Recent situation in the blackcurrant production and breeding in Poland

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Established on January 1st, 2011
by a Decree of the Ministry of Agriculture and Rural Development
by merging

Research Institute of Pomology and Floriculture
Institute of Vegetable Crops

Established in 1951
Established in 1964

Professor Szczepan A. Pieniążek
Professor Emil Chroboczek
EUROPEAN CENTRE
OF HORTICULTURAL RESEARCH
DIVISIONS
ORGANIZATIONAL STRUCTURE

DIRECTOR

RESEARCH COUNCIL

DIVISION OF POMOLOGY
Skierniewice

DIVISION OF VEGETABLE CROPS
Skierniewice

DIVISION OF FLORICULTURE
Skierniewice

DIVISION OF APICULTURE
Puławy

Research Departments

Laboratories

11 4 5 4

19 10 6 2
Researchers and lab technicians

Administration, maintenance staff and field workers

Total 536
BLACKCURRANT – recent situation with fruit production

Commercial plantations with fruit collecting by harvesters
Different types of harvested used in Poland
INTRODUCTION – the blackcurrants

- Big economic importance (1st place in the world in the fruits production, about 30% of the world production of the blackcurrants),

- Great interest in the commercial and amateur cultivation,

- High nutrient and health benefit value of fruits and good usefulness for the processing and freezing industries, as well as for fresh market and consumption

- Construction and production of different types of harvesters in Poland,

- Working out the technology of cultivation and maintaining plantations established for fruit picking by harvests,

- Good weather and soil conditions for blackcurrant growing in Poland.

- Long tradition in the blackcurrant production in Poland
FRUIT PRODUCTION OF BLACKCURRANTS IN POLAND [1000 tones]
Average prices of blackcurrants for growers in Poland in 1996-2012, [Euro/kg]

[Graph showing price fluctuations from 0.21 in 1996 to 1.00 in 2012]
Structure of blackcurrant cultivars

Grown recently on commercial plantations in Poland.
Further development (1)

✓ The present blackcurrant production (acreage and fruit crop) is rather steady because of three reasons:

1. the plantations are getting older and older, so the yield potential of plants is decreasing !!!

2. the reduction (or lack) of effective pesticides for plant protections against the most serious fungal diseases and pests

3. spreading out the main pests and disease, mainly gall mite („big bud”) and Blackcurrant Reversion Virus (BRV)
American powdery mildew 
(*Sphaerotheca mors-uvae*)

Gall mite („big bud“).  
(*Cecidophyopsis ribis*)

Blackcurrant Reversion Virus (BRV)
Further development (2)

✓ The most important matters to be arranged:

- well organized Polish growers (group of growers, production organization - regional or/and on the National level
  
  - National Blackcurrant Grower’s Association was established in April 2012 by the initiative group of growers

- better cooperation between growers and processing/freezing industries resulting in signed contracts on „fair-play” conditions
Further development

- **PROMOTION** needed for increasing the consumption of the valuable blackcurrant products.

- Annual increase of consumption of **only 1 litre** of juice/nectar per person in EU countries could improve the profitability of blackcurrant fruit production in Poland and EU.

