

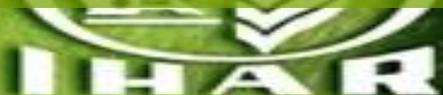
IHAR-PIB contribution into Agriculture - related research and innovation in a changing world

Edward Arseniuk

Plant Breeding and Acclimatization Institute,
National Research Institute, Radzików,
05-870 Błonie, Poland

Plant Breeding and Acclimatization Institute - National Research Institute

The Institute was founded in 1951 for research in breeding and seed production of arable, vegetable and ornamental crops. IHAR responsibilities were changing over decades. At present IHAR mandate of responsibilities ranges from basic research for plant breeding to germplasm conservation, enhancement, and utilization, development of production technologies of field crops and technologies for certified seed production, etc...



**Instytut Hodowli
i Aklimatyzacji Roślin**

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tel. (0 22) 725 36 11, fax (0 22) 725 47 14
e_mail: postbox@ihar.edu.pl
www.ihar.edu.pl

The Institute subordinates to the Ministry of Agriculture and Rural Development

EMPLOYMENT as of 31 December

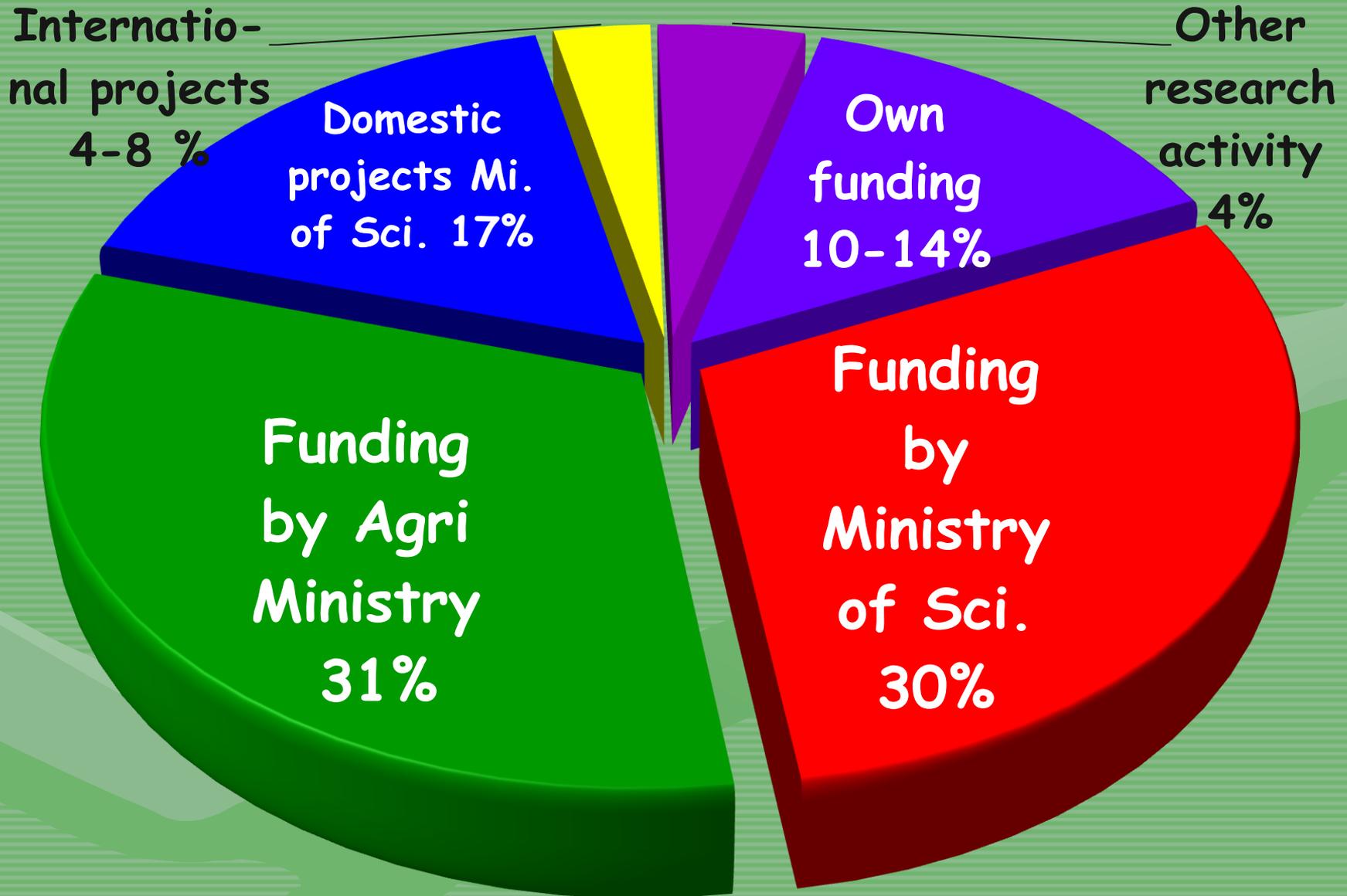
POSITION	INSTITUTE	Exp. Stn.	TOTAL
2010			
Titular Professors	10		10
Associate Professors	21		21
Adjunct Professors	64		64
Research Assistants	50		44
Total research personnel	145		145
Technical personnel	148	26	174
Administrative personnel	66	30	96
Auxiliary personnel	71	104	175
TOTAL	430	160	590

430 (Institute)+160 (Exp.Sta.)+550 (PB Co. Ltd) =1180 empl.

Organization structure of the Institute



How the Institute is financed 2010





FUNDAMENTAL RESEARCH

Universities, PAS Institutes

IHAR = Institute of the Center,
which couples/integrates
fundamental & applied research with practical
plant breeding, seed science & seed production

APPLICATIVE R + D
IHAR & other Agric.
Res. Institutes

INNOVATION & EXTENSION
Companies & Enterprises
practical plant breeding
& seed production



1st Circular

INTERNATIONAL CONFERENCE
ON:

**BIOTECHNOLOGY
AND PLANT BREEDING
PERSPECTIVES TOWARDS FOOD
SECURITY AND SUSTAINABILITY**

SEPTEMBER 10-12, 2012

Organized by:

