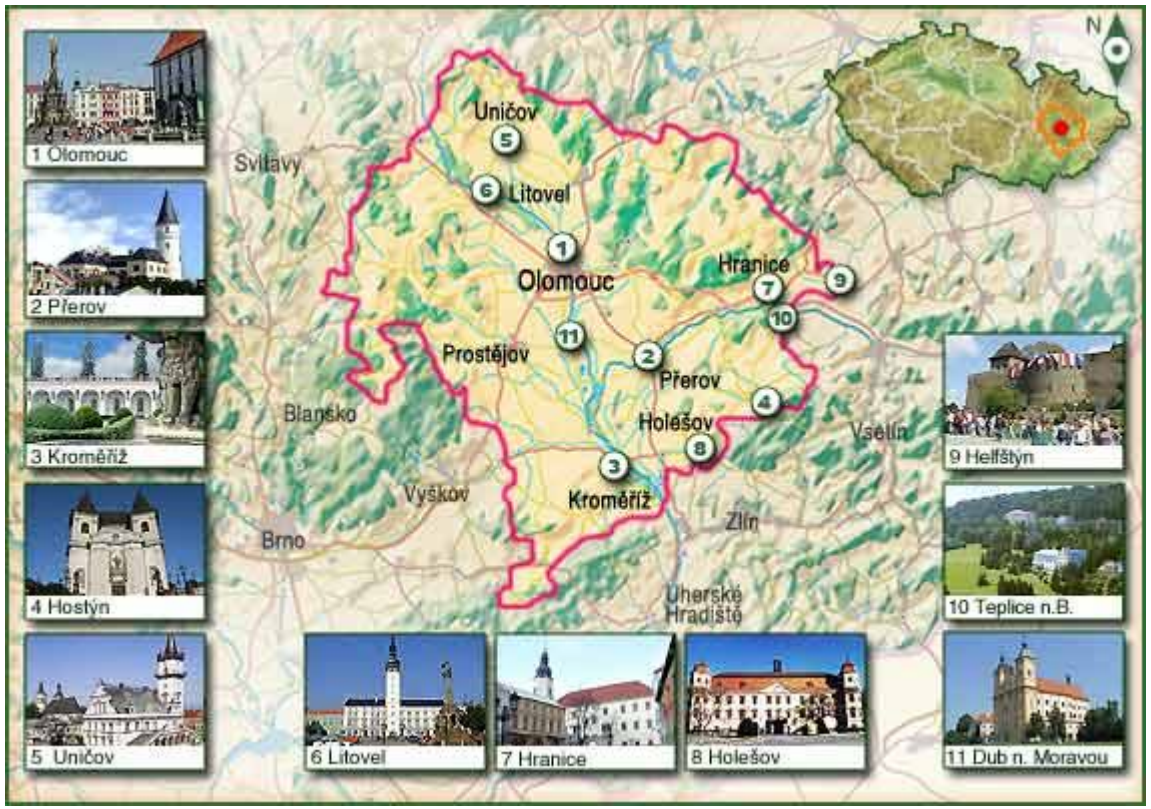
CENTRE OF THE REGION HANÁ FOR BIOTECHNOLOGICAL AND AGRICULTURAL RESEARCH

Ivo Frébort

27.11. 2012

Region „Haná“



Centre Haná

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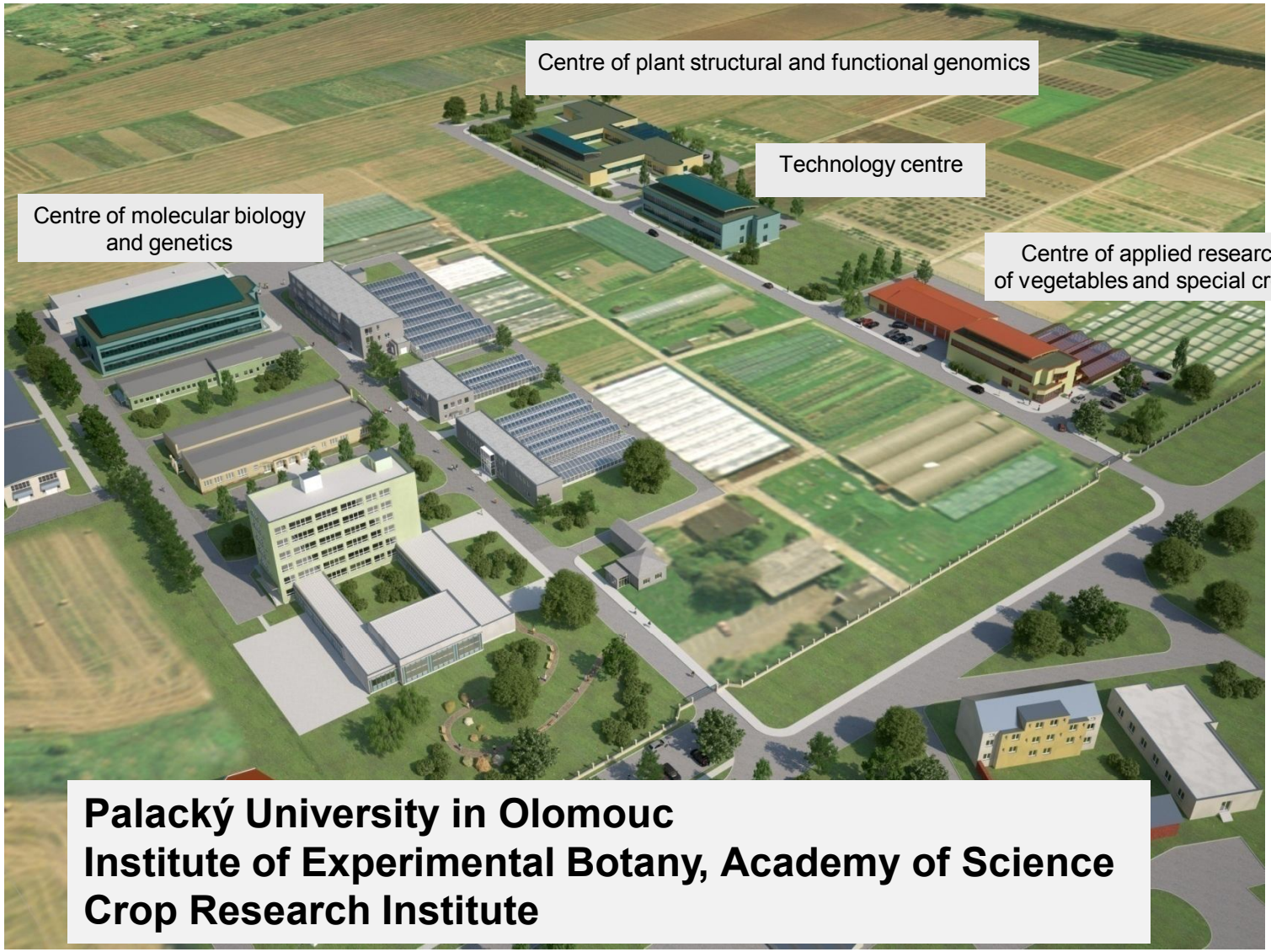
OP Research and Development for Innovation

