

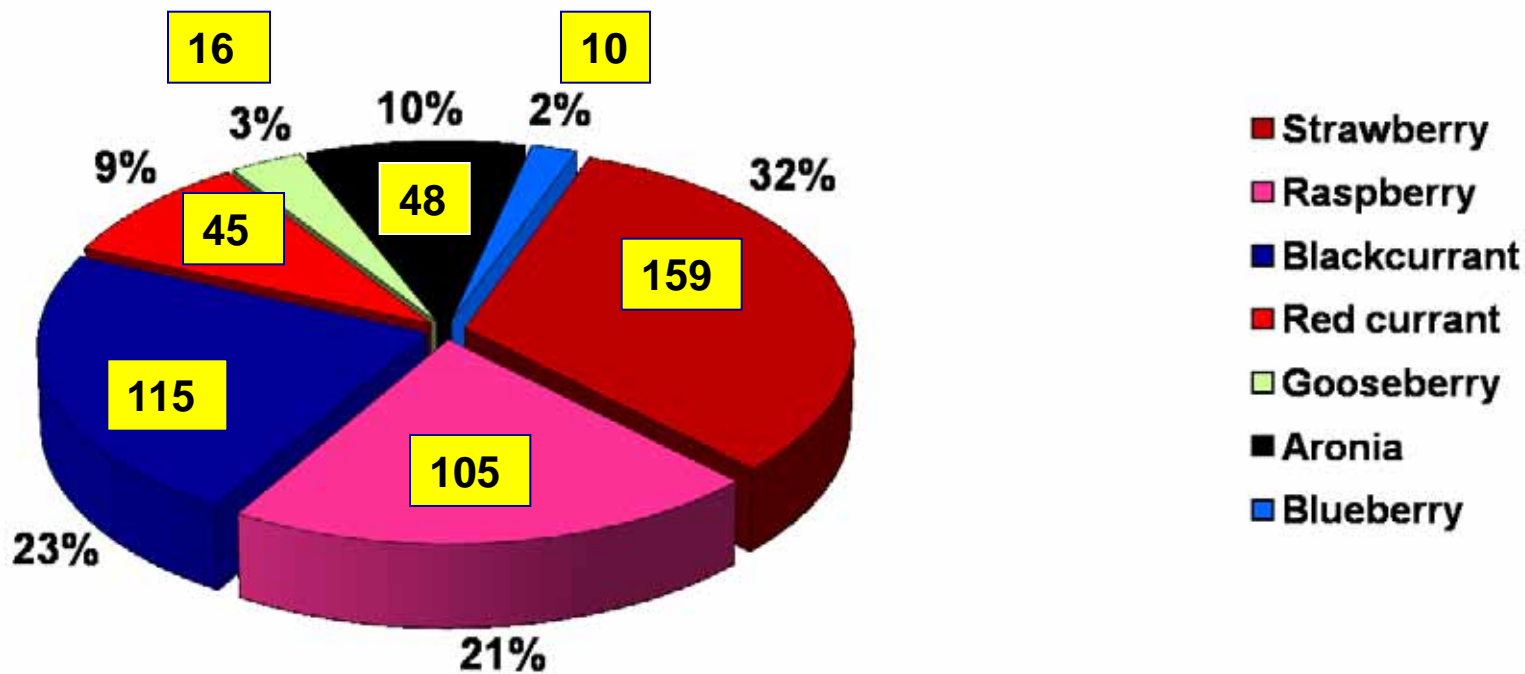
STRAWBERRY AND RASPBERRY PRODUCTION AND RESEARCH IN POLAND

Edward ŻURAWICZ



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



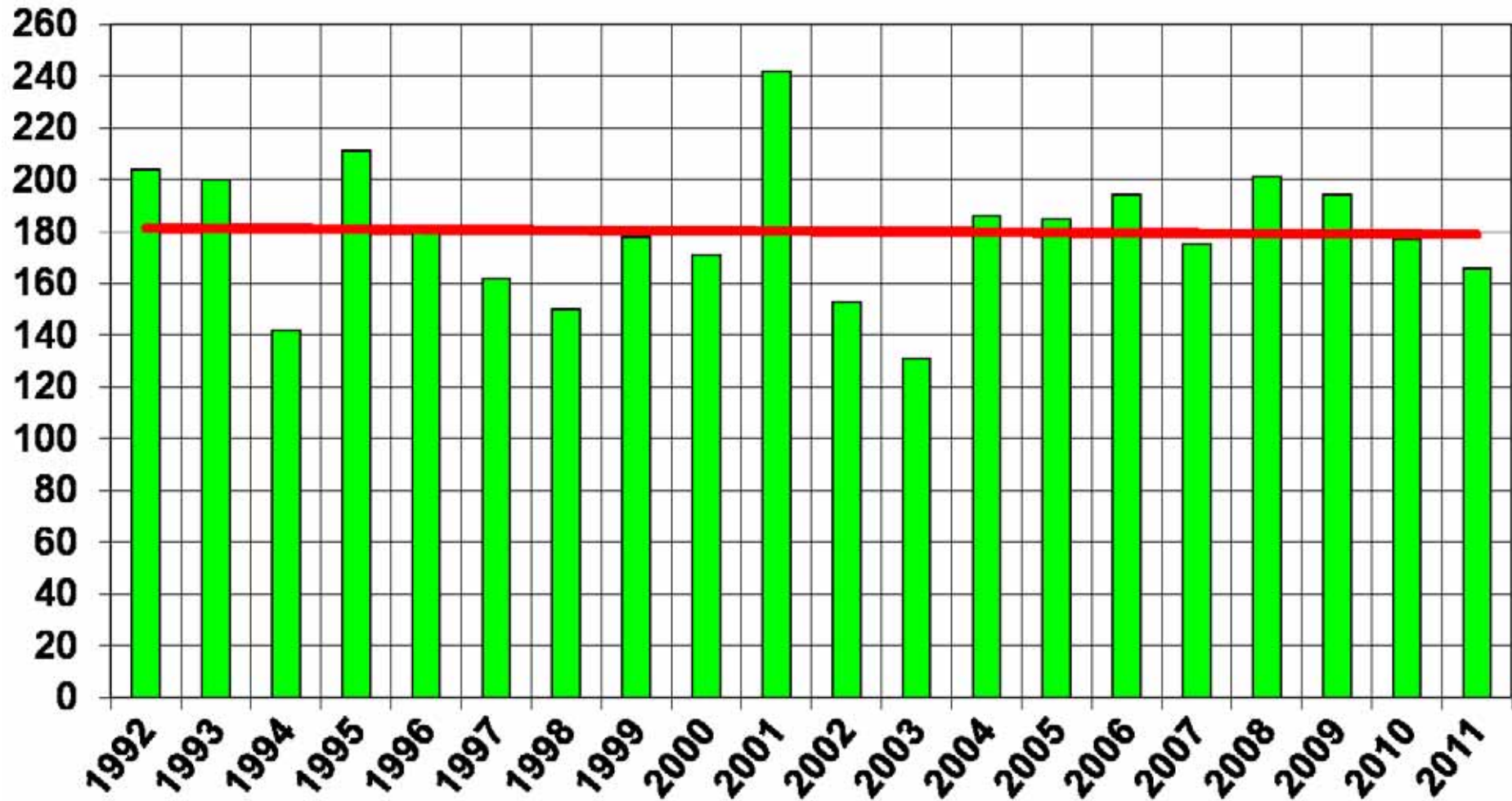
MAIN STRAWBERRY GROWING AREA



STRAWBERRY PRODUCTION IN POLAND



Thousand tonnes

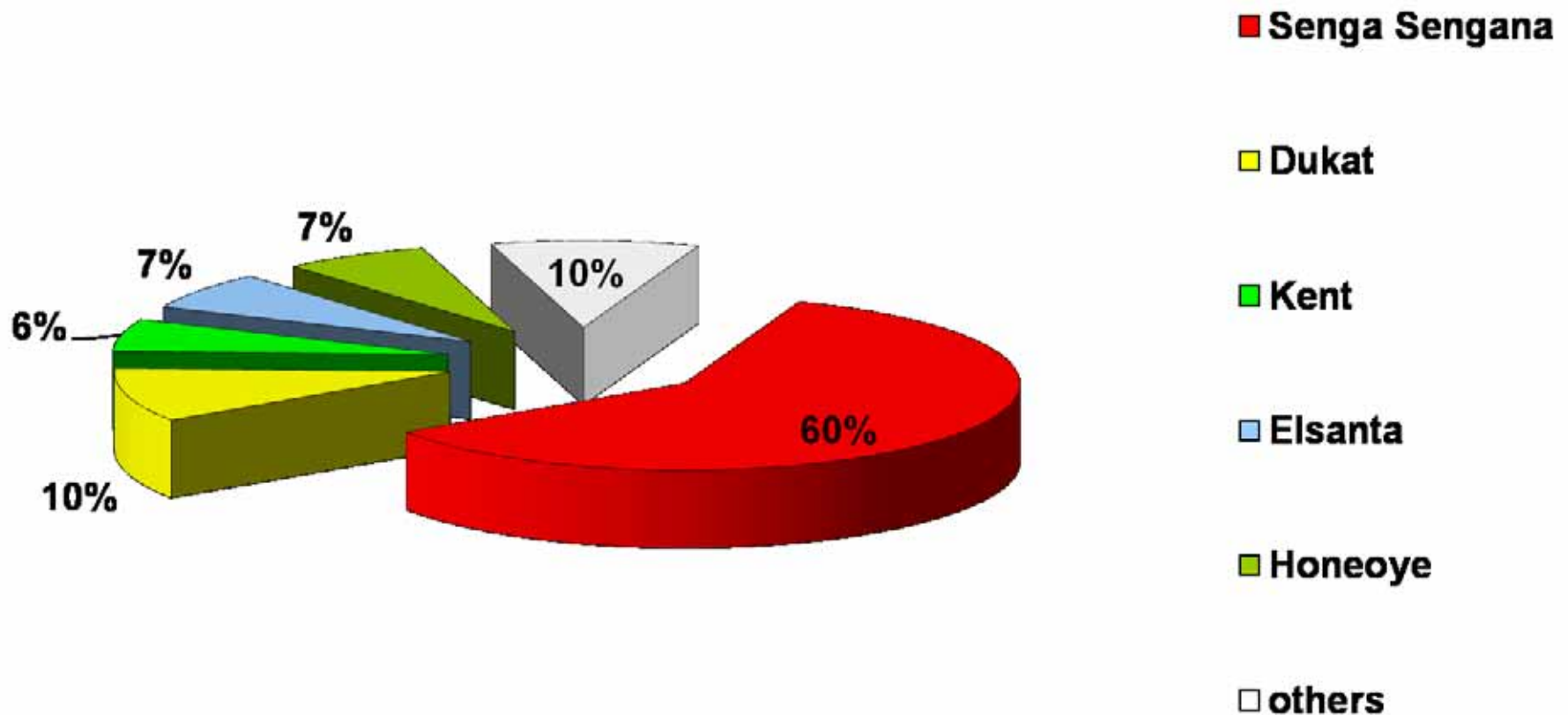


ACREAGE OF STRAWBERRY PLANTATIONS IN POLAND

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



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

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graph TD; A[GROWING STRAWBERRIES IN POLAND] --> B[TRADITIONAL OPEN FIELD CULTIVATION]; A --> C[PROTECTED CULTIVATION FOR EARLY AND LATE CROP];