PLANT BREEDING AND ACCLIMATIZATION INSTITUTE

NATIONAL RESEARCH INSTITUTE

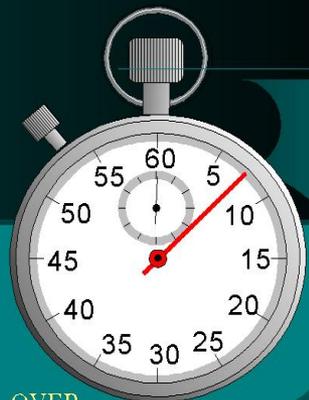
Radzików, 05-870 Błonie, Poland



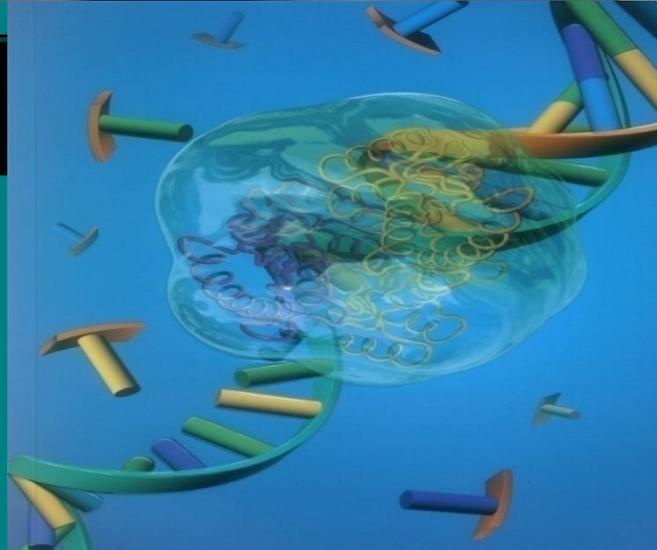


Share, please, your opinion with us...

DZIĘKUJĘ...
THANK YOU...
DANKE...
СПАСИБО...



MY PRESENTATION IS OVER

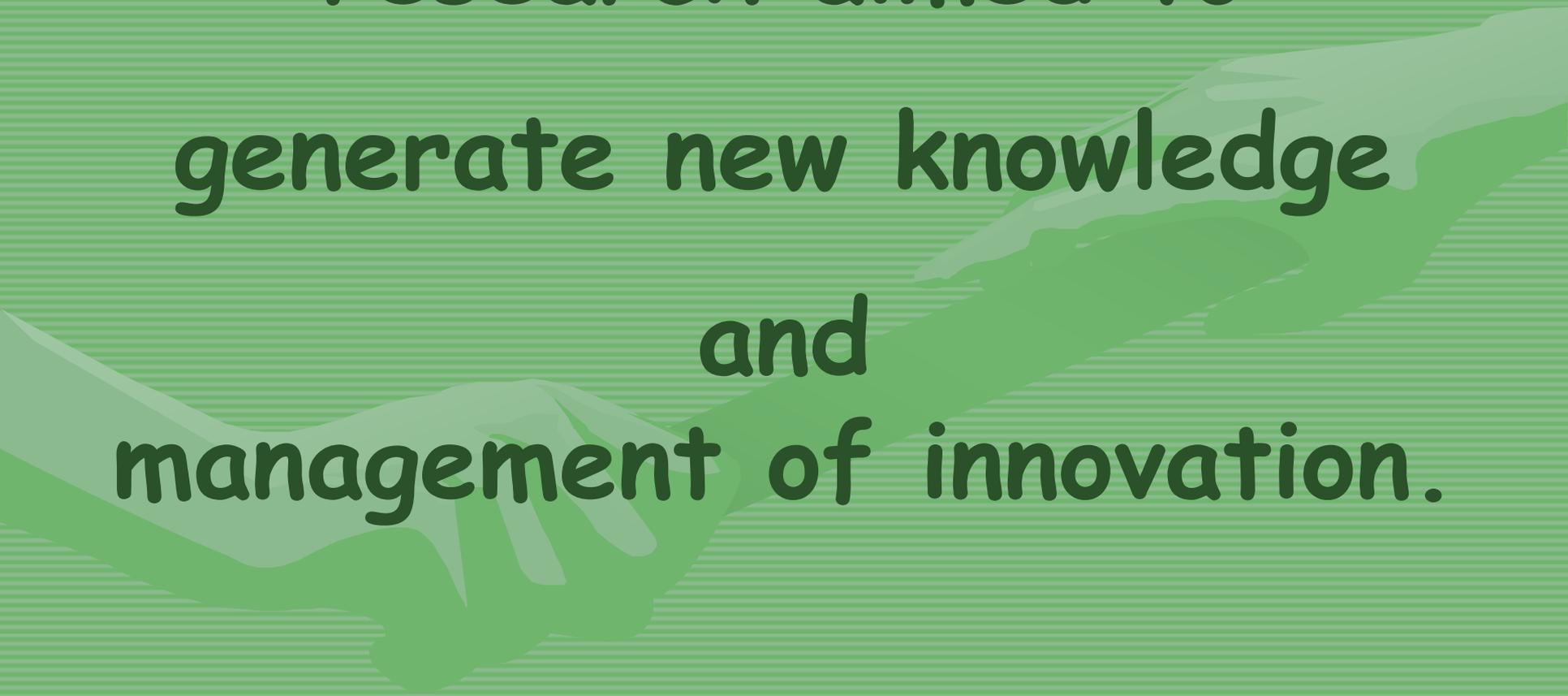


Comment 1

IHAR-PIB research programs are oriented to support sustainable and low input (organic) agricultural production systems with utilization of biological potential of crop plant.

Comment 2

Plant resistance to biotic and abiotic stresses is an important component of each Agro-Eco-System since plant resistance influences its effectiveness.

A stylized illustration of two hands shaking, rendered in shades of green, positioned behind the text. The hands are positioned as if in a firm handshake, with fingers slightly curled. The background is a solid light green color.

Programs and examples of
research aimed to
generate new knowledge
and
management of innovation.



IHAR-PIB R & D activities

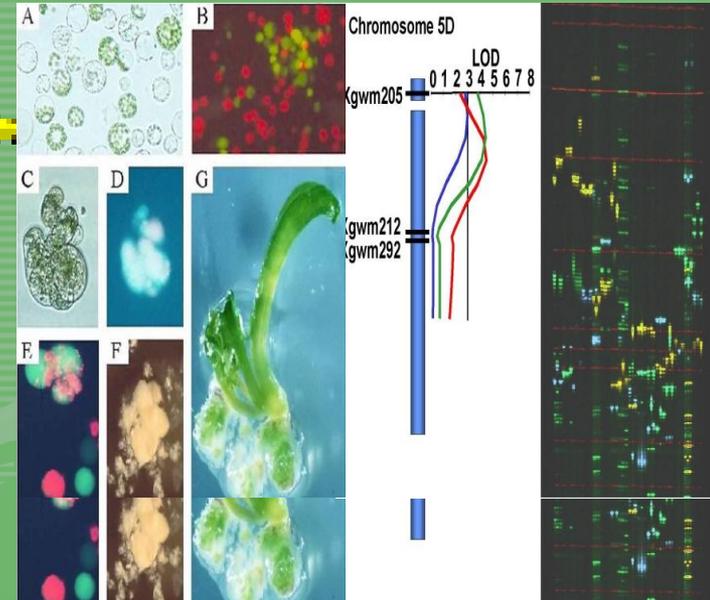
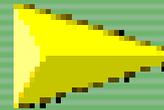
Research programs