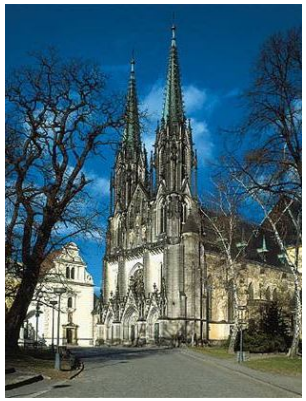


Palacký University in Olomouc
Institute of Experimental Botany, Academy of Science
Crop Research Institute

Olomouc, the Czech Republic

Founded in 11th century, today 100.000 inhabitants






Palacký University Olomouc

Established in 1573, at present 8 faculties, 23.000 students

Gregor Johann Mendel (1822-1884)

- In 1840-1843 he studied **practical and theoretical philosophy and physics** at the **University of Olomouc**
- **Laws of Genetics**

Faculty of Science
Palacký University Olomouc

Biotechnology related fields of study

- Biochemistry (M.Sc., Ph.D.)
- Experimental Biology (M.Sc.)
- Biophysics (M.Sc., Ph.D.)
- *Molecular and Cell Biology (M.Sc., Ph.D.)*

will open in 2013

- Bioinformatics
- Biotechnology and Genetic Engineering

Project information

OP Research and Development for Innovation: CZ.1.05/2.1.00/01.0007

Project budget : 809 mil. CZK (about 32 mil. €)

Implementation period: 03/2010 – 12/2013

Grant recipient: Palacký University in Olomouc (UP)

Partners: Institute of Experimental Botany, Academy of Science (IEB)

Crop Research Institute (CRI)

Investment: 80% of the budget, 4 new buildings for R&D in Olomouc-Holice, equipment and research instruments

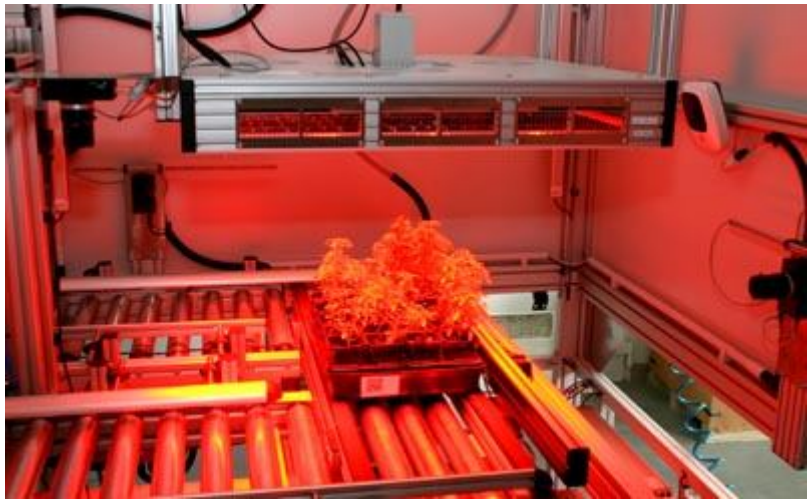
Start-up grant: 20% of the budget, implementation costs, wages, services

Human resources: 170 employees in 2013, 80 new position for researchers

Main equipment of the centre

- **Laser scanning confocal microscope** (07/2010)
- **High-speed flow cytometer and sorter** (09/2010)
- **Confocal microscope system for live cell imagining** (05/2012)
- **Mass spectrometer MALDI-TOF/TOF** (11/2012)
- **NMR spectrometer 500 MHz** (12/2012)
- **UPLC/MS, GC/MS** (11/2012)
- **Phytotrons and high resolution plant phenotyping line** (12/2012)
- **Greenhouses for study of GM plants and pathogens** (02/2013)

Phytotrons and high resolution plant phenotyping line



Research Programs and Scientists

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- **Protein biotechnology**
  Program leader: Marek Šebela

- **Chemical biology and genetics**
  Program leader: Miroslav Strnad

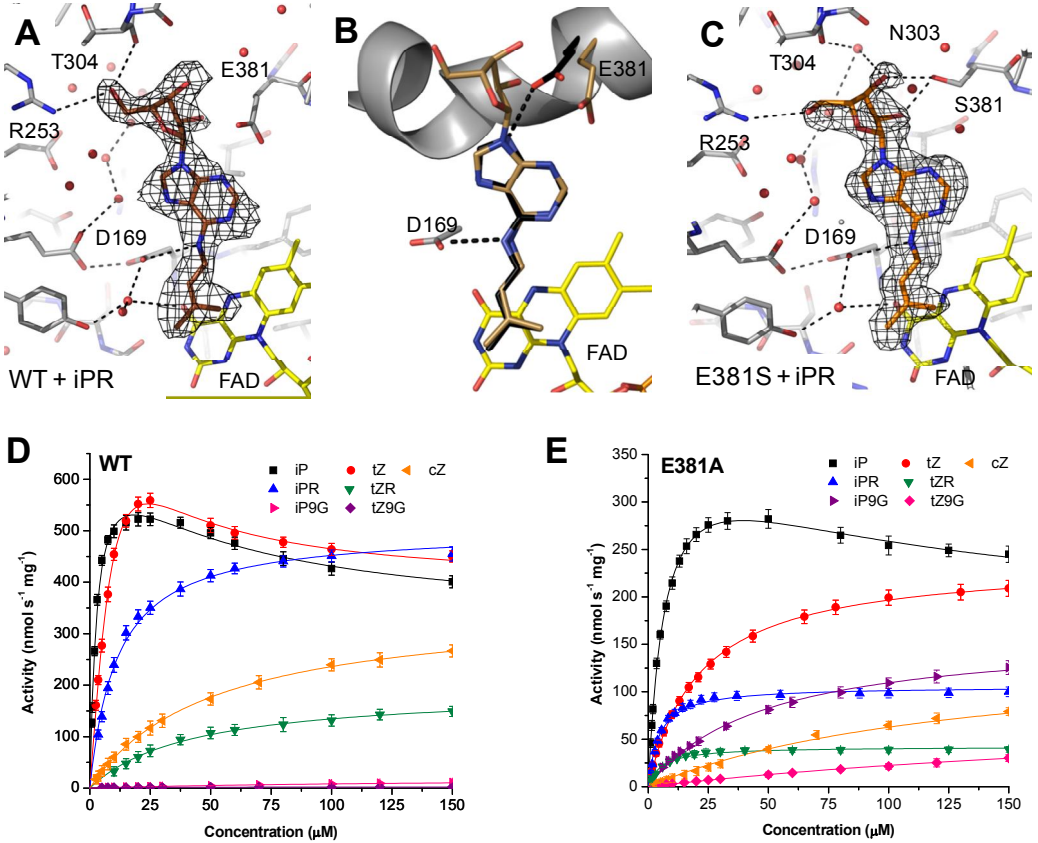
- **Novel materials and methods for plant breeding**
  Program leader: Jaroslav Doležel

