



DESSERT CULTIVARS OF BLACKCURRANT – A NEW BREEDING AIM AT THE RESEARCH INSTITUTE OF POMOLOGY AND FLORICULTURE IN SKIERNIEWICE.



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INTRODUCTION

Why dessert cultivars of blackcurrant?

- **Blackcurrant** (*Ribes nigrum* L.) is one of the small fruit crops easily grown commercially worldwide
- **Blackcurrant fruits** are regarded as having considerable health benefits, due to high level of vitamin C (ascorbic acid) and phenolics, including flavonoids such as anthocyanins and other compounds
- Breeding technology allows to receive high quality **dessert fruits of blackcurrant**, which are very suitable for fresh consumption
- Growing of **dessert type of blackcurrants** in EU countries, eg. (Holland, Belgium, Germany) and Switzerland has been under development. Also in Poland some interest of this kind of production has recently been observed.



Fruit Quality Parameters:

- **Ascorbic acid** (vit. C)
- **Anthocyanins and other phenolics**
- **Sensory components** (appearance, size/weight, taste, flavor, aroma, smell, ect.)

**High content of anthocyanins and other phenolics as well as ascorbic acid in fresh blackcurrant fruit
=
HIGH ANTIOXIDANT CAPACITY**

Antioxidant capacity

[$\mu\text{mol TEAC/gram}$]

blackcurrant	14 - 50
blueberry	20 - 45
raspberry	13 - 22
strawberry	9 - 18
plum	9.5
orange	7.5
grape	7.4 - 18
apple	2.2
red wine	10 - 18
white wine	2 - 5

Dessert type blackcurrants for fresh Market

- Enhance the fresh fruit market
- Enrich the human diet with healthy fresh fruit
- Allow the grower to introduce innovative blackcurrant production technology
- Increase profitability of blackcurrant productivity
- **Cultural practices** – e.g. open field and protected cultivation on wires etc.
- **Desired fruit traits:**
 - ✓ Large berries preferred (1,5 g or more) on long strigs,
 - ✓ Green strigs preferred
 - ✓ High fruit quality (ascorbic acid, anthocyanins, others)
 - ✓ Uniform fruit ripening
 - ✓ Easy hand picked on strig



JUSTIFICATION OF STUDIES

- As a good example of blackcurrant cultivars fulfilling the requirements of dessert fruits can be listed: Scottish cv. 'Ben Sarek' and Polish 'Bona' as well as few Ukrainian cultivars such as 'Czereszniowa', 'Sjuta Kijewskaja' and Sanjuta
- At RIPF in Skierniewice, Poland the breeding program oriented at receiving of high dessert fruit quality for fresh consumption it has been carried out for several years

BREEDING RESEARCH OBJECTIVES

Provide information on breeding value based on General Combining Ability (GCA) effects of six genotypes which could be used in the efficient breeding program aimed at developing **dessert type of blackcurrant cultivars**.

PLANT MATERIAL

Seedlings resulting from 6 x 6 half-diallel complete design Griffing's method 4, (15 F₁ full-sib families — 720 seedlings)

♀ \ ♂	♂	BONA	BEN SAREK	LENTAJ	STORKLAS	SCRI C2/15/40	CZERESZNIE WA
BONA			X	X	X	X	X
BEN SAREK				X	X	X	X
LENTAJ					X	X	X
SCRI C2/15/40						X	X
CZERESZNIE WA							X

GENOTYPES CROSSED:
(Six cultivars were crossed)



1. BONA
(PL)



2. BEN SAREK
(U.K.)



3. LENTAJ
(RUS)

GENOTYPES CROSSED:
(Six cultivars were crossed)



4. STORKLAS
(S)



5. SCRI C2/15/40
'BIG BEN'
(UK)

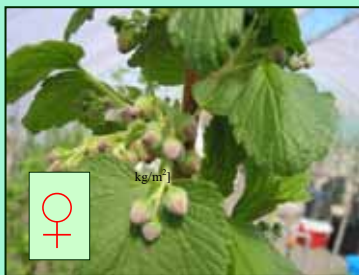


6. CZERESZNIEWA
(UA)

Crossing program – plastic tunnel (spring – 1996)



Crossing of parental forms; e.g.:



'BONA'

X



'BIG BEN'

Production of seedlings in the glasshouse (January 15 - May 30, 1997)



Seedlings in the field at the Experimental Station of RIFP Skierniewice.