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**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 OF 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)

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graph TD; A[DESTINATION OF STRAWBERRIES (STRAWBERRY MARKET IN POLAND)] --> B[PROCESSING AND FREEZING INDUSTRY (60%)]; A --> C[FRESH CONSUMPTION (40%)]
```

**PROCESSING AND
FREEZING INDUSTRY**
(60%)

**FRESH
CONSUMPTION**
(40%)

MAIN PROBLEMS IN STRAWBERRY CULTIVATION



Winter injuries



Verticillium dahliae



WINTER INJURY SYMPTOMS



S. SENGANA



ELSANTA

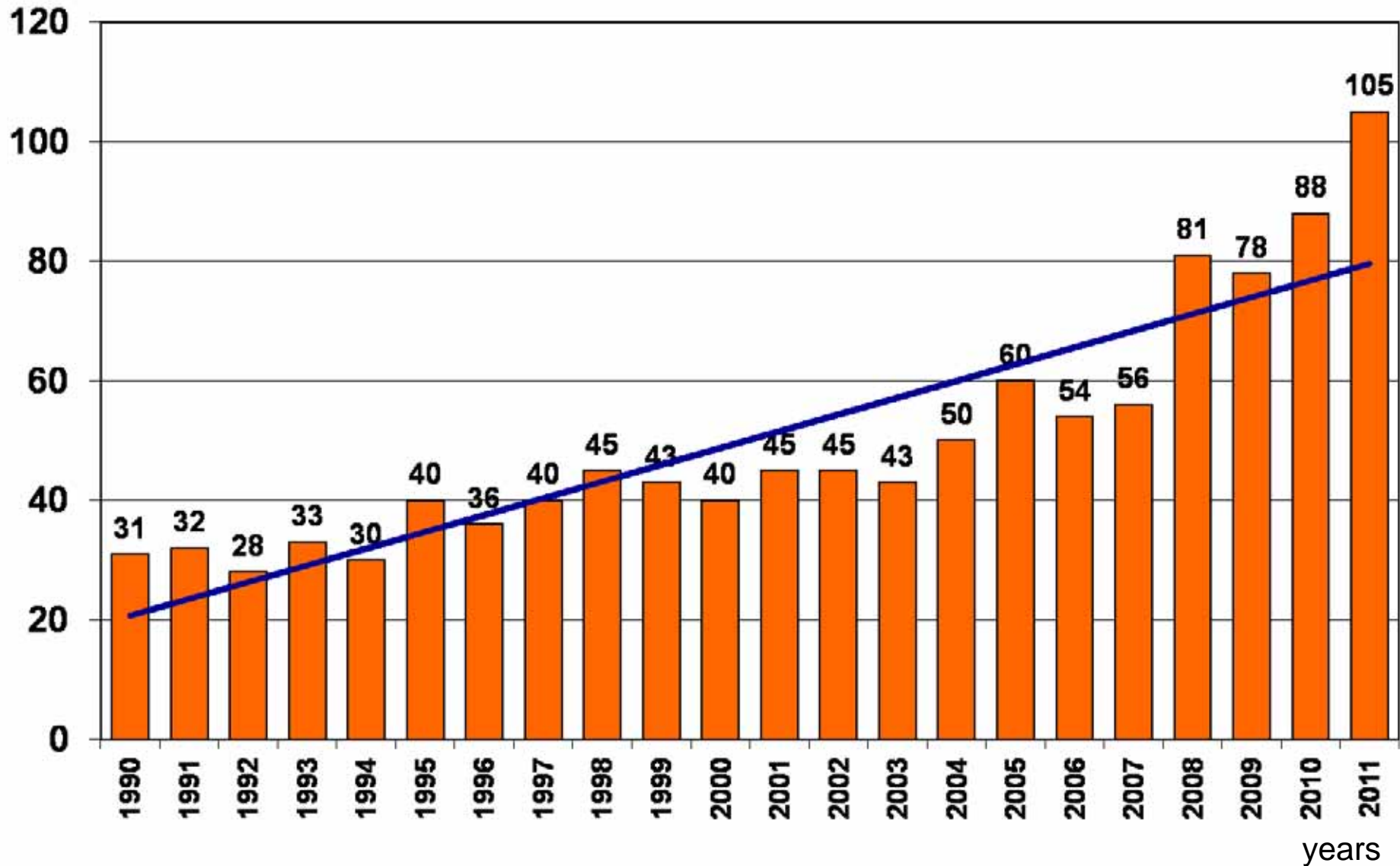


PRODUCTION OF RASPBERRIES IN POLAND

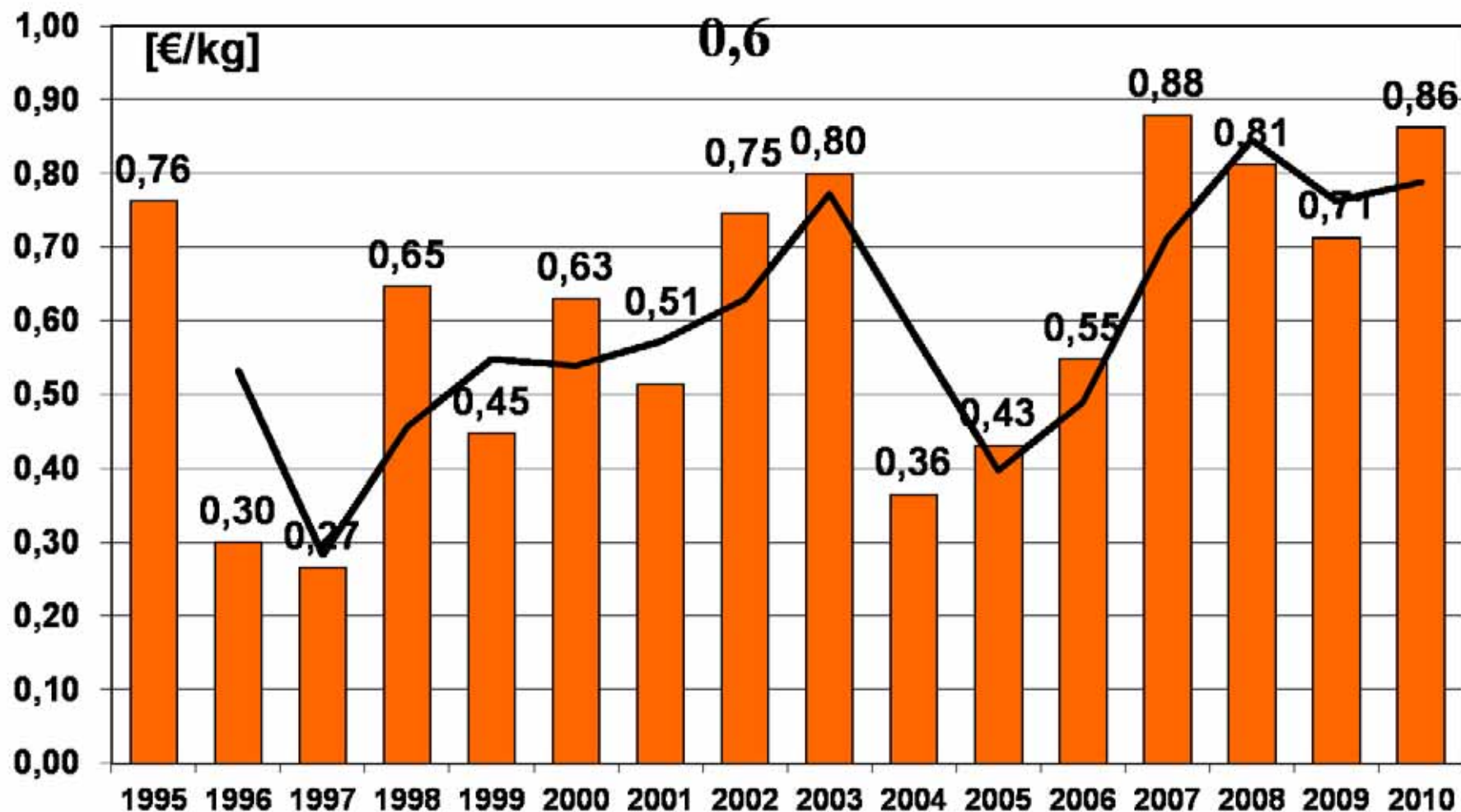


RASPBERRY PRODUCTION IN POLAND (1990-2011)

thousand MT



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

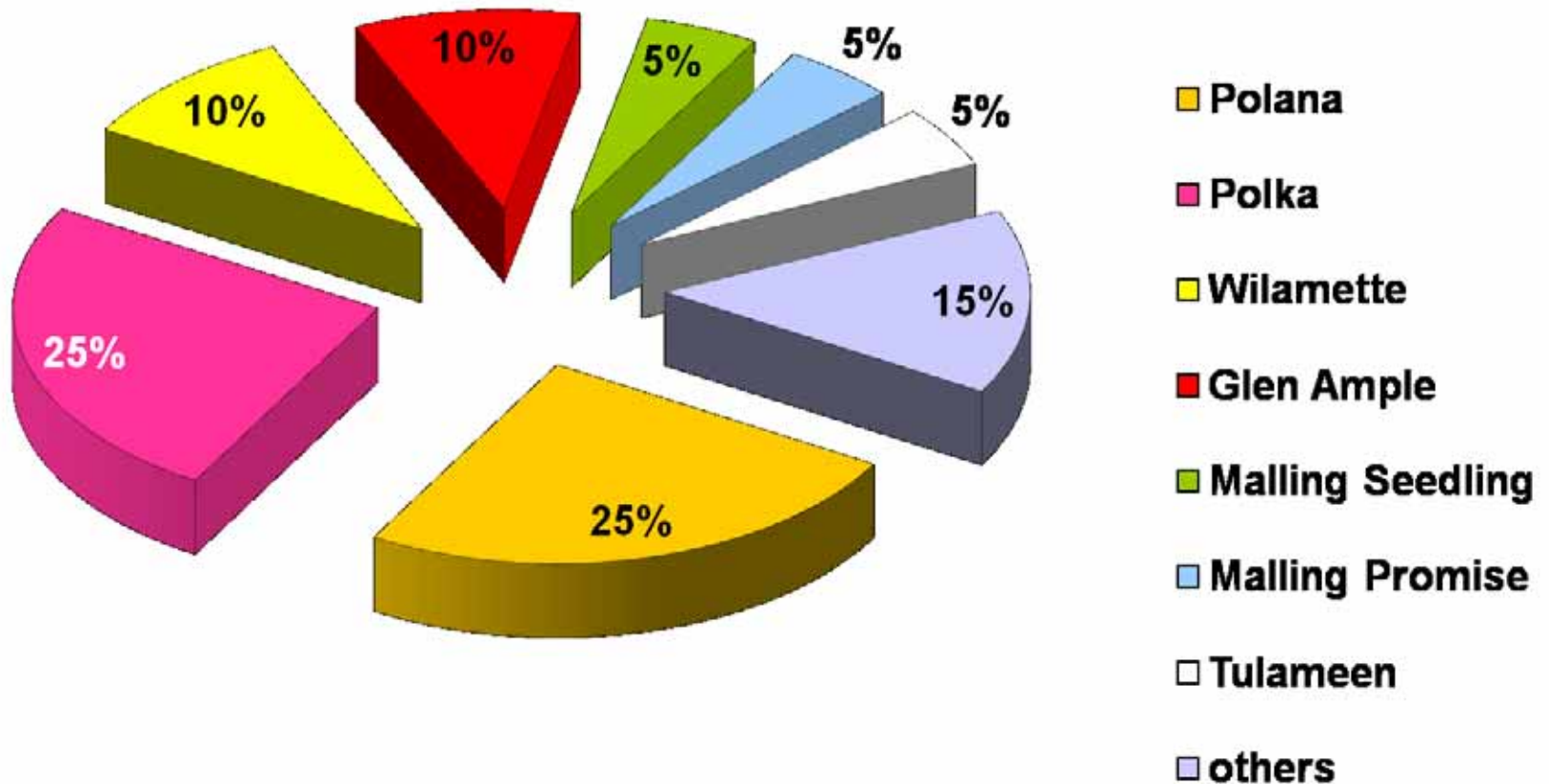
- **Plantation area: 1,0 ha or less – 90 %**
the largest plantation over 300 ha

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, but 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

```
graph TD; A[RASPBERRY MARKET] --> B[PROCESSING and FREEZING]; A --> C[FRESH MARKET];