Statutory research

I. Development & enhancement of plant germplasm and implementation of new strategies into plant breeding - funded by Ministry of Science

Done by:

- classical recombination,
- &
- *in vitro* cultures - somaclones, dihaploids
- regeneration from protoplasts,
- R genes,
- QTLs,
- Molecular Assisted Selection





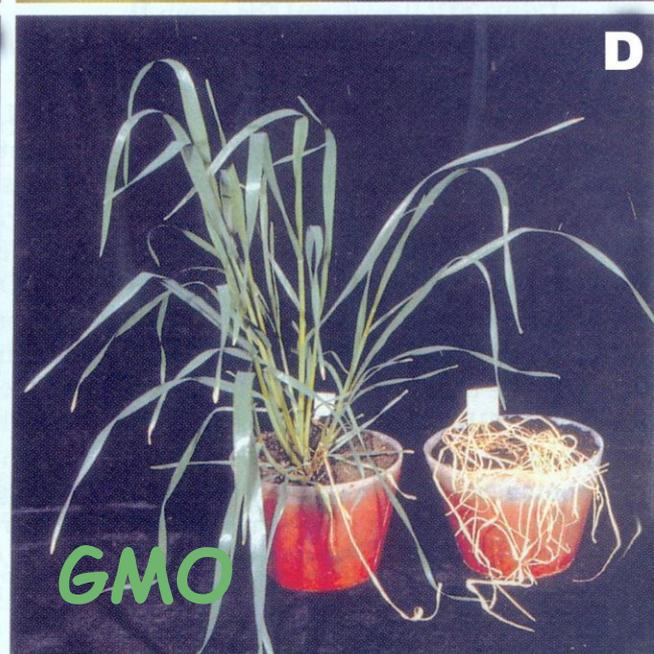
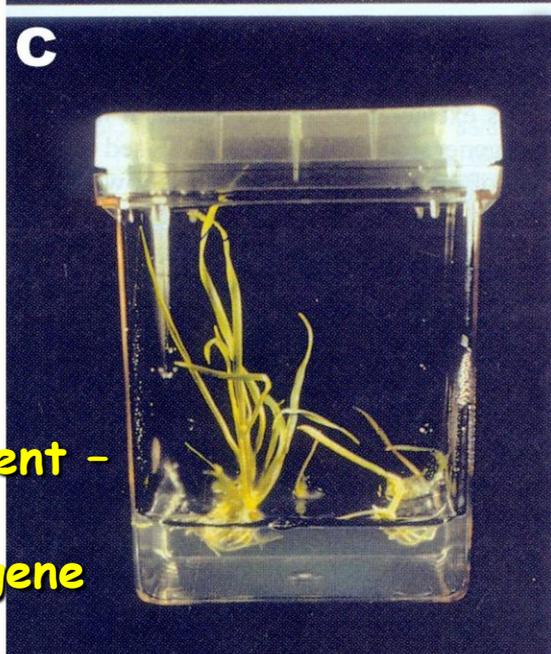
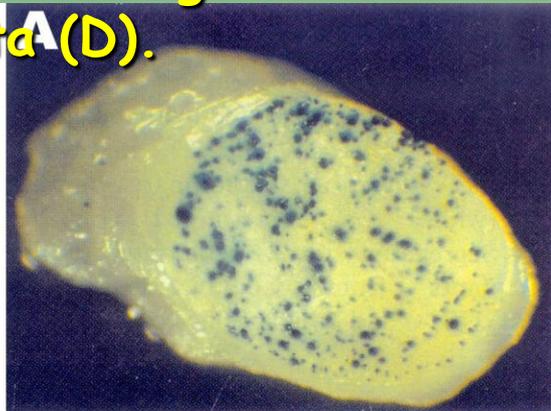
Classic and transgenic cereal improvement for yield & weed control

Genetic transformation of triticale MAH 1590 with herbicide resistance gene *bar* - conferring resistance to herbicide Basta (D).



ECOLOGY

The past and the present concepts of cereal improvement - replacing of classical recombination breeding with gene transformation technology.

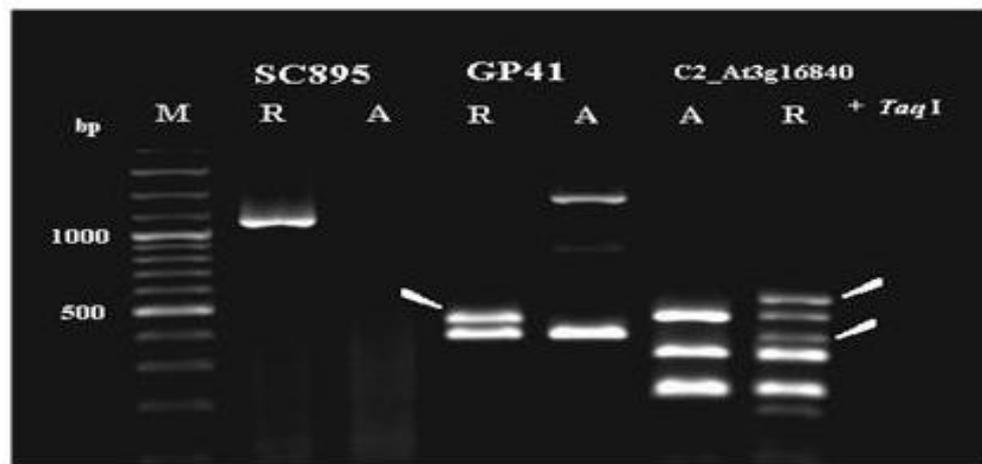
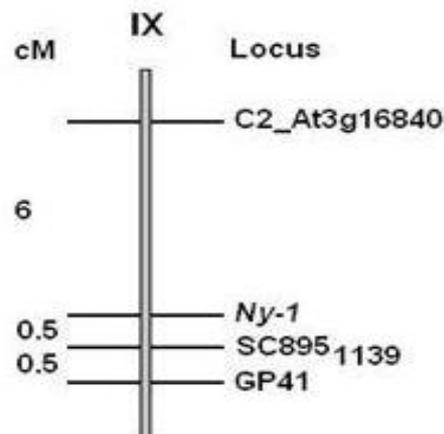
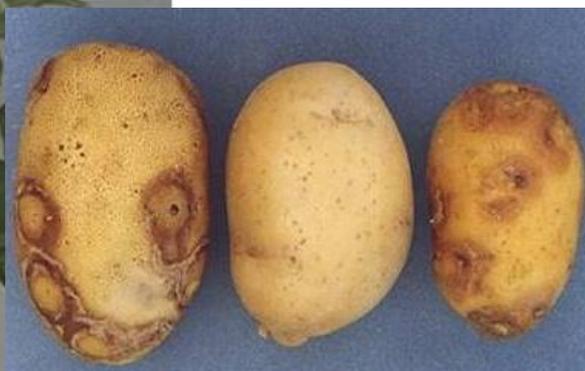
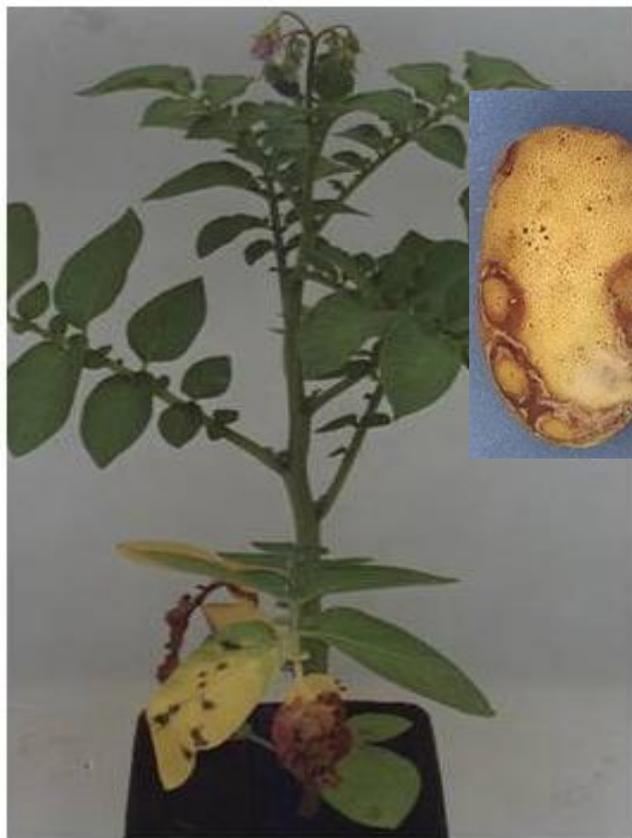


