STRAWBERRY AND RASPBERRY PRODUCTION AND RESEARCH IN POLAND

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SUSTAINABLE FRUIT GROWING: FROM PLANT TO PRODUCT
Riga-Dobele, August 22-24, 2012
SMALL FRUIT PRODUCTION IN POLAND (2011 – 500,000 MT)
PRODUCTION OF STRAWBERRIES IN POLAND
MAIN STRAWBERRY GROWING AREA
ACREAGE OF STRAWBERRY PLANTATIONS IN POLAND

Growing area: about 35 000 ha
(Decreased after last winter)

Plantation area: 1.0 – 2.0 ha
(largest plantation over 300 ha, also decreased after last winter)
STRAWBERRY CULTIVARS GROWN IN POLAND

- Senga Sengana: 60%
- Dukat: 10%
- Kent: 7%
- Elsanta: 7%
- Honeoye: 7%
- Others: 6%
STRAWBERRY VARIETIES GROWN IN POLAND

S. SENGANA

HONEOYE
STRAWBERRY VARIETIES GROWN IN POLAND

ELSANTA

MARMOLADA
STRAWBERRY VARIETIES GROWN IN POLAND

KENT

ELKAT
GROWING STRAWBERRIES IN POLAND

TRADITIONAL OPEN FIELD CULTIVATION

PROTECTED CULTIVATION FOR EARLY AND LATE CROP
TRADITIONAL OPEN FIELD CULTIVATION
SENGA SENGANA FOR PROCESSING
TRADITIONAL OPEN FIELD CULTIVATION
CULTIVARS FOR FRESH MARKET
OUT OFF SEASON PRODUCTION
EARLY CROP – FIELD AND HIGH TUNNELS

Perforated plastic film
or fiber cover
OUT OF SEASON PRODUCTION
LATE CROP – OPEN FIELD
CULTIVATION OF EVERBEARING CULTIVARS

Selva
15.08.2007
CULTIVATION OF DAY-NEUTRAL CULTIVARS

SAN ANDREAS – 22.09.2009
DESTINATION OF STRAWBERRIES
(STRAWBERRY MARKET IN POLAND)

- PROCESSING AND FREEZING INDUSTRY (60%)
- FRESH CONSUMPTION (40%)
MAIN PROBLEMS IN STRAWBERRY CULTIVATION

Winter injuries

Verticillium dahliae
WINTER INJURY SYMPTOMS

S. SENGANA

ELSANTA
PRODUCTION OF RASPBERRIES IN POLAND
Average prices of raspberries for processing in Poland (1995-2011)
RASPBERRY PRODUCTION IN POLAND

• Growing area: about 20 000 ha
  Stabile during last 4 years

• Plantation area: 1,0 ha or less – 90 %
  the largest plantation over 300 ha
MAIN RASPBERRY GROWING AREA
RASPBERRY CULTIVARS GROWN (recently planted in Poland)
EXTENDED HARVESTING TIME IN OPEN FIELD IS POSSIBLE

22nd SEPTEMBER, 2009
CULTIVATION METHODS

Open field (more than 95 %, approx.) – most of plantations are managed as free-standing (primocane) or in hedgerow system (floricane). Only some plantations are furnish with irrigation or fertigation system.

Under cover (less than 5 %, approx.) – plastic tunnels or roof type cover. The plants are grown mostly in the ground, bud in some cases in the pots.
FRUIT HARVESTING

Hand picking – about 95 %

Machine harvesting – about 5 %

“Natalia” harvester for primocane cultivars

Selection No 95152
RASPBERRY MARKET

PROCESSING and FREEZING

FRESH MARKET
MAIN PROBLEMS IN RASPBERRY GROWING

RBDV
Crumbly fruit

Resistant cultivars: Willamete, Heritage, Polana
MAIN PROBLEMS IN RASPBERRY CULTIVATION
STRAWBERRY AND RASPBERRY RESEARCH IN POLAND
FRUIT RESEARCH IN POLAND – AGRICULTURAL COLLAGES

- Szczecin
- Bydgoszcz
- Olsztyn
- Poznan
- Lodz
- Warszawa
- Siedlce
- Leipzig
- Dresden
- Wrocław