- **Plant biotechnology**
  Program leader: Jozef Šamaj

- **Phytofarm and genetic resources of vegetables, medicinal, aromatic and culinary plants**
  Program leader: Karel Dušek

Protein biotechnology

- Protein preparation using recombinant expression or by isolation from biological materials
- Structural and functional analysis, use as biocatalysts



Proteomics – biotyping of plant pathogens

Cell surface protein profiling by mass spectrometry

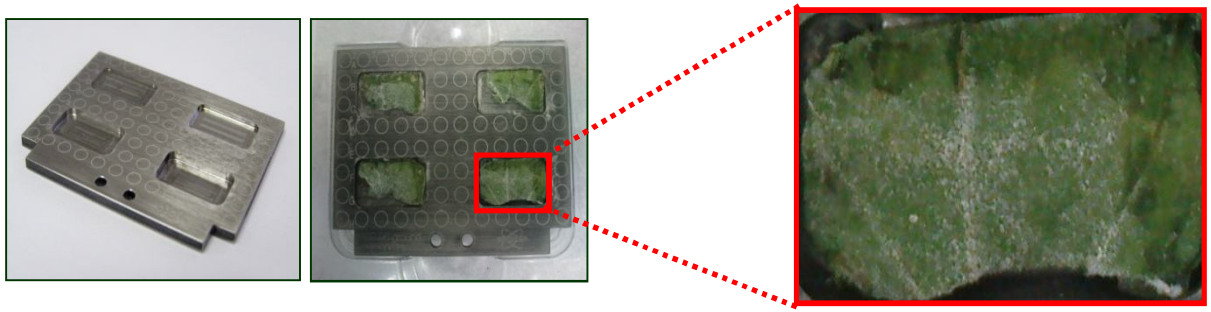
- Fungal plant parasites
- Epidemic spreading
- Crop destruction (grape, hop, vegetables)

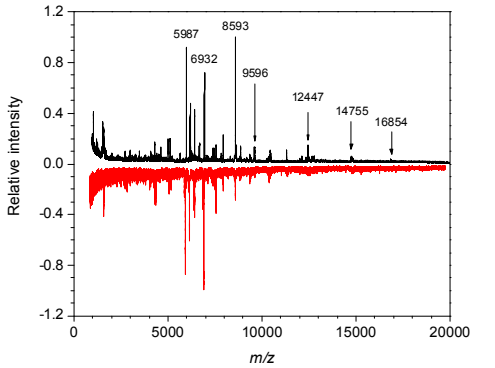
Downy mildew

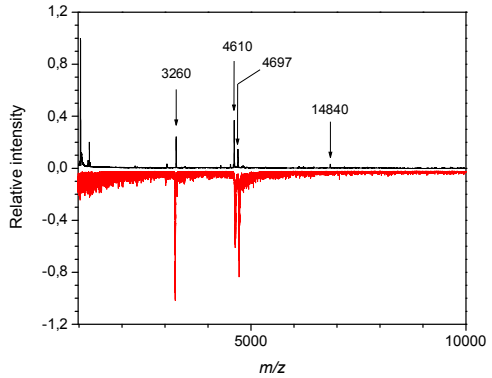
Powdery mildew

MALDI TOF from the surface of intact leaf

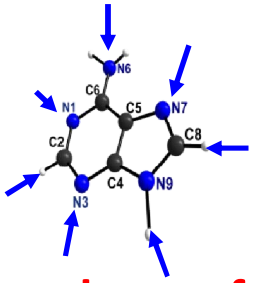
- Rapid recording of peptide mass spectrum
- Establishment of database of pathogen spectra
- Identification – diagnostics - treatment



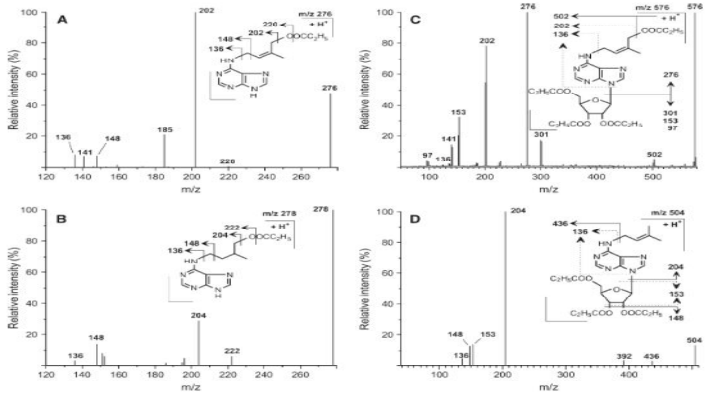




Chemical biology and genetics



- State-of-the-art **methods for qualitative and quantitative analyses of plant hormones** cytokinins, auxins, strigolactones, polyamines and plant phenolics (SPE → immunoaffinity preconcentration → UPLC/MS or CE/MS)
- Directed **synthesis of plant hormone derivatives** for applications in agriculture (growth regulators) and cosmetics (anti-aging agents)
- Biotests - **physiological effect and metabolic fate** of prepared compounds
- Finding molecular targets - **differential proteomics**