GMO

Examples of IHAR-PIB research on transgenesis:

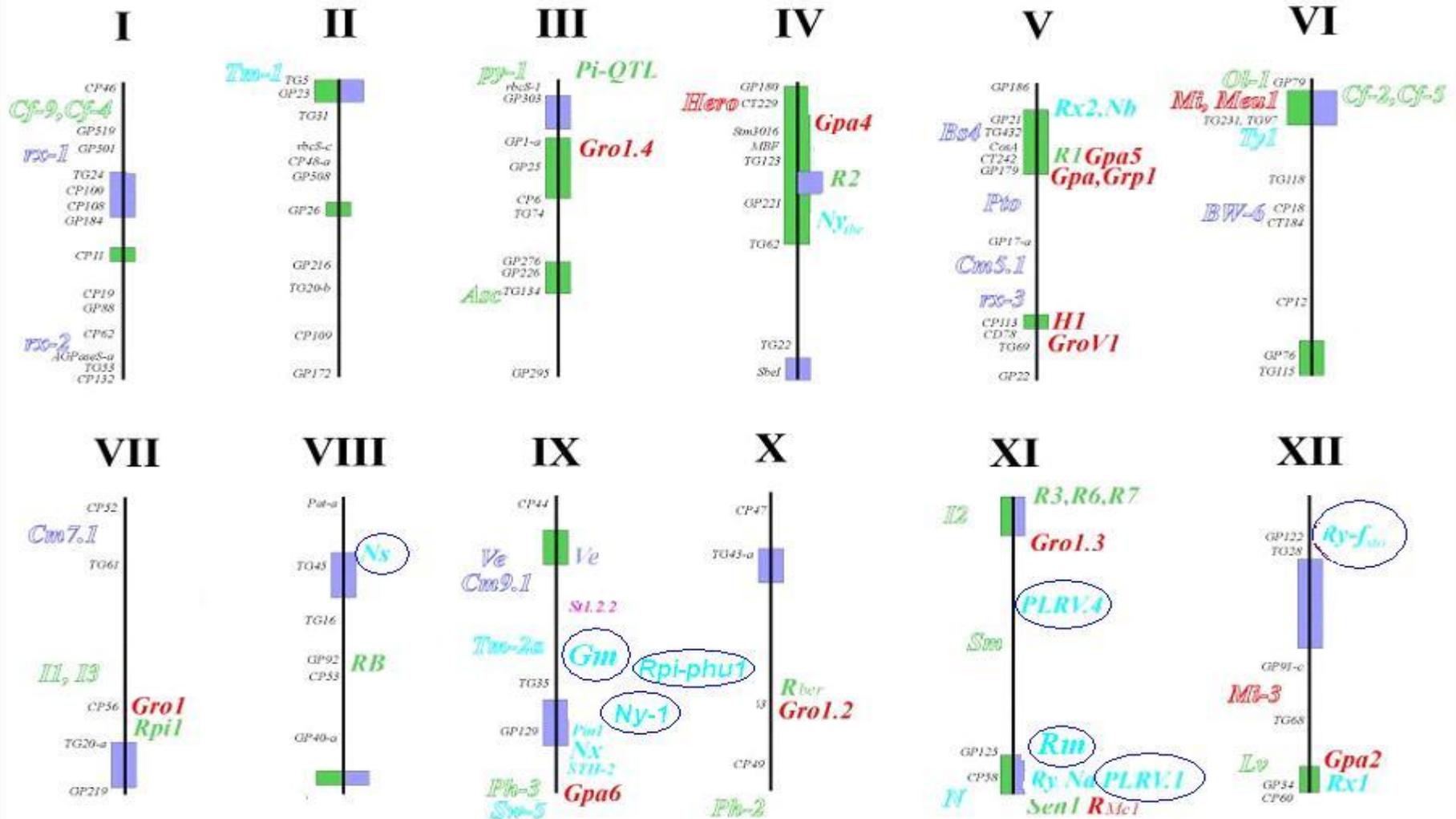
- histopathological analysis of plant-pathogen interaction and elucidation of oxidative burst role in expression of plant defense against pathogen,
- determine the role and place of GMO, (co-existence of classical and transgenic crop cultivars) in plant production,
- quantitative and qualitative GMO detection in plant products,
- input into the GMO law development and implementation in Poland,
- contribution to the National Biosafety Program of Poland,

Marker Assisted Selection - biology measures, mapping of R genes and molecular markers - here, mapping of Ny-1 gene responsible for hypersensitivity reaction to PVY in potato cultivar Rywal.