```

**PROCESSING
and
FREEZING**

**FRESH
MARKET**

MAIN PROBLEMS IN RASPBERRY GROWING

RBDV
Crumbly fruit



Resistant cultivars: Willamete, Heritage, Polana

MAIN PROBLEMS IN RASPBERRY CULTIVATION

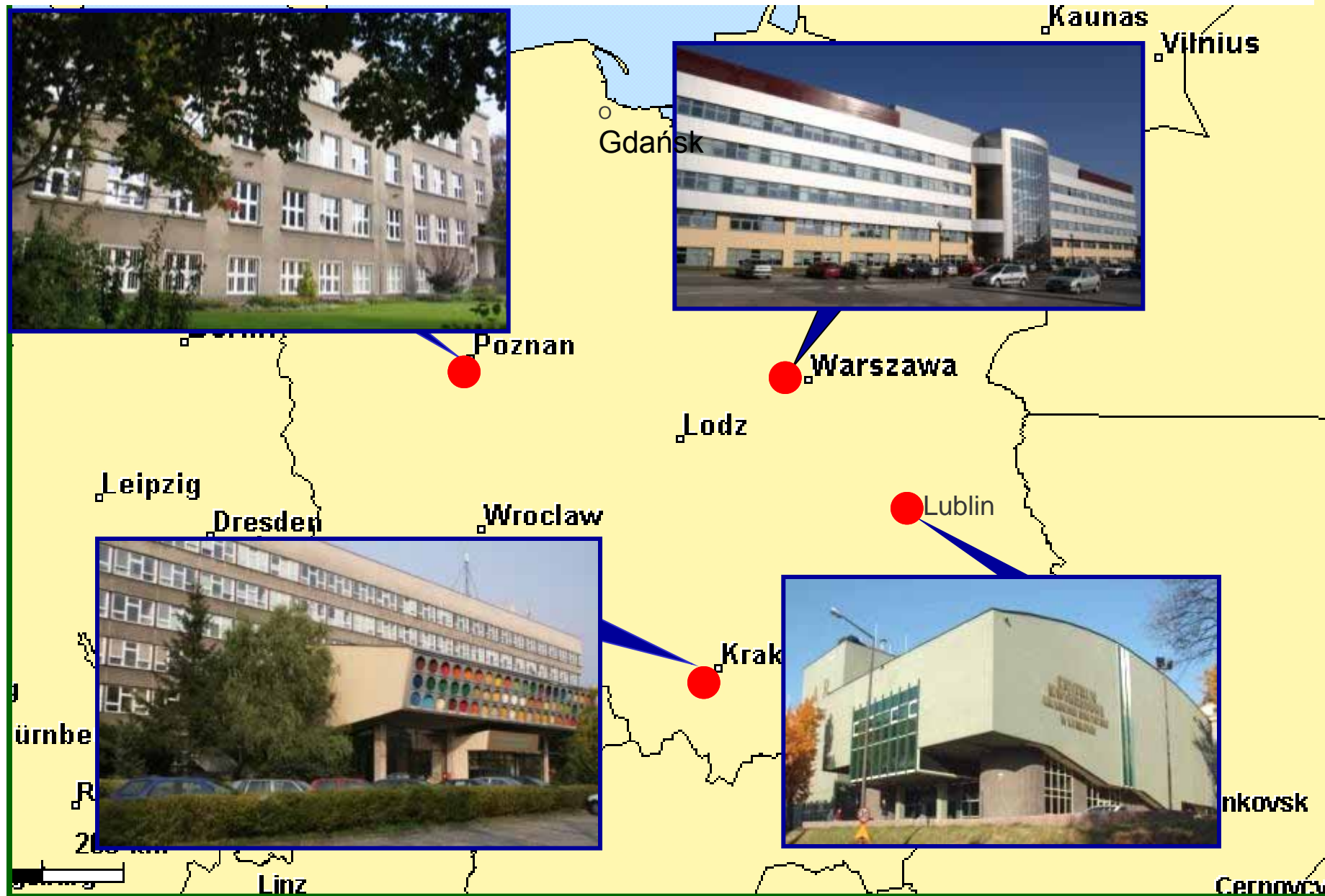


STRAWBERRY AND RASPBERRY RESEARCH IN POLAND

FRUIT RESEARCH IN POLAND – AGRICULTURAL COLLAGES



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**

**Developement 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

	Clone / cultivar	Parentage	Marketable yield [g/plot]	Weight of 100 fruits [g]	Firmness [N]	Soluble solids [Brix]	Vit. C content [mg/100 ml]