Spring - 1997



Summer -2000

Collecting results – fruit harvesting

15 July, 2001



INVESTIGATED TRAITS: 2000 - 2003

- Fruit yield [*kg/plant*]
- Fruit size [*weight of 100 berries in g*]
- Field resistance to American powdery mildew (*Sphaerotheca mors-uvae*) [*ranking scale 1-5*]
- Field resistance to leaf spot (*Drapenopezizia ribis*) [*ranking scale 1-5*]
- Field resistance to white pine blister rust (*Cronatrium ribicola*) [*ranking scale 1-5*]
Ranking scale 1-5; 1 –no symptoms, 5 – very severe symptoms

Taste and aroma (only on the selected clones with good productive value) – evaluated by 5 persons

Analysis of variance of combining ability of selected traits in blackcurrant diallel-cross design (averaged 2000-2003)

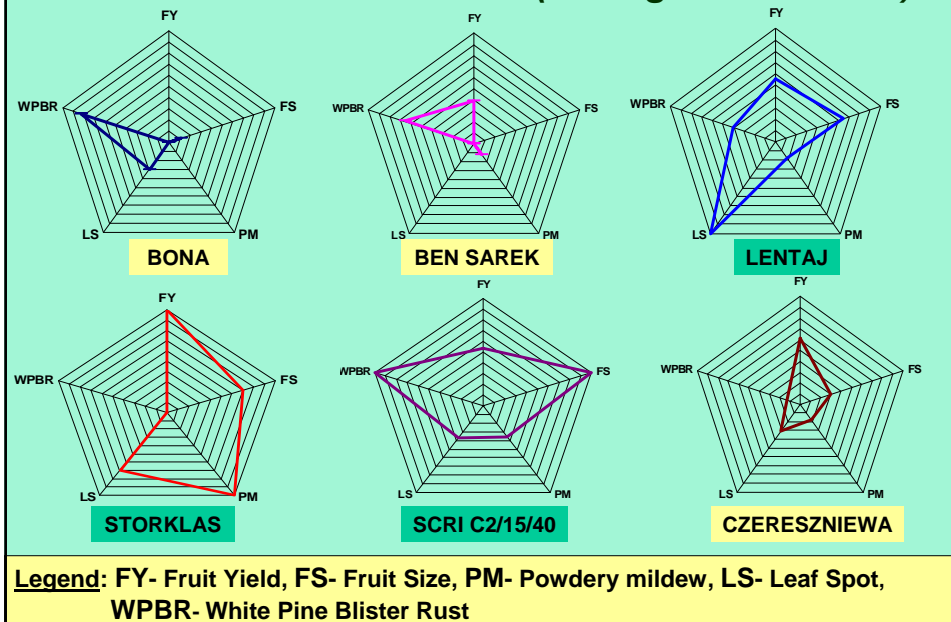
Source of variation	df	Mean squares (S ²)				
		Fruit yield	Fruit size	Field resistance to fungal diseases		
				Powdery mildew	Leaf spot	WPBR
GCA	5	0,368**	449,9**	0,058**	0,320**	0,676**
SCA	9	0,298**	181,6**	0,076**	0,128**	0,576**
Error	42	0,080	42,8	0,006	0,024	0,005
$\frac{S_{GCA}^2}{S_{SCA}^2}$		0,55	0,71	0,43	0,71	0,54