- The people/consumers should change their thinking: „**Blackcurrant juice or nectar is pretty expensive, because it is very healthy and beneficial for the health**”.
<table>
<thead>
<tr>
<th>CONUNTRY</th>
<th>Share in fruit crop - 2009 (%)</th>
<th>Acreage (ha)</th>
<th>Crop (t)</th>
<th>Acreage (ha)</th>
<th>Crop (t)</th>
<th>Acreage (ha)</th>
<th>Crop (t)</th>
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</thead>
<tbody>
<tr>
<td>1. Poland</td>
<td>69,8</td>
<td>25 000</td>
<td>125 000</td>
<td>25 000</td>
<td>110 000</td>
<td>25 000</td>
<td>80 000</td>
</tr>
<tr>
<td>2. U.K</td>
<td>8,0</td>
<td>2 300</td>
<td>14 250</td>
<td>2 250</td>
<td>12 300</td>
<td>2 400</td>
<td>10 750</td>
</tr>
<tr>
<td>3. Denmark</td>
<td>4,7</td>
<td>1 600</td>
<td>8 500</td>
<td>1 600</td>
<td>10 900</td>
<td>1 600</td>
<td>8 400</td>
</tr>
<tr>
<td>4. France</td>
<td>5,0</td>
<td>2 000</td>
<td>9 000</td>
<td>2 200</td>
<td>7 500</td>
<td>2 000</td>
<td>7 500</td>
</tr>
<tr>
<td>5. Lithuania</td>
<td>4,5</td>
<td>4 000</td>
<td>8 000</td>
<td>3 500</td>
<td>7 000</td>
<td>3 500</td>
<td>7 000</td>
</tr>
<tr>
<td>6. Germany</td>
<td>3,1</td>
<td>1 100</td>
<td>5 500</td>
<td>1 600</td>
<td>6 000</td>
<td>1 600</td>
<td>4 500</td>
</tr>
<tr>
<td>7. Holland</td>
<td>1,7</td>
<td>450</td>
<td>3 000</td>
<td>470</td>
<td>2 800</td>
<td>420</td>
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<td>8. Finland</td>
<td>1,1</td>
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<td>1 730</td>
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<td>9. Hungary</td>
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<td>1 200</td>
<td>350</td>
<td>1 200</td>
<td>300</td>
<td>900</td>
</tr>
<tr>
<td>10. Sweden</td>
<td>0,7</td>
<td>300</td>
<td>1 200</td>
<td>300</td>
<td>700</td>
<td>300</td>
<td>1 000</td>
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<tr>
<td>11. Latvia</td>
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<td>648</td>
<td>318</td>
<td>848</td>
<td>301</td>
<td>878</td>
<td>351</td>
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<tr>
<td>12. Estonia</td>
<td>0,2</td>
<td>300</td>
<td>350</td>
<td>350</td>
<td>400</td>
<td>420</td>
<td>200</td>
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<tr>
<td>13. Norway</td>
<td>0,4</td>
<td>150</td>
<td>700</td>
<td>160</td>
<td>320</td>
<td>160</td>
<td>520</td>
</tr>
</tbody>
</table>

| UE TOTAL   | 100                           | 38 710       | 156 150  | 39 510       | 166 600  | 39 350       | 125 270  |
Acreage and fruit crop of blackcurrants in selected worlds’ countries in 2009-2011, according to IBA data

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
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<tbody>
<tr>
<td></td>
<td>Acreage (ha)</td>
<td>Crop (t)</td>
<td>Acreage (ha)</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1 600</td>
<td>6 500</td>
<td>1 600</td>
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<tr>
<td>Australia</td>
<td>78</td>
<td>496</td>
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<td>China</td>
<td>4 000</td>
<td>14 500</td>
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<tr>
<td>Canada</td>
<td>140</td>
<td>650</td>
<td>140</td>
</tr>
<tr>
<td>USA</td>
<td>85</td>
<td>175</td>
<td>100</td>
</tr>
<tr>
<td>UKRAINE</td>
<td>-</td>
<td>-</td>
<td>5 200</td>
</tr>
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</table>

IBA – International Blackcurrant Association; www.internationalblackcurrantassociation.com/
## Acreage and fruit crop of blackcurrants in EU countries in 2012 according to IBA* data

<table>
<thead>
<tr>
<th>CONUNTRY</th>
<th>2012 (Forecast)</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Acreage (ha)</td>
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<tr>
<td>1. Poland</td>
<td>26 000</td>
<td>90 000</td>
</tr>
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<td>2 000</td>
<td>6 500</td>
</tr>
<tr>
<td>5. Lithuania</td>
<td>2 890</td>
<td>6 000</td>
</tr>
<tr>
<td>6. Germany</td>
<td>1 600</td>
<td>4 500</td>
</tr>
<tr>
<td>7. Holland</td>
<td>370</td>
<td>2 100</td>
</tr>
<tr>
<td>8. Finland</td>
<td>1 600</td>
<td>2 500</td>
</tr>
<tr>
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<td>300</td>
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<td>440</td>
<td>250</td>
</tr>
<tr>
<td>13. Norway</td>
<td>160</td>
<td>560</td>
</tr>
<tr>
<td>UE TOTAL</td>
<td>40 538</td>
<td>131 110</td>
</tr>
</tbody>
</table>