1.	Honeoye	Standard	5628	720	1,35	7,62	44,5
3.	Elsanta	Standard	3188	837	1,47	8,40	62,0
9.	T-03021-12	Granda x Camarosa	7509	1323	2,22	8,50	63,3
21.	T-03066-01	Vikat x Nadina	8611	1068	1,81	8,50	72,8
28.	T-04046-01	Camino Real x Filon	5687	1090	1,78	6,11	54,0
30.	T-04048-01	Panon x Vikat	3134	809	3,24	8,34	62,3
33.	T-04052-06	Granda x Sophie	5958	872	2,25	7,56	52,0
40.	T-04083-05	Filon x Earlibrite	3825	1034	1,52	8,01	73,3



New raspberry cultivars

Polesie – primocane, early, for processing



Benefis – floricane, mead season, for fresh and processing



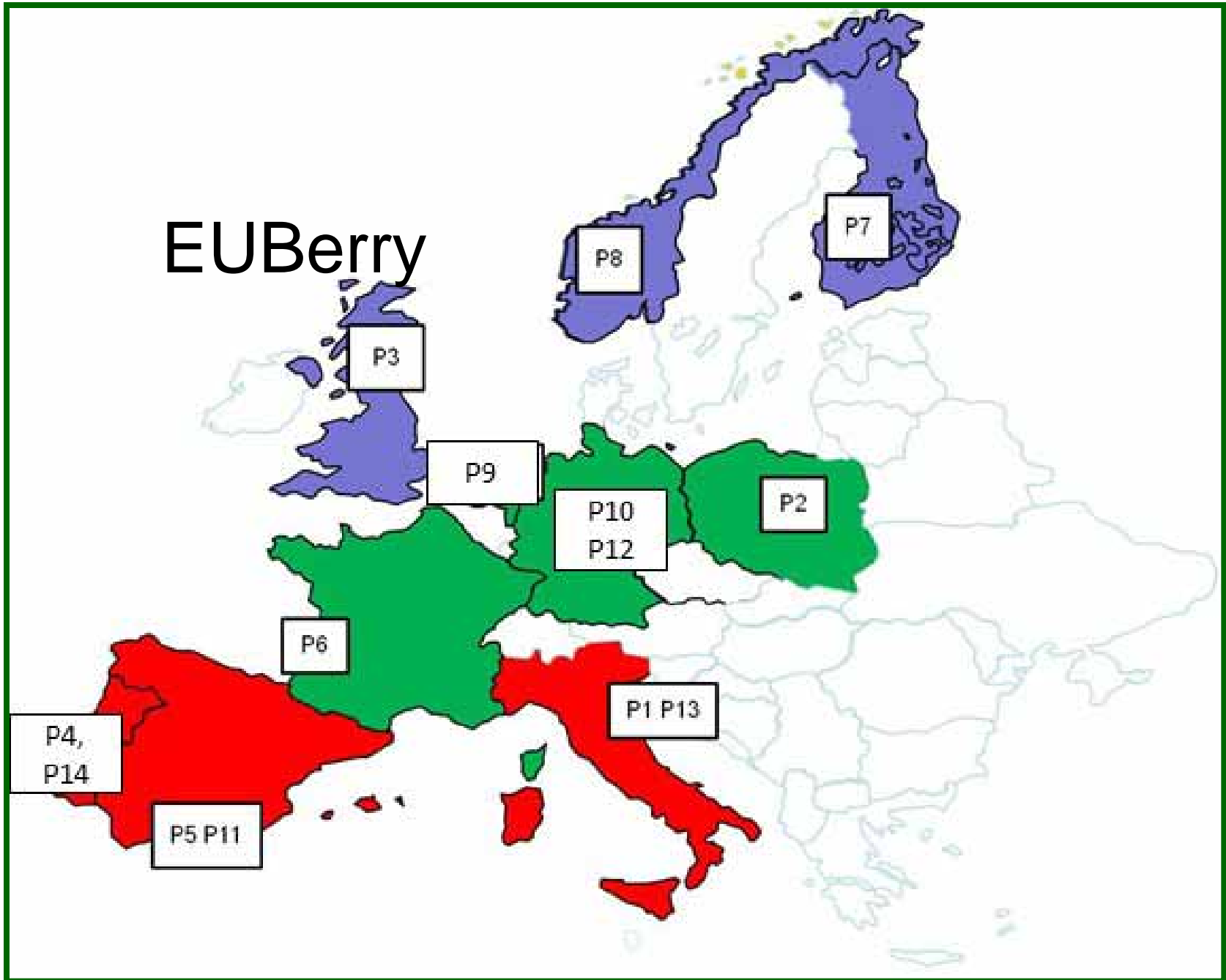