200 km
FRUIT RESEARCH IN POLAND – AGRICULTURAL UNIVERSITIES
MAIN RESEARCH ACTIVITIES WITH STRAWBERRIES AND RASPBERRIES

- Testing of productive value of new Polish and foreign cultivars
- Extending the harvesting time by using different cultivars and cultural practices
- Evaluation of cold hardiness in artificial conditions
- Development of new methods for testing plant’s susceptibility to verticillium wilt
- Use of micropropagation and embryo rescue techniques
- Breeding new cultivars (breeding research and developing new cultivars)

EUBerry Project
NEW SYSTEMS OF GROWING STRAWBERRIES FOR LATE HARVEST

ELSANTA

GRANDAROSA and PINK ROSA
MAIN BREEDING DIRECTIONS

- Breeding for resistance to pests and diseases,
- Breeding for high fruit quality,
- Breeding for good adaptation to local weather and soil conditions.
# PRODUCTIVITY AND FRUIT QUALITY OF NEW CULTIVARS BRED AT IO

<table>
<thead>
<tr>
<th>Clone / cultivar</th>
<th>Parentage</th>
<th>Marketable yield [g/plot]</th>
<th>Weight of 100 fruits [g]</th>
<th>Firmness [N]</th>
<th>Soluble solids [Brix]</th>
<th>Vit. C content [mg/100 ml]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Honeoye</td>
<td>Standard</td>
<td>5628</td>
<td>720</td>
<td>1.35</td>
<td>7.62</td>
<td>44.5</td>
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<tr>
<td>3. Elsanta</td>
<td>Standard</td>
<td>3188</td>
<td>837</td>
<td>1.47</td>
<td>8.40</td>
<td>62.0</td>
</tr>
<tr>
<td>9. T-03021-12</td>
<td>Granda x Camarosa</td>
<td>7509</td>
<td>1323</td>
<td>2.22</td>
<td>8.50</td>
<td>63.3</td>
</tr>
<tr>
<td>21. T-03066-01</td>
<td>Vikat x Nadina</td>
<td>8611</td>
<td>1068</td>
<td>1.81</td>
<td>8.50</td>
<td>72.8</td>
</tr>
<tr>
<td>28. T-04046-01</td>
<td>Camino Real x Filon</td>
<td>5687</td>
<td>1090</td>
<td>1.78</td>
<td>6.11</td>
<td>54.0</td>
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<tr>
<td>30. T-04048-01</td>
<td>Panon x Vikat</td>
<td>3134</td>
<td>809</td>
<td>3.24</td>
<td>8.34</td>
<td>62.3</td>
</tr>
<tr>
<td>33. T-04052-06</td>
<td>Granda x Sophie</td>
<td>5958</td>
<td>872</td>
<td>2.25</td>
<td>7.56</td>
<td>52.0</td>
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<tr>
<td>40. T-04083-05</td>
<td>Filon x Earlibrite</td>
<td>3825</td>
<td>1034</td>
<td>1.52</td>
<td>8.01</td>
<td>73.3</td>
</tr>
</tbody>
</table>
New raspberry cultivars

**Benefis** – floricane, mead season, for fresh and processing

**Polesie** – primocane, early, for processing

**Polka** – primocane, early, high fruit quality, for fresh and processing

**Laszka** – floricane, early, large fruit, for fresh
EUBerry
Project acronym: EUBerry
Project full title:

„The sustainable improvement of European berry production, quality and nutritional value in a changing environment: Strawberries, Currants, Blackberries, Blueberries and Raspberries”

COORDINATOR – Prof. Dr. Bruno MEZZETTI from Italy

Beginning: 1 May 2011, end: 30 October 2014
WP 2. Improved cultivation techniques

Task 2.1 Cultivation techniques for season extension

Subtask 2.1.1. Controlling plant development for season extension
(v) different plant types including fresh and cold-stored plants

(vii) different light conditions utilizing light-emitting diode (LED) technology

(viii) novel soilless plant propagation method in greenhouse to produce plants for cold-storing
PRIMOCANE FRUITING RASPBERRIES TESTED (for extended harvest)

Polana

Polka

Polesie
MATERIALS AND METHODS

- TYPES OF PLANTS:
  1. root cuttings

- TYPES OF TREATMENTS
  1. fiber cover (17 g/m²)
  2. perforated plastic cover (700 holes per 1 m²)
  3. mowing of emerging young shoots
  4. control
MATERIALS AND METHODS

- The experiment was established in the autumn 2010. Random block design, 4 replications with 5 plants per rep. (20 plants for each treatment), spacing of 0.5 m x 3.75 m.

