jonkheer van Tets, open pollination), and from open pollination of early ripening varieties Niva, Asya, Viksne.

In the families №№ 2041, 2047 and 2049 (one or both parents - late-ripening varieties), most of resulting seedlings were medium-ripening, and no early-ripening ones were found. The use in breeding work of medium-ripening varieties and forms has led to the offspring with different ripening terms. However, no late-ripening seedlings were found in progeny of early-ripening varieties and forms, as well as no early-ripening seedlings - in progenies of late-ripening parents.

In progenies from crossing of two albino parental forms 1044-20-80 × Bayana, all hybrids had white berries. Most of the seedlings from open pollination of cv Roza (pink berries) had pink berries too, and individual plants had white and red berries. A very wide range of berry coloration was observed among the seedlings from open pollination of cv Viksne (berries - dark cherry color) - white, red (light red and dark red), cherry and dark cherry (though, no seedlings with pink berries were detected). The only red color of berries (different tints) was observed in seedlings obtained from open pollination of varieties Asya, Niva, Vika and in families resulting the crosses of parental forms with red berries (№№ 1895, 2003, 2007, 2047, 2049).

In the 4th vegetation season (2009), all the seedlings in families Valentinovka × Osipovskaya and from open pollination of cv Bayana started fructification, and in approximately one quarter of the seedlings (respectively, 23,1 and 22,2%) berry yield was estimated as 4 and 5 (Table 2). The greater number of highly productive seedlings was observed in the families №№ 2007 (Niva × 111-19-81), 2064 (Viksne, open pollination) - 16,7%, 2052 (Belka, open pollination) - 15,4%, 2003 (Asya × 1368-12-57) - 14,3%. In some families, no highly-yielding seedlings were found (1044-20-80 × Bayana; 79-1-89 × 1439-23-139; Niva, open pollination; Roza, open pollination).

2. The output of seedlings with economically valuable characteristics in red currant breeding families depending on their origin (All-Russia Research and Development Institute of Fruit Crop Selection, Orel province, 2009)

Number of a family	Origin	Number of seedlings, pcs.	Proportion of seedlings, %					
			evaluation of fructification (grade)		long clusters (> 10 cm)	large berries	sweet berries	selected
			0	4-5				
1895	44-5-30 × 1368-12-57	16	6,2	6,2	13,3	93,3	0	6,2
2003	Asya × 1368-12-57	17	14,3	14,3	16,7	50,0	16,7	14,3
2007	Niva × 111-19-81	16	16,7	16,7	0	40,0	0	16,7
2039	Valentinovka × Osipovskaya	23	0	23,1	41,7	46,2	0	30,8
2041	1044-20-80 × Bayana	22	16,7	0	0	0	75,0	16,7
2047	79-1-89 × 1439-23-139	31	28,6	0	16,7	16,7	16,7	0
2049	Orlovskaya zvezda × 1440-25-37	18	11,1	5,6	6,2	37,5	15,4	11,1
2059	Asya (open pollination)	36	31,2	6,2	0	50,0	0	6,2
2060	Niva (open pollination)	54	7,4	0	14,0	41,2	15,7	11,1
2064	Viksne (open pollination)	30	10,0	16,7	4,2	16,0	24,0	10,0
2052	Belka (open pollination)	27	23,1	15,4	0	14,3	0	0
2062	Roza (open pollination)	40	50,0	0	0	10,5	23,8	0
2063	Vika (open pollination)	32	26,1	13,0	17,6	41,2	29,4	18,2
2054	Bayana (open pollination)	29	0	22,2	22,2	33,3	22,2	11,1
2066	JeLS 68-3-134 (open pollination)	24	20,8	4,2	21,0	27,8	10,5	4,2

A maximum sterile seedling was detected in the family from open pollination of cv Roza.

The highest proportion of seedlings with berry clusters longer than 10 cm were observed in the combination Valentinovka × Osipovskaya and in families from open pollination of varieties Bayana end JeLS 68-3-134 (descendants of polyanthous species *R. multiflorum* Kit.). The long-cluster seedlings were absent in five of the 15 studied families.

The largest size of berries was found in seedlings the combination 44-5-30 × 1368-12-57 (93,3%), whose maternal form was used as a source of large berry size, father – the inbred seedling I_2 of the large-fruited variety Jonkheer van Tets. The greatest number of large-fruited seedlings was demonstrated by the families Asya × 1368-12-57, Asya (open pollination) - 50,0%, Valentinovka × Osipovskaya - 46,2%. The only combination 1044-20-80 × Bayana revealed no seedlings with large berries.

The best taste of berries (sweet and sour-sweet) was demonstrated by 10 of the 15 studied families. The highest number of such seedlings was given by the combination 1044-20-80 × Bayana (75,0%), about 30% were obtained from open pollination of Vika and more than 20% - Viksne, Roza and Bayana.

Hybridological analysis of progenies has revealed the most valuable combination of crosses for the complex of desired features - Valentinovka × Osipovskaya, whose seedlings (30,8%) exhibited high productivity, long clusters and large berry size. A somewhat smaller proportion (14,3-18,2%) of large-fruited seedlings with sweet and sour berries and long clusters has been found in families from the cross Asya × 1368-12-57 and the open pollination of Vika. In combination Niva × 111-19-81, the selection was carried out for large berry size, in combination 1044-20-80 × Bayana - for dessert taste of berries. The valuable seedling with several fairly high indices of productivity, taste and nutritional quality of berries has been isolated from the family № 2003 (Asya × 1368-12-57).

Thus, breeding work upon red currant frequently results in obtaining of seedlings with medium term of ripening, as they use to be split off in progenies of varieties and forms with early, medium and late ripening. The greatest number of seedlings with long clusters was observed in progenies of polyanthous species. The outstanding large size of berries was observed in the combination 44-5-30 × 1368-12-57, whose mother form was a source of large berry size, father – the inbred seedling I_2 of a large-fruited variety Jonkheer van Tets. The group of seedlings with sweet berries was mainly represented by forms with sour-sweet taste of berries; individual seedlings with sweet berries can be used as a valuable source material.

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