** - significant at the level $\alpha=0,05$

Estimates of GCA effects of six blackcurrant cultivars for selected traits (averaged 2000-2003)

Cultivar	Fruit yield	Fruit size	Field resistance to fungal diseases		
			Powdery mildew	Leaf spot	WPBR
Bona	-0,24*	-4,92*	0,05*	0,06	-0,17*
Ben Sarek	-0,06	-6,68*	0,03	0,18*	0,18*
Lentaj	0,02	2,70	0,02	-0,22*	-0,22*
Storklas	0,23*	3,45*	-0,12*	-0,10*	-0,10*
SCRI C2/15/40	0,01	7,74*	-0,01	0,03	0,03
Czereszniwa	0,05	-2,30	0,02	0,06	0,06
$SE(\hat{g}_i) \times 2,77$	0,17	5,01	0,06	0,11	0,06
$SE(\hat{g}_i, g_j) \times 3,11$	0,31	8,74	0,09	0,16	0,09
General mean	0,75	97,4	1,32	3,39	2,28

Estimates of GCA effects of 6 blackcurrant cultivars for selected traits (averaged 2000-2003)



CONCLUSIONS

- Of the tested six genotypes the highest significantly positive GCA effects possess the following cultivars (based on the averaged values for 2000-2003):
 - 'Storklas' – fruit yield
 - 'Big Ben' (SCRI C2/15/40) and 'Storklas' – fruit size
 - 'Storklas' – resistance to American powdery mildew
 - 'Lentaj' and 'Storklas' – resistance to leaf spot
 - 'Big Ben', 'Bona' and 'Ben Sarek' – resistance to WPBR
- For the practical breeding oriented on the studied traits 'Big Ben' (SCRI C2/15/40), 'Storklas' and 'Lentaj' are recommended as the parental forms.

DESSERT TYPE CULTIVARS

- As a good example of blackcurrant cultivars fulfilling the requirements of **dessert fruits** can be listed: Scottish cv. 'Big Ben' and Polish 'Bona', 'Tisel', 'Tines' as well as Ukrainian cvs. 'Czereszniowa', 'Sofijewskaja' and Lithuanian cvs. 'Blizgiai', 'Gagatai', 'Vyciai',
- At RIPF in Skierniewice, Poland the breeding program oriented at receiving of **high dessert fruit quality** for fresh consumption has been carried out since 1997.



NEW CROSSING PROGRAM - 2008 (factorial crossing design)

PARENTAL FORMS	1. CERES	2. FOXENDOWN	3. SANJUTA
1. BONA (PL)	X	X	X
2. BIG BEN (UK)	X	X	X
3. CZERESZNIEWA (UA)	X	X	X
4. KUPLINIAI (LT)	X	X	X
5. GOFERT (PL)	X	X	X
6. DLINNOKISTNAJA (RUS)	X	X	X
7. LENTAJ (LT)	X	X	X
8. TINES (PL)	X	X	X
9. TISEL (PL)	X	X	X
10. SOFIJEWSKAJA (UA)	X	X	X
11. PC-425 (PL)	X	X	X
12. D 13B/11 (PL)	X	X	X
13. ORES (PL)	X	X	X
14. RUBEN (PL)	X	X	X
15. TITANIA (S)	X	X	X

DESSERT TYPE CULTIVARS



BONA



'BIG BEN'
SCRI C2/15/40



CZERESZNIWA

DESSERT TYPE CULTIVARS



KUPOLINIAI



VYCIAI



LENTAJ

DESSERT TYPE CULTIVARS (new Polish)



TISEL



TINES



GOFERT

FURTHER SELECTION WORK



STAGE I. (2008-2013)

- Selection of seedlings and individuals with large fruits and good productive value



STAGE II. (2012-2013)

- Sensory evaluation and internal chemical analysis of fruit of the best breeding clones selected in the stage I.



THANK YOU