- In the middle of March 2011 the plants were covered with perforated plastic cover and fiber cover, the covers were removed one month later.

- In the treatment with mowing of emerging young shoots, mowing was done in the middle of May.

- The control plants were neither covered nor moved. The total number of plants in the experiment: 3 genotypes x 4 treatments x 4 reps x 5 plants = 240 plants.
MEASUREMENTS AND OBSERVATIONS

✓ ripening time
✓ yield (kg)
✓ average fruit weight (g)
✓ soluble solid content (TSS) (using a refractometer Rudolph J-157) (BRIX)
✓ ascorbic acid content (using a reflectometer RQ-Easy and Merck test strips) (mg/100 ml)
Old canes are removed

control

perforated plastic cover

mowing of emerging young shoots

fiber cover
control

perforated plastic cover

fiber cover

mowing of emerging young shoots
SEASON EXTENSION OF PRIMOCANE FRUITING RASPBERRIES (DIFFERENT TYPE OF PLANTATION MANAGEMENT)
PRIMOCANE FRUITING RASPBERRIES
DYNAMICS OF YIELDING OF RASPBERRY ‘POLESIE’ IN 2011 (Pomological Orchard, Skierniewice, first year of harvest)
DYNAMICS OF YIELDING OF RASPBERRY ‘POLKA’ IN 2011
(Pomological Orchard, Skierniewice, first year of harvest)
DYNAMICS OF YIELDING OF RASPBERRY ‘POLANA’ IN 2011
(Pomological Orchard, Skierniewice, first year of harvest)
Subtask 2.1.1. Controlling plant development for season extension

(v) different plant types including fresh and cold-stored plants of strawberries

Main objective is to extend the harvesting season of Junebearing strawberries in Poland in the open field conditions through differentiated planting time and enhancing the yielding potential of plants using different type of plant material.
Task 2.2 Ensuring profitable berry production in changing climate

Sub-task 2.2.1 Developing technology to control temperature stress in berry plants

Susceptibility to late spring frost of strawberry and blackcurrant genotypes selected in T1.1 and effectiveness of the mist maker (developed by Finish SME) in reducing frost damages will be evaluated in these experiments.
vii) different light conditions utilizing light-emitting diode (LED) technology

Application of light-emitting diodes (LEDs) as a light source in strawberry production system (under greenhouse conditions) for an evaluation of plant physiology, growth and productivity in response to LED lighting.
THANK YOU FOR YOUR ATTENTION
Examples of expression profiles for some candidate genes involved in plant defense reaction to *Verticillium dahliae*
Description of the work

2010
The field experiment was established on June 1st, 2010, using plants of raspberry cultivar ‘Meeker’ and blackberry cultivar Čačanska Bestrna produced in vitro and propagated by the standard method. The total number of plants in the experiment: 30 blackberry plants from in vitro + 30 blackberry plants from standard production + 12 raspberry plants from in vitro + 15 raspberry plants from standard production = 87 plants.

2011
Trait assessment: physiological properties (leafing onset, flower-cluster development, flowering onset, full blooming, end of flowering, ripening onset, full ripening, end of ripening, period of fruit ripening, duration of growing period), vegetative potential and yield parameters (total number of canes, cane number per row meter, yield per cane, yield per row meter, and the total yield), organoleptic quality (fruit weight, height, width and thickness of fruits, drupelets properties – number within a fruit, heigh, diameter, shape factor and weight of drupelets, fruit colour and chemical parameters of fresh fruit quality – total dry matter, soluble solids, total sugars, inverted sugars, sucrose, total acids, pH value, sugar/acid ratio and total content of pectins and the sensory analysis of fresh fruits – appearance, taste, aroma and consistency of fruits), as well as disease resistance to *Didymella applanata*, *Leptosphaeria rubi*, *Botrytis cinerea* and *Resseliella theobaldi* and winter hardiness, assessment of plant genetic stability (determination of chromosome number, PAGE of isoperoxidases and flow citometry analysis).

2012
Trait assessment for the traits mentioned above. Additionally aromatic compounds of the fruits of raspberry cultivar ‘Meeker’ and blackberry cultivar Čačanska Bestrna will be assessed.