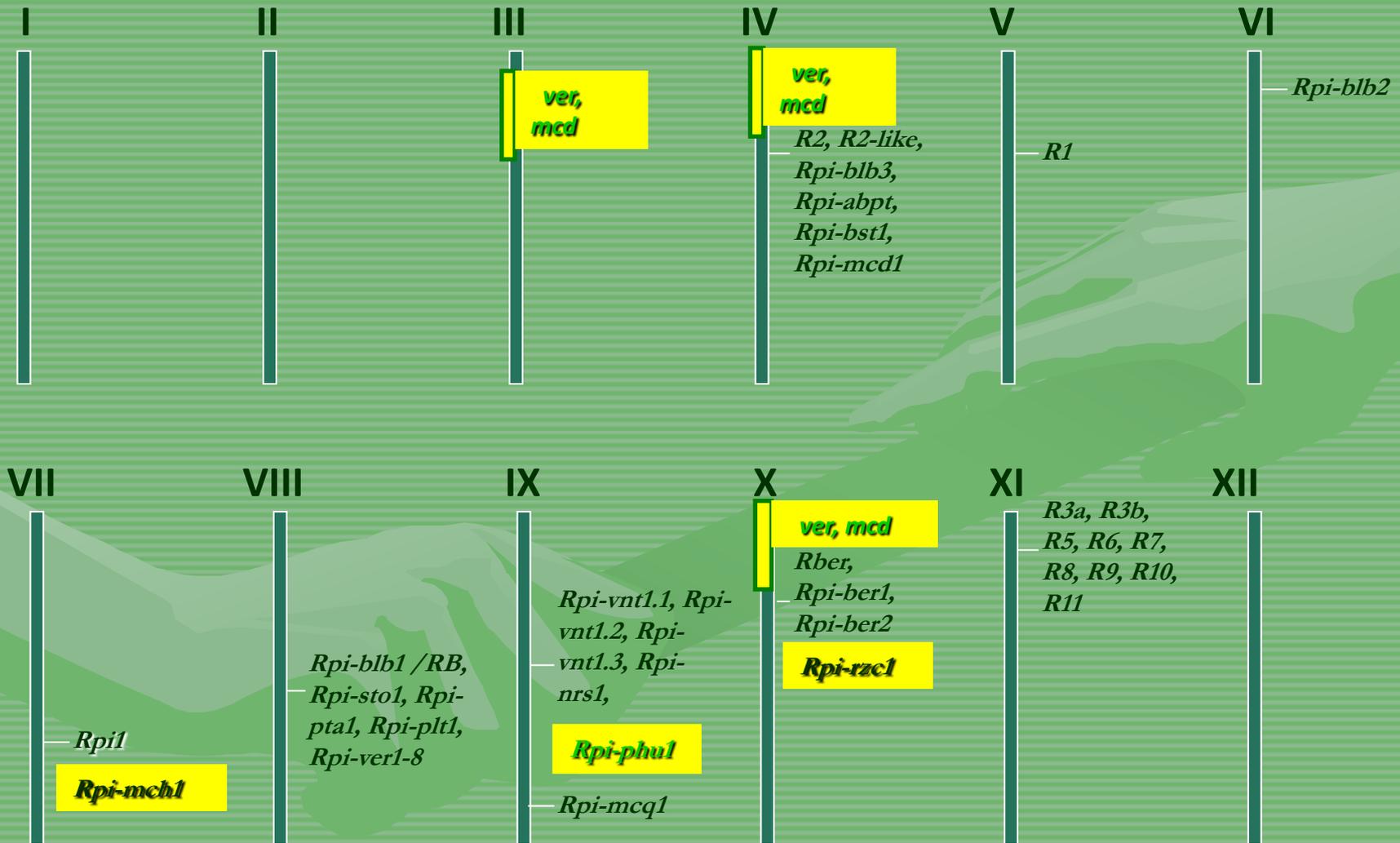


Szajko i wsp. TAG, 2008

Potato genome map. R genes to viruses in enircled fields of blue color localized in **IHAR-PIB Center Młochów**.



R genes to *P. infestans* on genetic map of potato, yellow color denotes QTL and genes mapped in **IHAR-PIB Center Młochów**





IHAR-PIB R & D activities

Research programs

Statutory research cd.

II. Seed science
and seed production
- funded by Ministry
of Science



Some of objectives of the program:

- determine seed healthiness and other sowing value parameters of seeds from conventional and organic farming,
- study effect of storage on sowing value,
- IHAR is a member in the International Seed Testing Association,
- translation ISTA Rules into Polish and every year edition of amendments, cooperation with ISTA Technical Committees, proficiency tests.