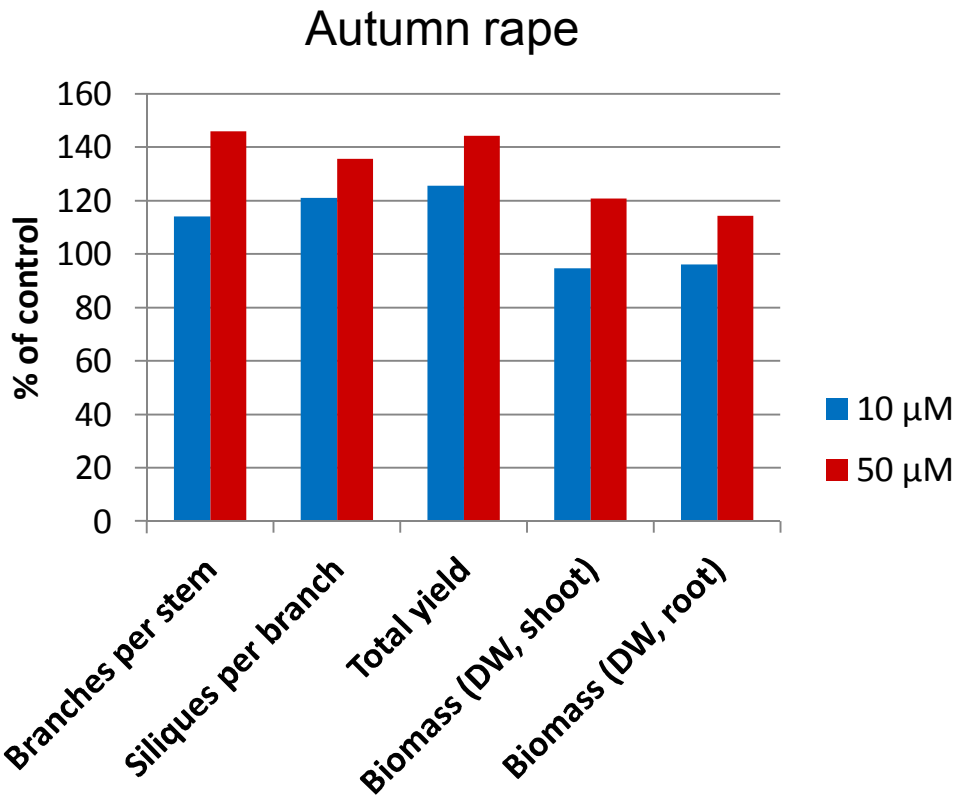


New plant growth regulator for yield increase

Applied concentration

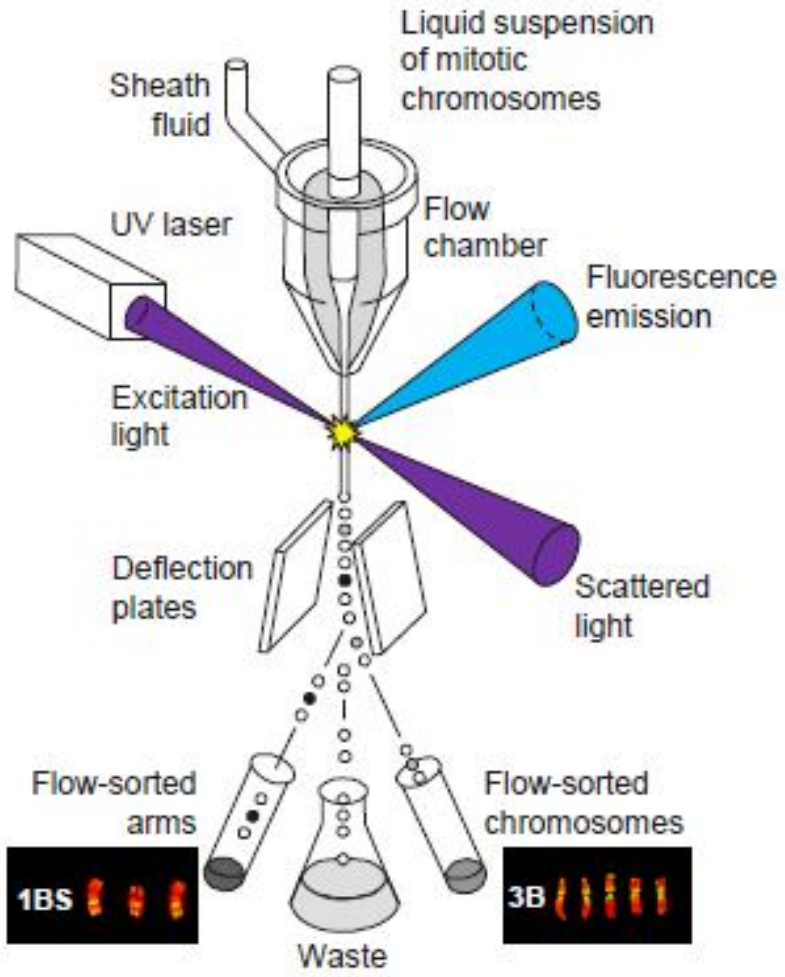
INCYDE = INhibitor of CYtokinin DEgradation