**Russia** – no official statistic data available NOW !!!

<table>
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<td>China</td>
<td>3 300</td>
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<tr>
<td>Canada</td>
<td>140</td>
<td>800</td>
</tr>
<tr>
<td>USA</td>
<td>120</td>
<td>300</td>
</tr>
<tr>
<td><strong>UKRAINE</strong></td>
<td>5650</td>
<td>30 000</td>
</tr>
</tbody>
</table>

*IBA* = International Blackcurrant Association
The blackcurrant breeding programme in Poland – Aims and recent achievements

Stan PLUTA
Fruit Breeding Department
Research Institute of Horticulture
SKIERNIEWICE, Poland
E-mail: spluta@insad.pl
FRUIT BREEDING DEPARTMENT  
(2 Laboratories)

1. Genetics and Breeding Laboratory

2. Laboratory of Unconventional Breeding Methods (Biotechnology)

Main activities:

• Genetic, methodological and molecular studies

• Development of new cultivars
The blackcurrant breeding has been carried out at the Fruit Breeding Department, in different facilities:
1. Working „breeding collection (germplasm)
2. High plastic tunnel,
3. Glasshouses
4. Selection fields at the Experimental Station at Dabrowice, near Skierniewice
Traditional cross combination:
   a/ direct hybridization,   b/ interspecific hybridization

Supported by:
   - methodological studies on breeding value (GCA and SCA effects)
     of parental forms, inheritance and variability of selected traits,
   - the molecular biology (in vitro, embryo rescue and DNA fingerprinting,
     markers, MAS – Marker Assisted Selection – in the nearest future)

2. Mutation (small scale in the past)
Crossing programs – under cover
Hybridization – traditional cross combination

Blackcurrant (*Ribes nigrum* L.):

Blackcurrant (*Ribes nigrum* L.):
Interspecific hybridization

Blackcurrant (Ribes nigrum L.):

GOOSEBERRY (Ribes grossularia)

RED CURRANT (Ribes rubrum)

R. sanguineum
Aims and breeding efforts

Breeding for resistance

to main pests and diseases, including gall mite, BRV and fungal diseases

Breeding for fruit quality

and suitability for processing and freezing as well as fresh market

Good adaptation

to local environmental conditions (winter hardiness, spring frost tolerance, chilling requirements and machine fruit harvest).
Aims and breeding efforts

Breeding for resistance to:
- the most harmful pest - **gall mite** (*Cecidophyopsis ribis* Westw.)
- and **Blackcurrant Reversion Virus** (*BRV*) transmitted by the gall mite (vector) remains a high priority.

5-7 000 mites/buds
GALL MITE

Characteristic symptoms „big buds“
Blackcurrant Reversion Virus (BRV)

Both types of BRV cause the sterility of flowers and consequence reduce yield of blackcurrant plants.
Powdery mildew
(Sphareotheca mors-uvae)

Leafspot
(Drepanopeziza ribis Kleb.)

White Pine Blister Rust
(Cronartium ribicola Fisch.)
Main breeding directions

• Breeding for fruit quality:
  1. Processing and freezing:
     - high content of anthocyanins, ascorbic acids, acidity and soluble solids – Brix and polyphenols)
  2. Fresh market (increasing interest, related to health benefits)
     - large and attractive fruits, long and green strigs, sweet taste, aroma, uniform ripening, good shelf-life,
     - hand picked on strig
     - different cultural practices:
       • open field cultivation
       • protected cropping in the high-tunnels, on wires
Analytical methods

- **Soluble solids content** — by refractometer, according to Polish Standard PN-90/A-75101/02
- **Titratable acidity** — according to Polish Standard PN-90/A-75101/04, expressed as citric acid
- **Anthocyanins** — by pH differential method (Wrolstad, 1976);
- **Ascorbic acid** — by an HPLC method
### DESSERT BLACKCURRANT CULTIVARS