Kernels of triticale cv. Modus infected by *F. culmorum*



'tombstone'
kernel

sporulation of
F. culmorum

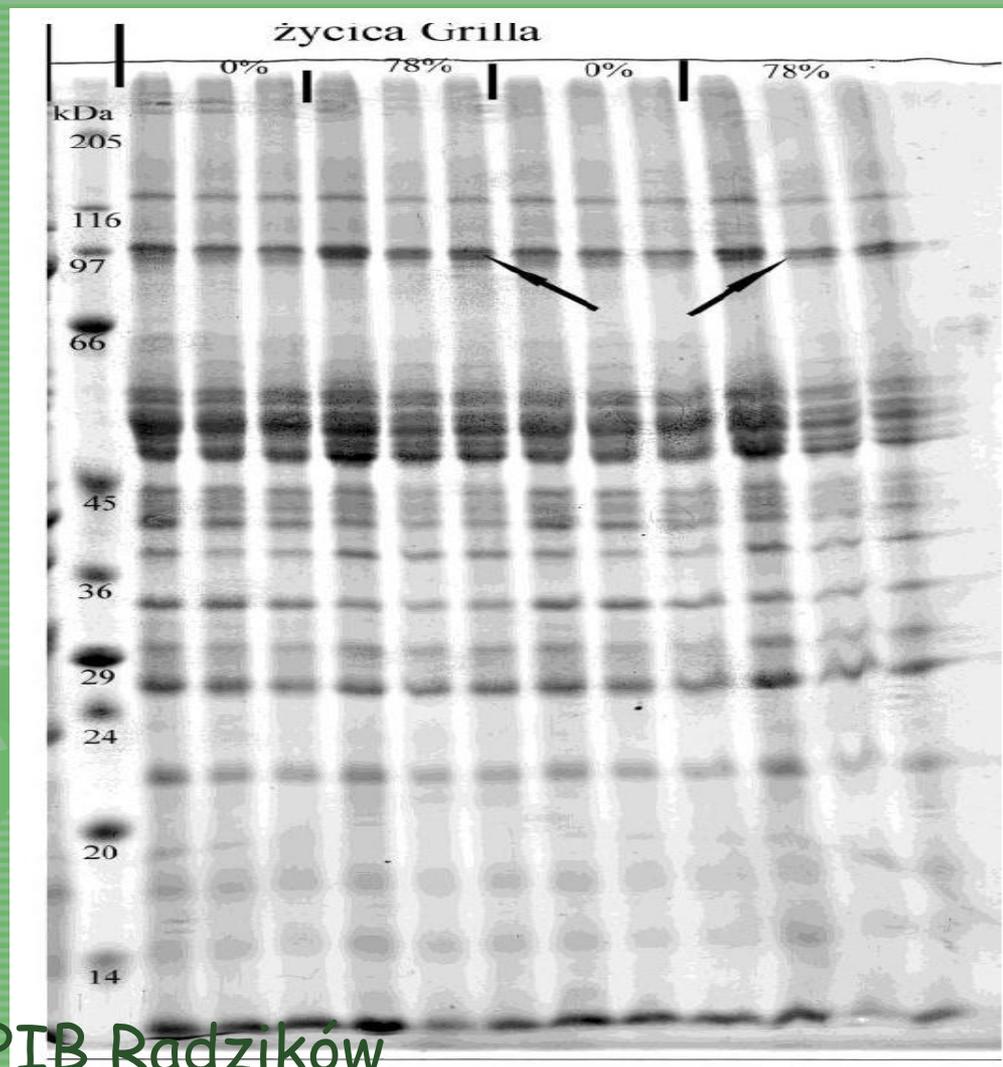
healthy
kernel

brown-shrivelled kernel

Detection & diagnosis of pests in seeds (here biochemical detection of endophytic fungi *Neothypodium* sp. in seed samples of perennial ryegrass *Grilla*).

Electroforegram of seed proteins:

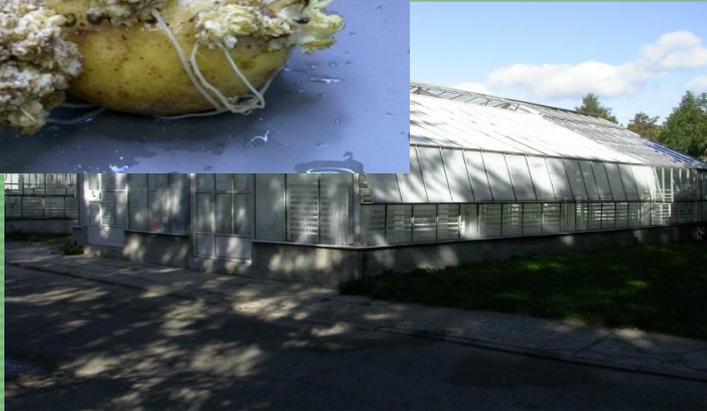
arrows show a new bar of 97 kDa, specific for seed samples heavily infected (78%), with *Neothypodium*.



Source: B. Wiewióra, IHAR-PIB Radzików

Detection & diagnosis of pests in potato tubers to produce certified potato & other seed free of pathogens, especially quarantine ones

= healthy plants, healthy environment, healthy people

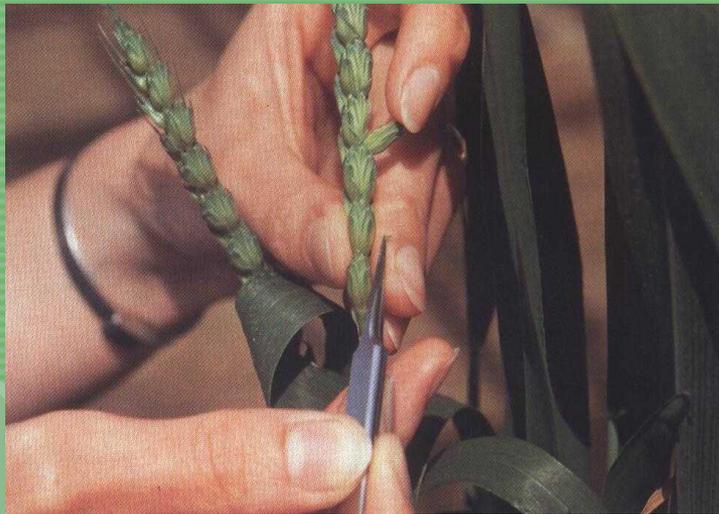


- *Synchytrium endobioticum*
- *Ralstonia solanacearum*
- *Clavibacter michiganensis* ssp. *sepedonicus*
- *Globodera pallida*
- *Globodera rostochiensis*





I HAR-PIB R & D activities



III. Research on plant breeding to identify & broaden genetic base and resources for crop improvement. - funded by Ministry of Agriculture

Program priorities

1. testing of plant germplasm in search for sources of resistance to biotic and abiotic stresses,
2. search for agronomic quality traits analysis of plant materials useful for practical breeding,
3. evaluation of uniformity & distinctness of breeding materials by conventional and molecular biology techniques,
4. refinement of biotechnology and plant breeding methods for crop improvement.

New technologies to shorten breeding cycle

Testing for *Stagonospora nodorum* blotch resistance of DH lines derived from F1 of winter triticale hybrid **Pinokio x Bogo**

16:11



IV. Multiannual program for 2008 - 2013 to support transfer of knowledge, innovation and technology to agri-sector - funded by Ministry of Agri

Title: Improvement of arable crops for sustainable agroekosystems, high quality of food, feed and plant production for none-food uses.



„Gene Bank” - collection & preservation in viable state genetic resources (biodiversity) of plants and their pathogens for breeding and research purposes, cd.

- conserve, elaborate, release and use of biological diversity for research and plant breeding purposes.