US patent 8,222,260 B2

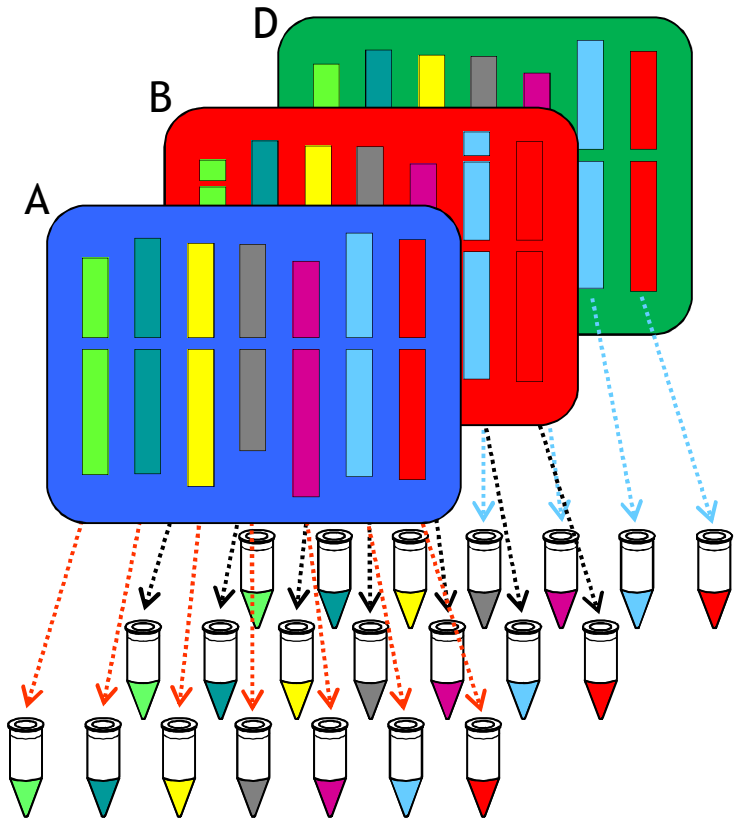


New materials for plant breeding

Flow sorting of chromosomes

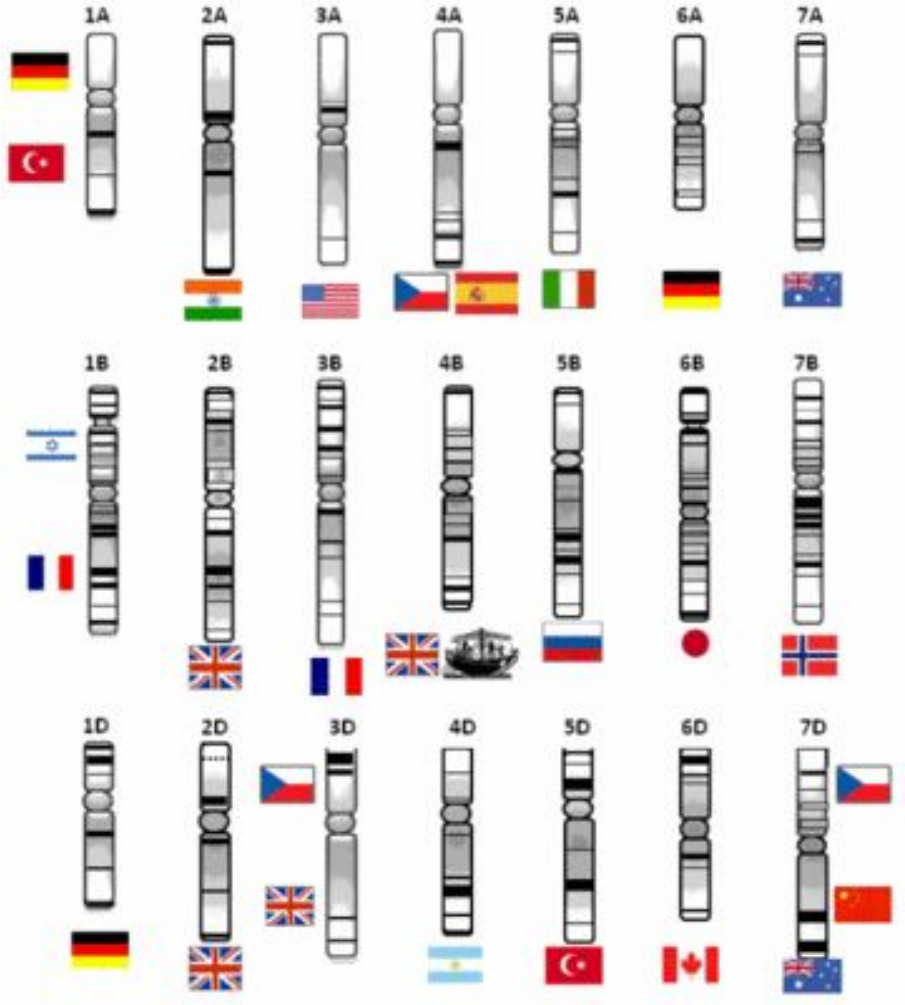


Dissection of the genome to single chromosomes (arms) representing individual (sub)genomes



Cereal genomics - sequencing of wheat genome

- Shot-gun sequencing (454 and Illumina)
- Assemble low-copy and genic sequences
- Establish virtual gene order
- Analyze genome structure and evolution
- Facilitate anchoring physical maps and positional cloning
- Provide sequences to the breeding community



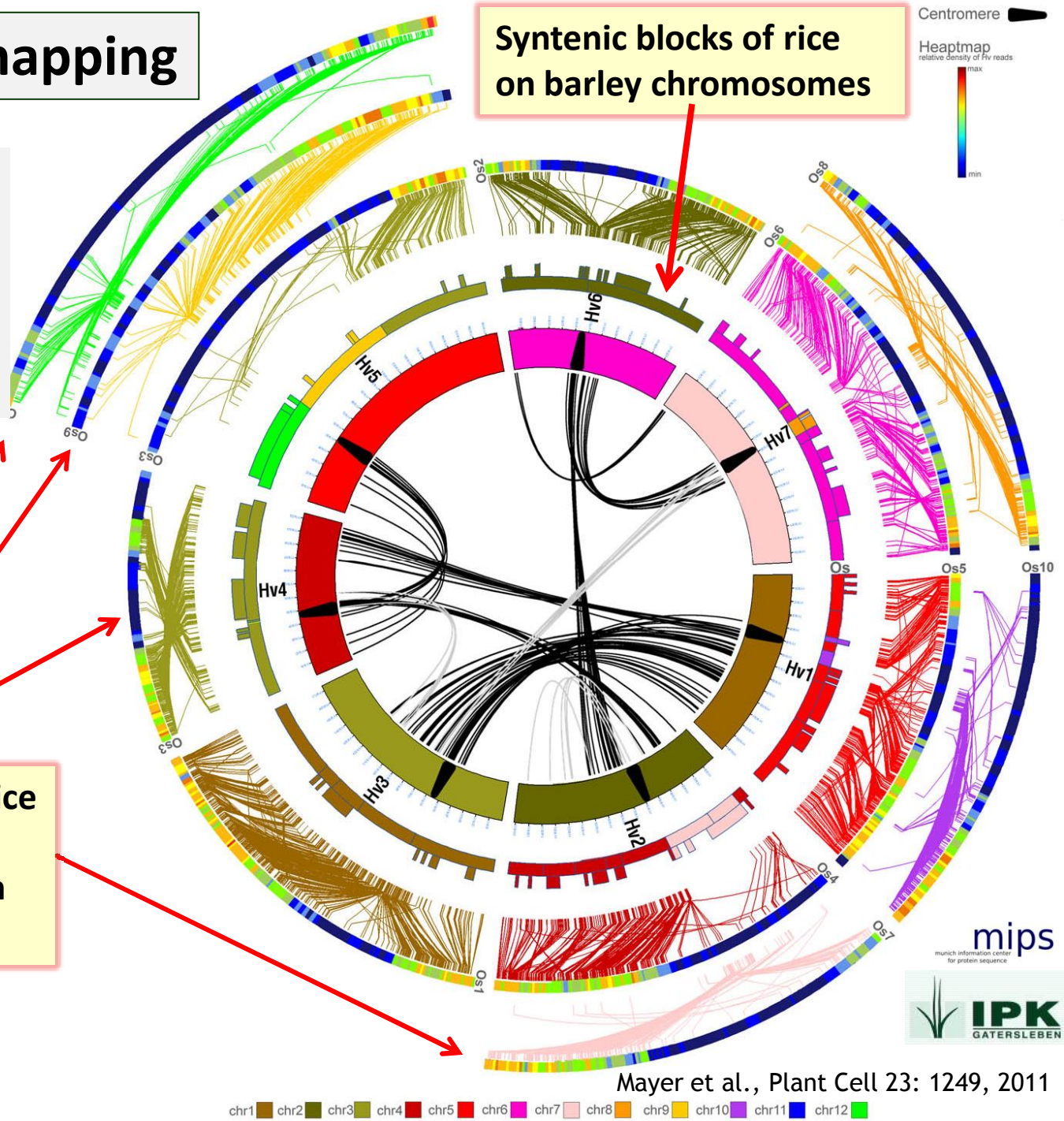
Graminor biogemma INRA Institute of Experimental Botany of the AS CR, v. v. i.

Barley genome mapping

24,700 non-redundant homologous genes were detected in barley using **genome zipper approach**

Syntenic blocks of rice on barley chromosomes

Pseudomolecules of rice linkage groups with syntenic blocks shown in yellow-red



mips
munich information center for protein sequence

IPK GATERSLEBEN

http://olomouc.ueb.cas.cz/

Mayer et al., Plant Cell 23: 1249, 2011

New materials and methods for plant breeding

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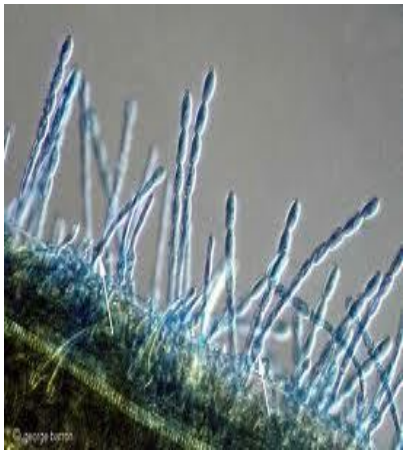
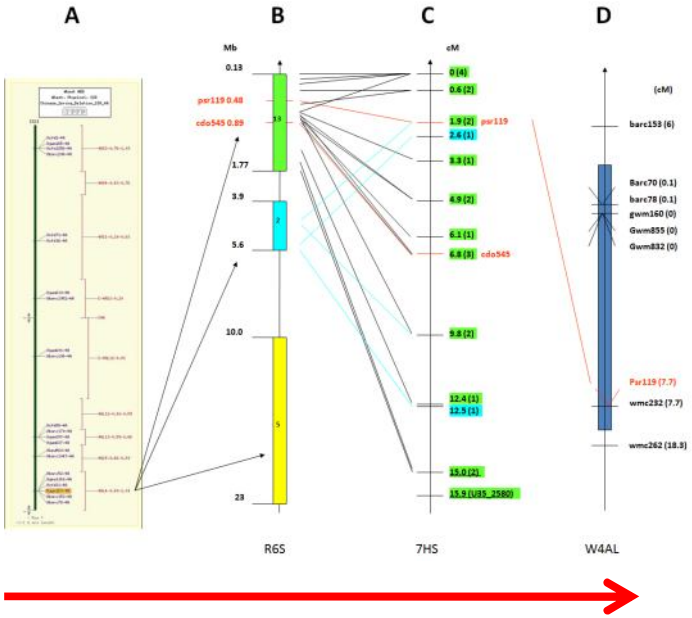
Positional gene cloning in wheat: resistance to powdery mildew