Polka – primocane, early, high fruit quality, for fresh and processing



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

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

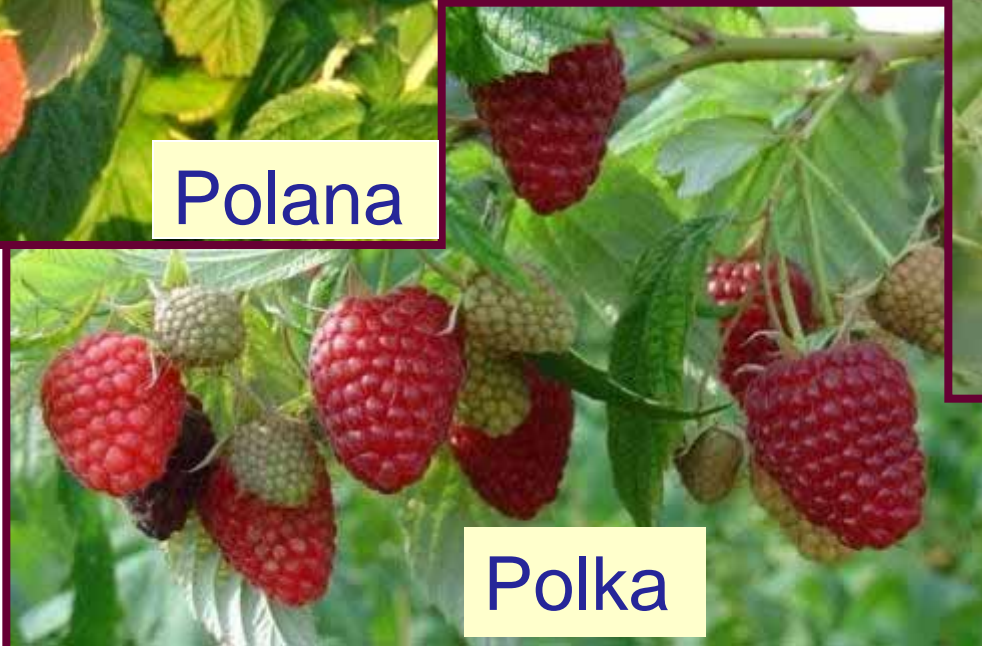
PRIMOCANE FRUITING RASPBERRIES TESTED (for extended harvest)



Polana



Polesie



Polka

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

**mowing of emerging
young shoots**

perforated plastic cover

fiber cover

control



perforated plastic cover



fiber cover



mowing of emerging young shoots



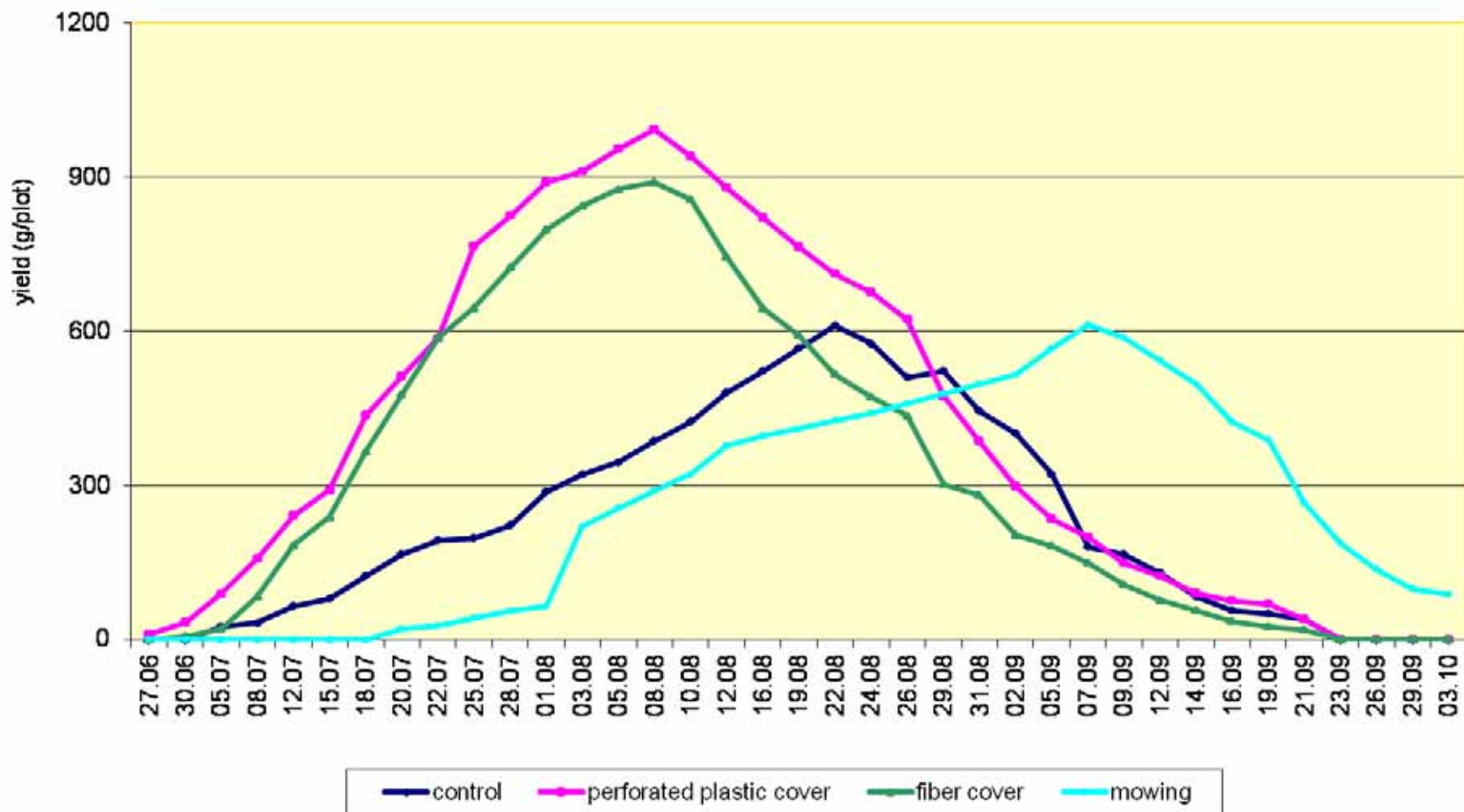