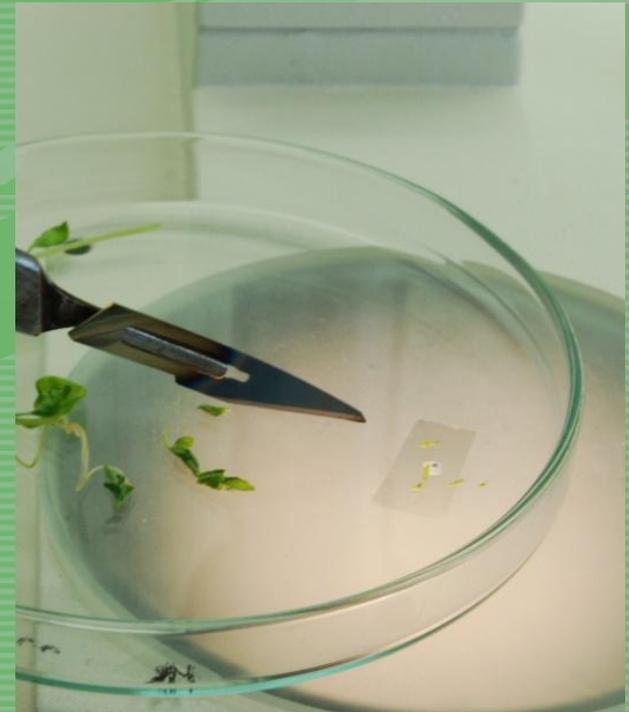
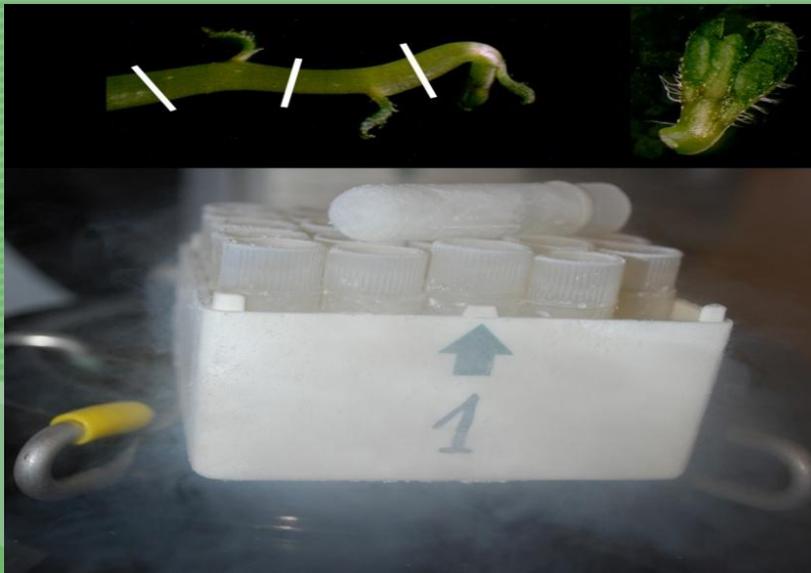


Origin of genes & QTLs in potato genome conditioning resistance to *P. infestans* in some lines

- gene *Rpi-phu1* originating from *S. stenotomum* x *S. phureja* on IX chromosome,
- gene *Rpi-mch1* originating from *S. michoacanum* on VII chromosome. Genes *Rpi-mch1* were mapped with DArT technology, one of the first maps of potato genome with DArT markers.
- gene *Rpi-rzc1* originating from *S. ruiz-ceballosii* on chromosome X. (DArT technology),
- **QTL** with resistance to *P. infestans* originating from a hybrid source of *S. microdontum* & *S. verrucosum*.



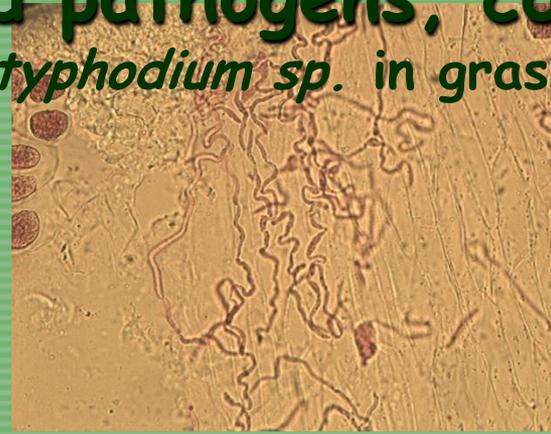
Use of cryopreservation methodology for *in vitro* collection of plant genotypes and isolates of pathogens, e.g. *P. infestans*



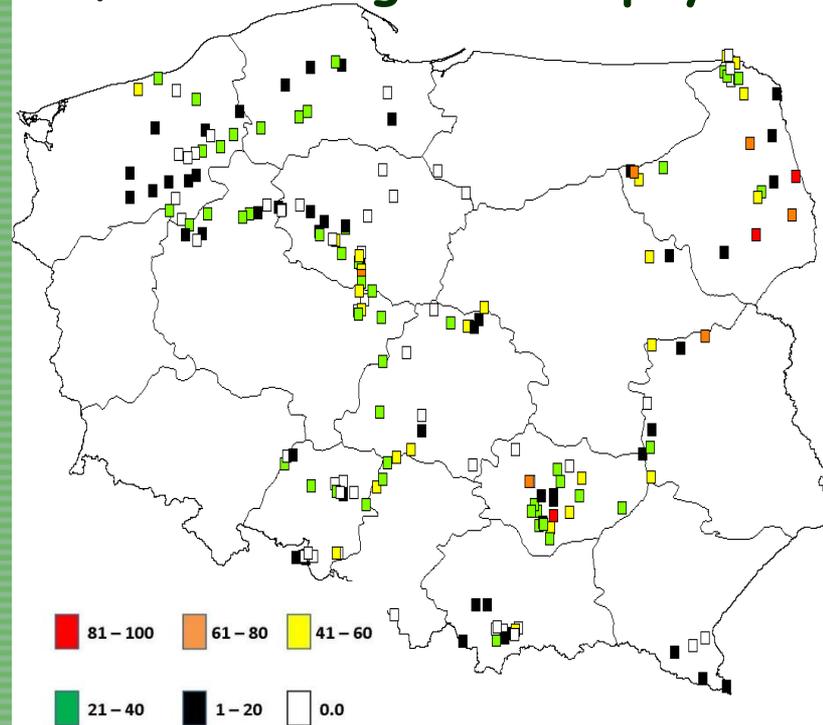
Source: E. Zimnoch-Guzowska
IHAR-PIB Center Młochów

Monitoring of plant pests and pathogens, cd.

(here, monitoring of endophytic fungi *Neotyphodium sp.* in grasses)



Mycelium in seeds



Frequency of occurrence in Poland (%)



Mycelium in plant tissue

Found often in plant and seed tissues. *Neotyphodium spp.* produce zootoxic alkaloids ergovaline and lolitrem B.

EUCARPIA Multisite Rust Evaluation Trail

European Research Area or Epidemiological Research Area

spores of rusts and mildews carrying resistance to pesticides blown eastward





Plant Breeding and Acclimatization Institute

International cooperation





ENDURE



European Network for the Durable Exploitation of crop protection strategies

INSTITUTIONS

Badania

- INRA - FR
- BBA - DE
- RRES - UK
- CIRAD - FR
- CNR - IT
- DIAS - DK
- FAL - CH
- WUR - NL
- IHAR - PL

Edukacja

- SSSUP - IT
- SZIE - HU
- UdL - ES

Rozszerzenie

- DIAS - DK

Zarządzanie

- IT - FR
- Przemysł
- IBMA - Int.