Infected wheat



Locus *QPm-tut-4A*

Resistant wheat

Fodder and amenity grasses

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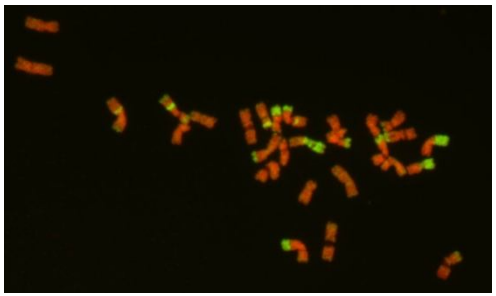
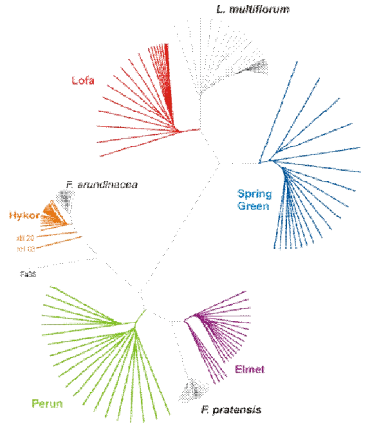
Karyotyping (Festulolium)



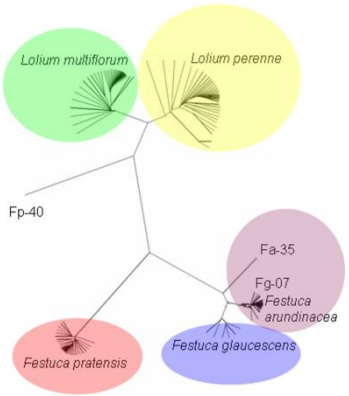
Newbred lines



DNA chip DArT

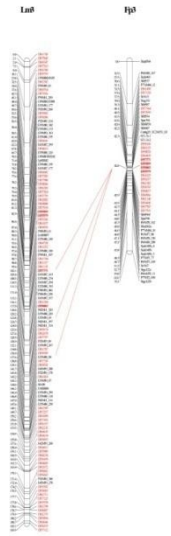
Diversity Arrays Technology Pty Ltd

Genetic variability studies



Genetic markers for breeding

Genetic mapping



The banana genome

nature

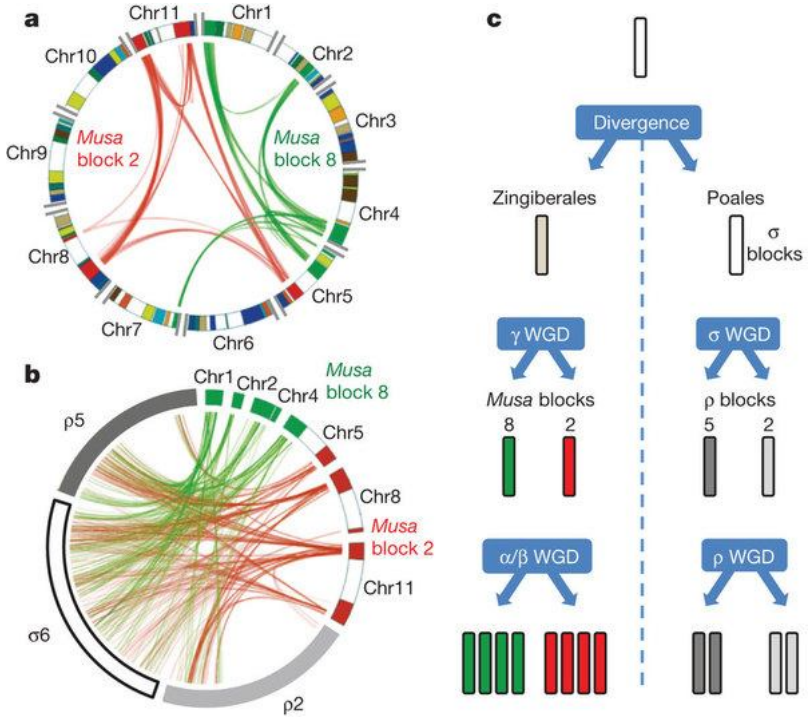
488, 213–217 (09 August 2012)

LETTER

doi:10.1038/nature11241

The banana (*Musa acuminata*) genome and the evolution of monocotyledonous plants

Angélique D'Hont[1]*, France Denoeud[2,3,4]*, Jean-Marc Aury[2], Franc-Christophe Baurens[1], Françoise Carreel[1,5], Olivier Garsmeur[1], Benjamin Noel[2], Stéphanie Bocs[1], Gaëtan Droc[1], Mathieu Rouard[6], Corinne Da Silva[2], Kamel Jabbari[2,3,4], Céline Cardi[1], Julie Poulain[2], Marlène Souquet[1], Karine Labadie[2], Cyril Jourda[1], Juliette Lengellé[1], Marguerite Rodier-Goud[1], Adriana Alberti[2], Maria Bernard[2], Margot Correa[2], Saravanaraj Ayyampalayam[7], Michael R. Mckain[7], Jim Leebens-Mack[7], Diane Burgess[8], Mike Freeling[8], Didier Mbéguié-A-Mbéguié[9], Matthieu Chabannes[5], Thomas Wicker[10], Olivier Panaud[11], Jose Barbosa[11], Eva Hribova[12], Pat Heslop-Harrison[13], Rémy Habas[5], Ronan Rivallan[1], Philippe Francois[1], Claire Poiron[1], Andrzej Kilian[14], Dheema Burthia[1], Christophe Jenny[1], Frédéric Bakry[1], Spencer Brown[15], Valentin Guignon[1,6], Gert Kema[16], Miguel Dita[19], Cees Waalwijk[16], Steeve Joseph[1], Anne Dievart[1], Olivier Jaillon[2,3,4], Julie Leclercq[1], Xavier Argout[1], Eric Lyons[17], Ana Almeida[8], Mouna Jeridi[1], Jaroslav Dolezel[12], Nicolas Roux[6], Ange-Marie Risterucci[1], Jean Weissenbach[2,3,4], Manuel Ruiz[1], Jean-Christophe Glaszmann[1], Francis Quétier[18], Nabila Yahiaoui[1] & Patrick Wincker[2,3,4]