**“NEW FASION or JUST LIFE”**

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Ascorbic Acid Content (mg/100g fresh weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackcurrant</td>
<td>181.0</td>
</tr>
<tr>
<td>Strawberry</td>
<td>58.8</td>
</tr>
<tr>
<td>Orange</td>
<td>53.2</td>
</tr>
<tr>
<td>Lemon</td>
<td>53.0</td>
</tr>
<tr>
<td>Blueberry</td>
<td>37.0</td>
</tr>
<tr>
<td>Grapefruit</td>
<td>34.4</td>
</tr>
<tr>
<td>Raspberry</td>
<td>26.2</td>
</tr>
<tr>
<td>Blackberry</td>
<td>21.0</td>
</tr>
<tr>
<td>Grapes</td>
<td>10.8</td>
</tr>
<tr>
<td>Apricot</td>
<td>10.0</td>
</tr>
<tr>
<td>Sour cherry</td>
<td>10.0</td>
</tr>
<tr>
<td>Plum</td>
<td>9.5</td>
</tr>
<tr>
<td>Bananas</td>
<td>8.7</td>
</tr>
<tr>
<td>Sweet cherry</td>
<td>7.0</td>
</tr>
<tr>
<td>Peach</td>
<td>6.6</td>
</tr>
<tr>
<td>Apple</td>
<td>4.6</td>
</tr>
<tr>
<td>Pear</td>
<td>4.2</td>
</tr>
</tbody>
</table>

Average ascorbic acid (vit. C) content in fruit

**Average ascorbic acid (vit. C) content in fruit (mg/100g fresh weight)**
Progress in increasing of fruit size
(dessert type blackcurrant cultivars)

0.8-1.0 g
Ojebyn, Titania, Ben Alder, Ben Lomond

1.2-1.5 g
Ben Hope, Tines, Ruben Czeresznieva

2.5-3.0 g
Bona, Big Ben, D 13 B/11
BONA (1,8 g)
CZERESZNIEWSA (1,4 g)
D 13B/11 (2,4 g)
ADVENTAGES OF BLACKCURRANT FRESH FRUIT PRODUCTION

CONSUMERS

- Enhancing the fresh fruit market
- Enriching the human diet in a very healthy fresh fruit

FRUIT GROWERS

- Increasing profitability of blackcurrant production
- Allowing the growers to introduce innovative technology of blackcurrant production (open field, protected cultivation, off season production)
ACHIVMENTS

25 YEARS OF BREEDING
(1986-2011)
The Research Institute of Pomology and Floriculture (since 2011 Research Institute of Horticulture) in Skierniewice, Poland is the main centre of top and small fruits breeding, including blackcurrant (*Ribes nigrum* L.) breeding programme

| Year of staring the breeding programme | 1986 - |
| Who finances the breeding              | Government |
| How many crosses are done per year     | 60-80 |
| How many seedlings are produced a year  | 5,000-10,000 |
| How many seedlings have been under evaluation in the selection fields for 25 years | >105,500 |
| How many advanced clones were selected during last five years | 70 |
| How many genotypes/cultivars are maintained in the „working“ breeding collection | 125 |
| How many new cultivars have been in the final evaluation | 2 (‘Polares’ and ‘Tihope’) |
| Name of cultivars which were released and registered in Poland or UE | ‘Tisel’, ‘Tiben’, ‘Ores’, ‘Ruben’, ‘Tines’, ‘Gofert’ |
Blackcurrant cultivars bred at the Research Institute of Horticulture in Skierniewice, Poland

- grown on commercial plantations since:
  - 2000: TISEL, TIBEN
  - 2005: ORES, RUBEN
  - 2010: GOFERT

Plant Breeding Rights on EU territory till 2030
The newest blackcurrant cultivars submitted in 2009 for the final evaluation before registration at the National Research Centre for Cultivar Testing (COBORU)

Breeding clone PC-7/13

'POLARES'

Breeding clone PC-425

'TIHOPE'
‘POLARES’ – late cultivar

- Productive
- Fruits – medium size and small
- Suitable for processing (high content of acidity, anthocyanins and ascorbic acid)
- Resistant to the gall mite, powdery mildew and medium susceptible to WPBR
- The suitability to machine fruit harvest is being under investigation.
‘TIHOPE’ – medium-early cultivar

- Productive
- Fruits – large and medium size
- Suitable for processing and freezing (high content of extract, acidity, and anthocyanins, medium content of ascorbic acid)
- Resistant to the powdery mildew, WPBR, but susceptible to gall mite
- The suitability to machine fruit harvest is being under investigation.
Thank you for your attention