PARTICIPANTS IHAR

- Prof. dr hab. Edward Arseniuk
- Doc. dr hab. Jerzy H. Czembor
- Dr Elżbieta Kochańska-Czembor
- Dr Paweł Czembor
- Dr Denise Fu Dostatny
- Dr Renata Lebecka
- Dr Tomasz Góral



Wyjście naprzeciw
oczekiwaniom konsumentów
i prowadzących

Biologia systemów
pasożytniczych

CASE STUDIES

RESEARCH

INTEGRATION

NoE ORGANIZATION

Zewnętrzna

Komisja Doradcza

Badania, Przemysł
Producenci,
Konsumenty,
Politycy
Sieć Ochrony Upraw

Research networks
Civil society networks
Related EU Projects

Rada Zarządzająca

Reprezentacja Instytucji
Komitet Wykonawczy

Zarząd

Laboratorium
Wirtualne

Centrum
Kompetencji

Badania szczegółowe biologii systemów
szkodników mające na celu redukcję i
optymalizację zużycia chemicznych
środków ochrony roślin

ENDURE assembled consortium partners with internationally-recognised expertise and excellence in areas of agronomy, plant genomics and breeding, cultivar resistance, pesticide resistance, weed biology/ecology, biological control, epidemiology and population dynamics, information and communication technology, decision support systems, social sciences, advisors and extension services.



Examples of IHAR collaborative research done with ENDURE partners

Point for discussion- Cultivar resistance reduces fungicide input...

From Science to Field
Wheat Case Study – Guide Number 1

Summary

Growing cultivars with good resistance to major diseases in winter wheat is a major factor for reducing disease problems in the crop. The benefits of growing resistant cultivars are significant and are very important in reducing the dependence on fungicides in an integrated pest management (IPM) strategy. In a specific season the number of fungicide treatments can be reduced by one or two and doses applied can be reduced by between 25 and 50% depending on the season and level of resistance in the cultivar.

Control of disease using resistant cultivars can provide savings in the range of €20/ha compared to the cost of controlling diseases in susceptible cultivars. Farmers also gain more flexibility with respect to timing and choice of dose if they choose the most resistant cultivars. Resistant cultivars will, however, not solve all problems, as the stability of resistance genes changes gradually over time.

There is major scope for better exploitation of genetic resources, which should include a constant focus from breeders and scientists in search of new sources of resistance as well as annual testing of all major cultivars to provide updates on any changes in virulence.

For further information please contact:

Lise Nistrup Jørgensen, Department of Integrated Pest Management, Faculty of Agricultural Sciences, Aarhus University, Forsøgsvej 1, 4200 Slagelse, Denmark. Tel: (+45) 8999 3652
E-mail: LiseN.Jorgensen@agrsci.dk

About ENDURE

ENDURE is the European Network for the Durable Exploitation of Crop Protection Strategies. ENDURE is a Network of Excellence (NoE) with two key objectives: restructuring European research and development on the use of plant protection products, and establishing ENDURE as a world leader in the development and implementation of sustainable pest control strategies through:

- > Building a lasting crop protection research community
- > Providing end-users with a broader range of short-term solutions
- > Developing a holistic approach to sustainable pest management
- > Taking stock of and informing plant protection policy changes.

Eighteen organisations in 10 European countries are committed to ENDURE for four years (2007-2010), with financial support from the European Commission's Sixth Framework Programme, priority 5: Food Quality and Security.

Website and ENDURE Information Centre

www.endure-network.eu

This publication was partially funded by EU grant (Project number: 031499), and is catalogued by the ENDURE Executive Committee as ENDURE Wheat Case Study - Guide Number 1, published in September, 2008.

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From Science to Field
Wheat Case Study – Guide Number 1

Using Cultivar Resistance to Reduce Fungicide Input in Wheat

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Philippe Lucas and Bernard Rolland, INRA, France
David Gouache, Arvalis, France
Laszlo Hornok, SZIE, Hungary



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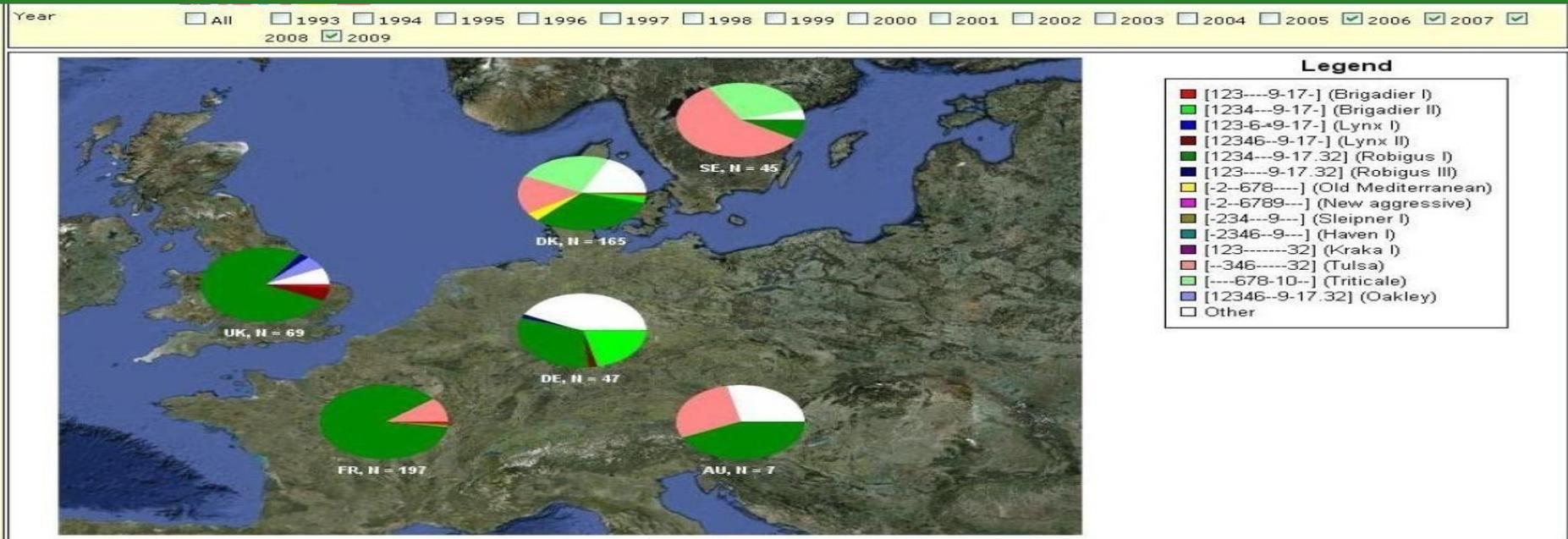


Examples of IHAR collaborative research done with ENDURE partners

EuroWheat.org: a new research-based website supporting integrated disease management in wheat



Monitoring of frequency of pathotypes across EUROPE



Distribution of yellow rust pathotypes (races) in Europe. Each colour refers to a unique race. © www.eurowheat.org.

Thank you, My presentation is over,
I pass my invitation to you to attend an



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