Plant biotechnology

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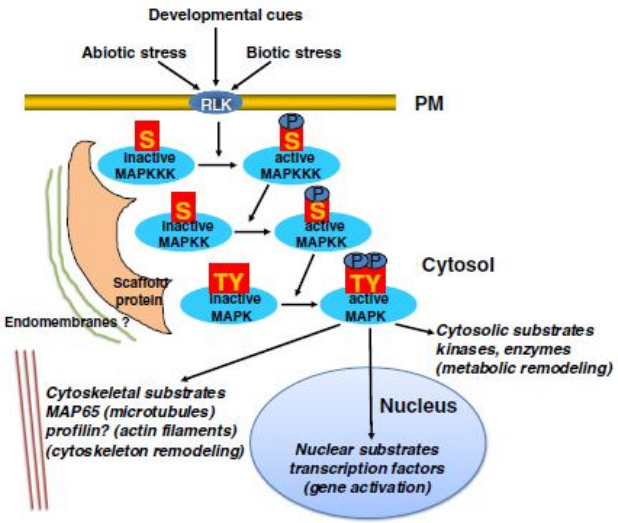
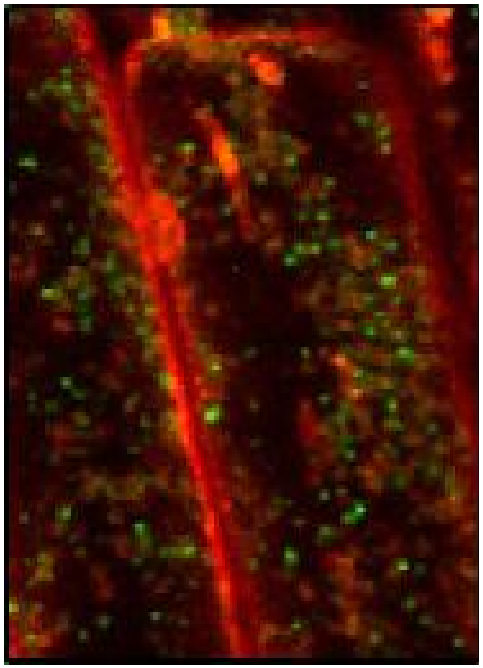
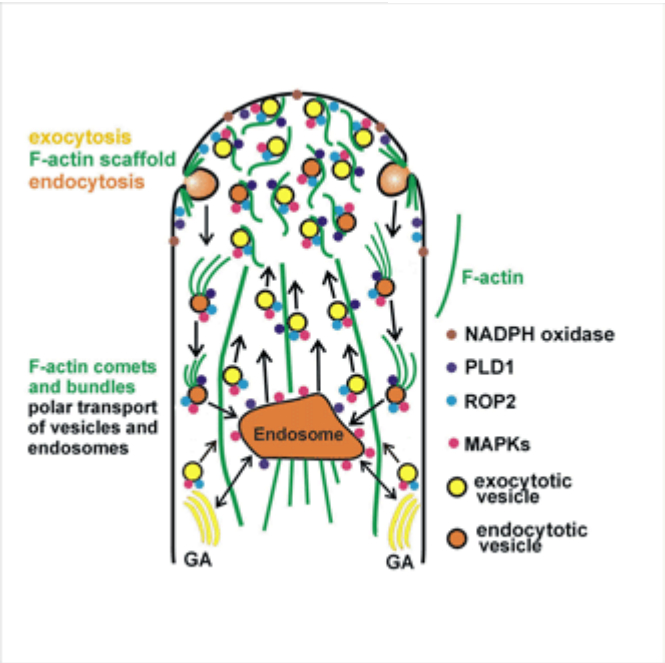
- Study of plant signalling networks
- Development of genetically modified crops
- Molecular farming

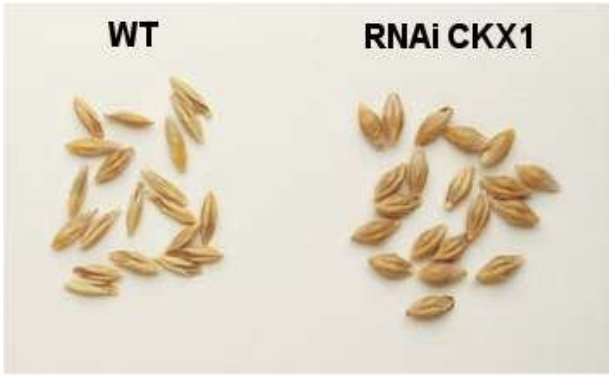


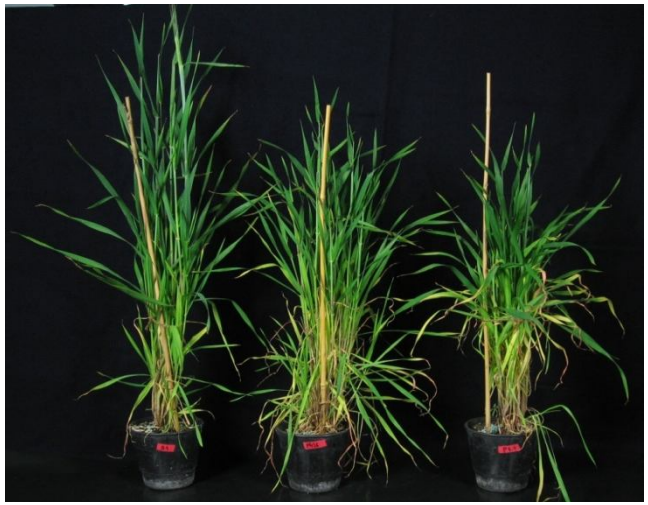




Genetic engineering of barley

Gene silencing of the enzyme degrading plant hormones cytokinins in grain increases yield





Larger roots formed by overexpression of cytokinin degrading gene – T2 generation under testing for draught tolerance

Molecular farming in barley

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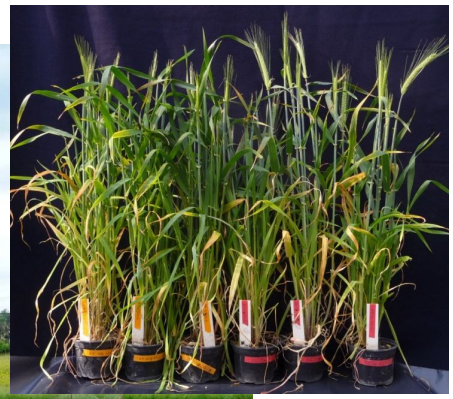
- Targeting gene expression to grain endosperm
- Production of custom peptides and proteins