SEASON EXTENSION OF PRIMOCANE FRUITING RASPBERRIES (DIFFERENT TYPE OF PLANTATION MANAGEMENT)



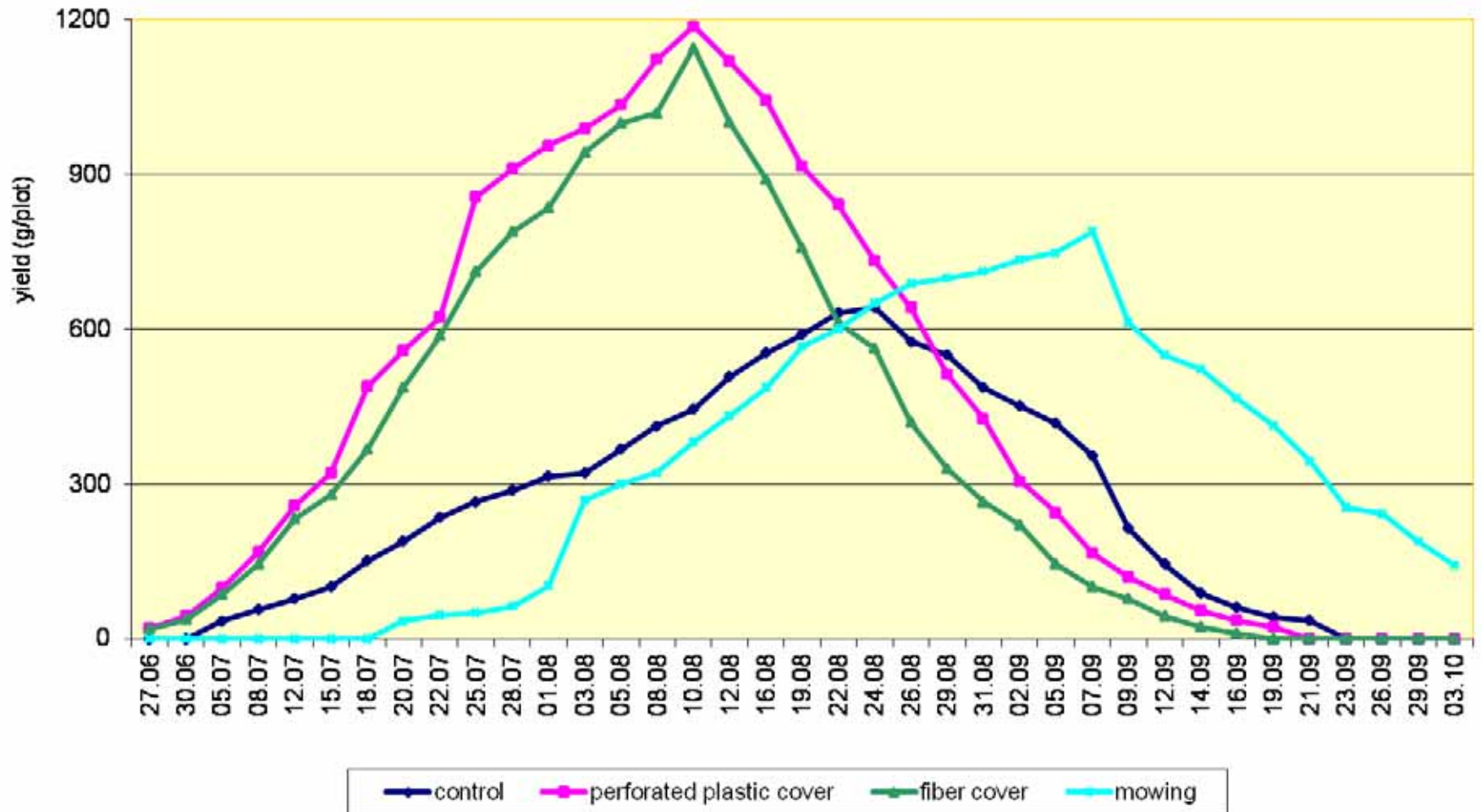
PRIMOCANE FRUITING RASPBERRIES



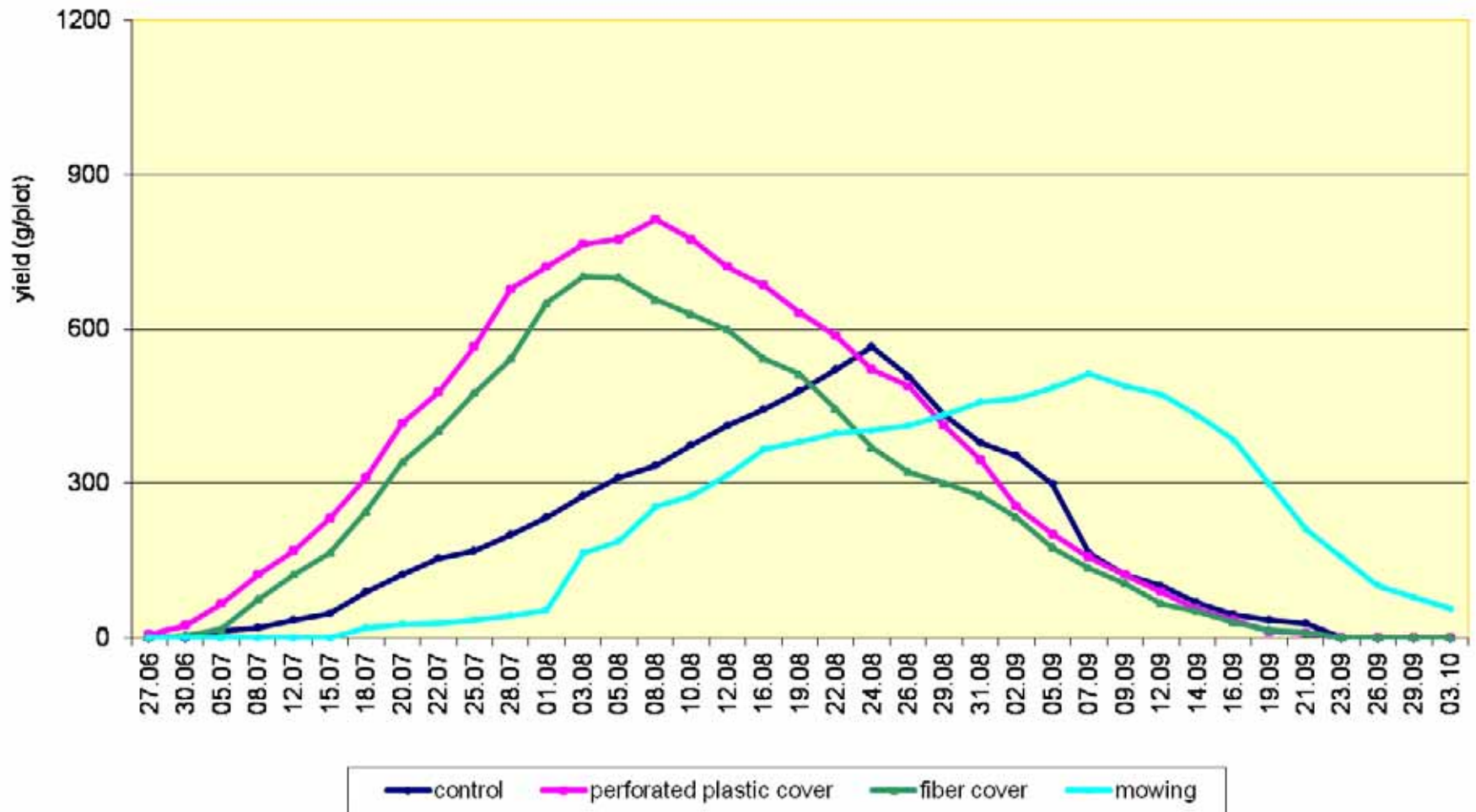
DYNAMICS OF YIELDING OF RASPBERRY 'POLESIE' IN 2011 (Pomological Orchard, Skierniewice, first year of harvest)



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.



Elsanta

Grandarosa

Pink Rosa



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.



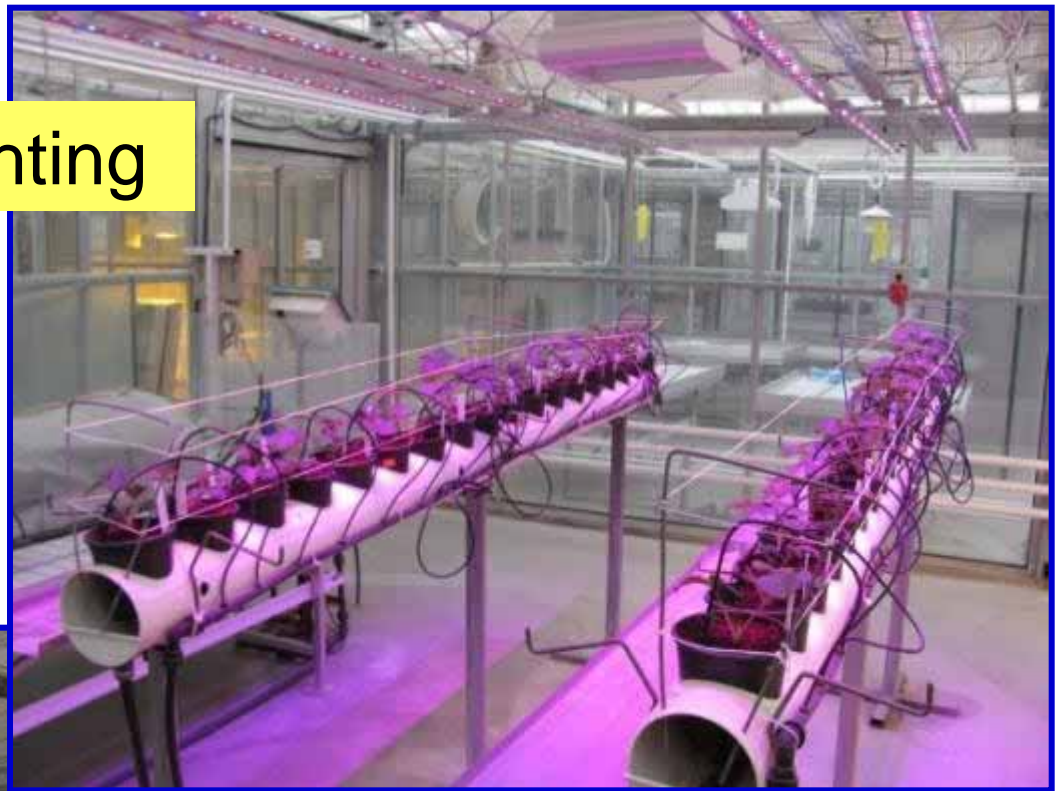
Sub-task 2.1.1. Controlling plant development for season extension

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.



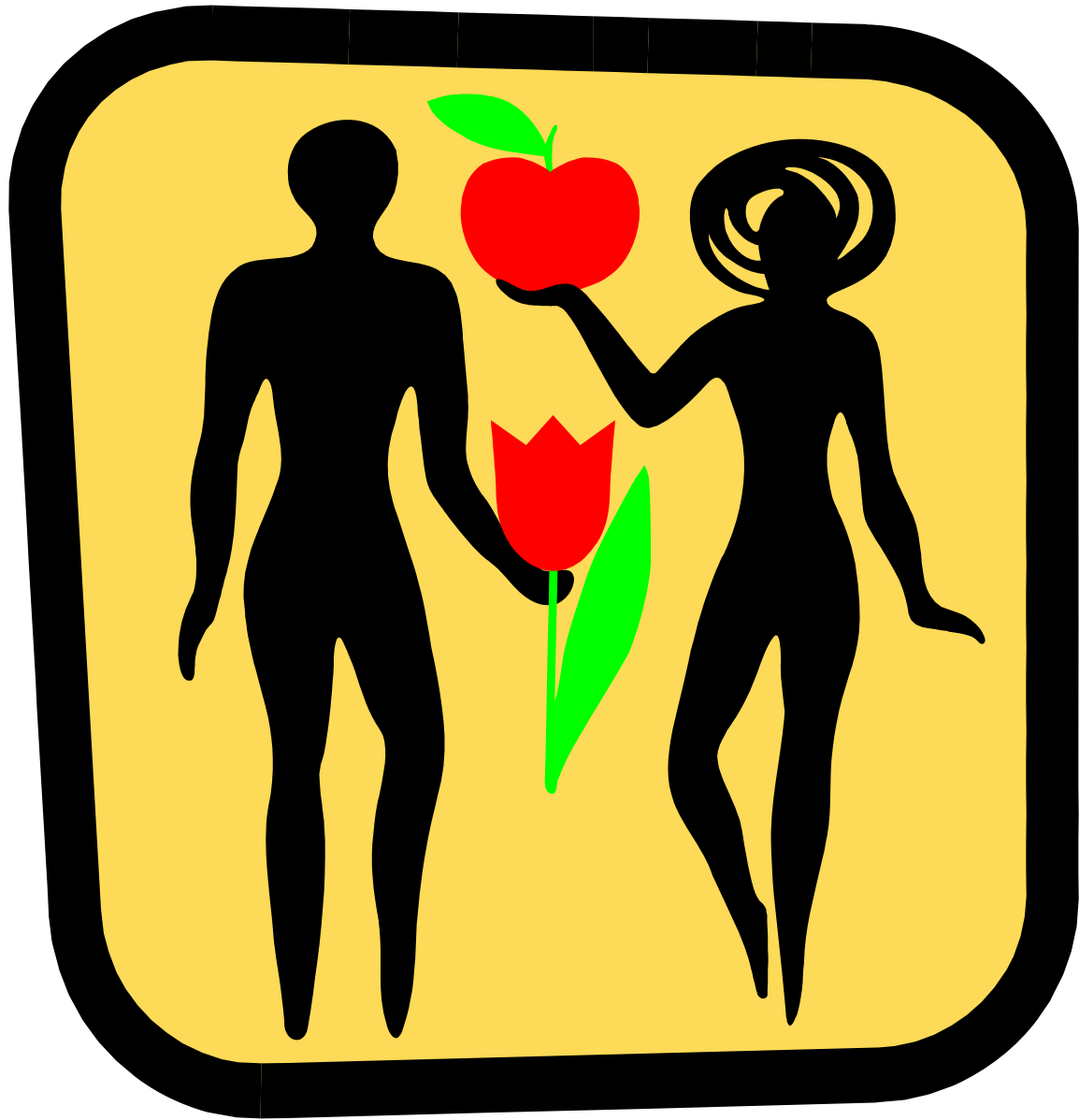
LED lighting



HPS lighting

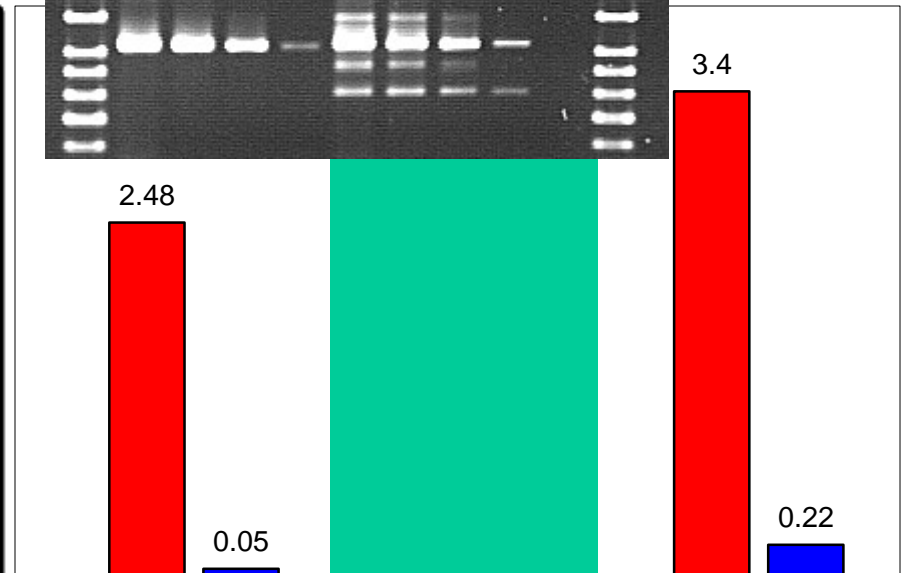
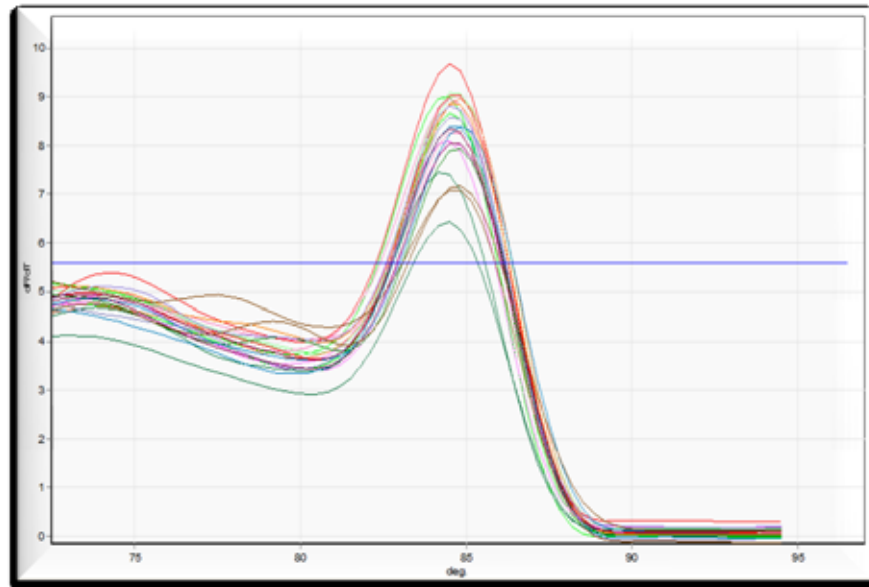
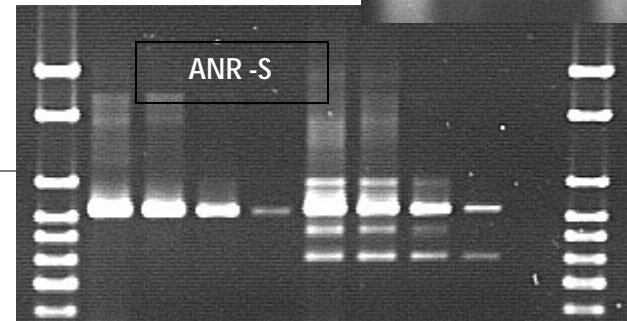
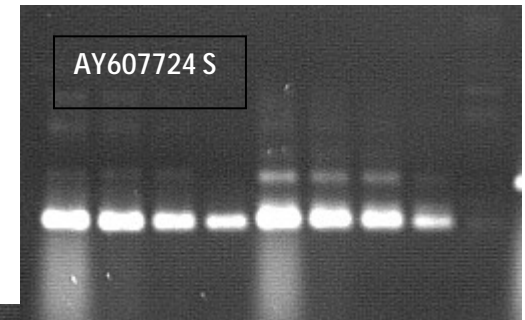
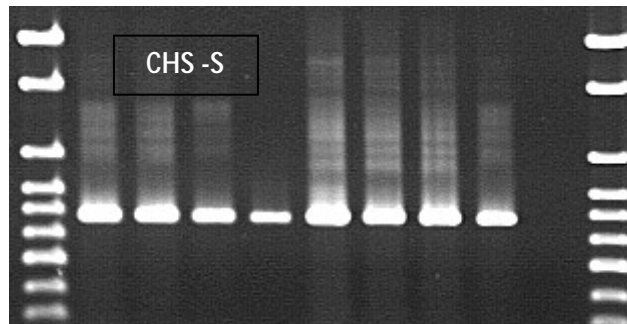






THANK YOU FOR YOUR ATTENTION

Examples of expression profiles for some candidate genes involved in plant defense reaction to *Verticillium dahliae*



Subtask 2.1.1. Controlling plant development for season extension

Raspberry – Subcontractor– Serbia

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, height, 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 cytometry 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.