Industrial collaboration on ergot

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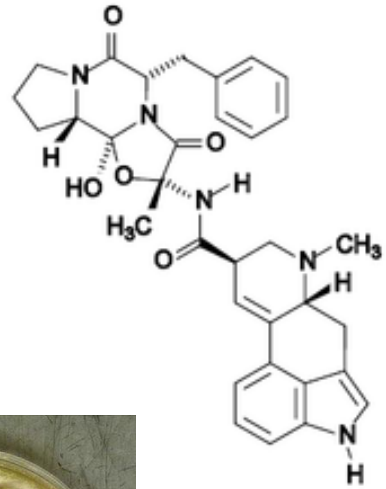
- Genetic modification of ergot - *Claviceps purpurea*
- Selection and modification of sterile rye
- Increased production of ergot alkaloids
- Collaboration with TEVA Czech Industries, Opava



Plant Genetic Resources at CRI

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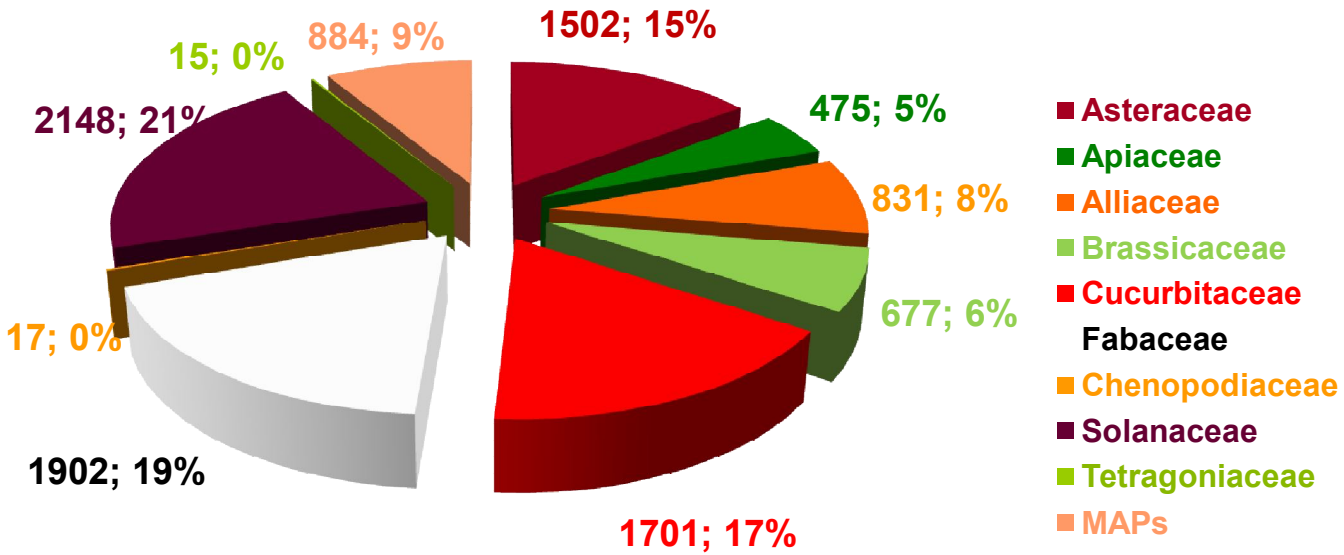
Vegetables – 9,268
Medical and Aromatic Plants - 884



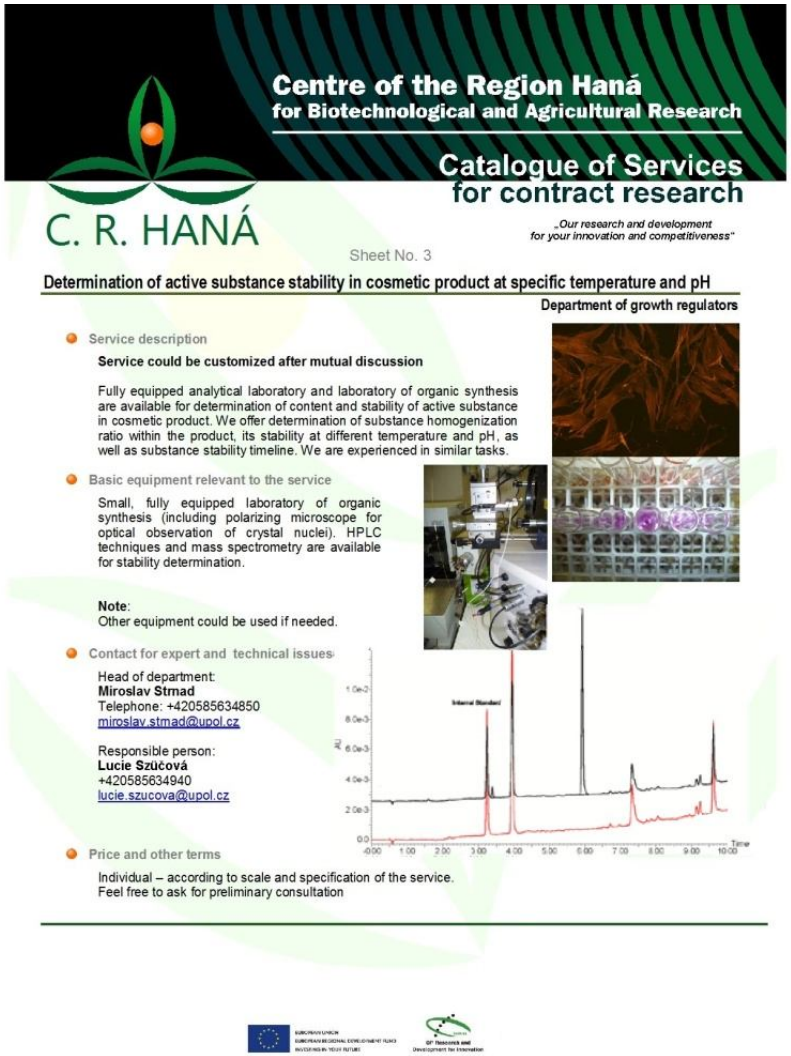
http://genbank.vurv.cz/genetic/resources

Contract research

- Range of specialized services provided in relation to current research programs, which can be chosen from standard offer or customized on demand

- Cooperation based on contracts or joint grant applications

- Collaboration with big companies (Syngenta, BASF, Nivea, Sumitomo, ChemapAgro) under CDA agreements



Centre of the Region Haná
for Biotechnological and Agricultural Research

Catalogue of Services
for contract research

„Our research and development
for your innovation and competitiveness"

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Sheet No. 3

Determination of active substance stability in cosmetic product at specific temperature and pH

Department of growth regulators

Service description

Service could be customized after mutual discussion

Fully equipped analytical laboratory and laboratory of organic synthesis are available for determination of content and stability of active substance in cosmetic product. We offer determination of substance homogenization ratio within the product, its stability at different temperature and pH, as well as substance stability timeline. We are experienced in similar tasks.

Basic equipment relevant to the service

Small, fully equipped laboratory of organic synthesis (including polarizing microscope for optical observation of crystal nuclei). HPLC techniques and mass spectrometry are available for stability determination.

Note:
Other equipment could be used if needed.

Contact for expert and technical issues

Head of department:
Miroslav Strnad
Telephone: +420585634850
miroslav.strnad@upol.cz

Responsible person:
Lucie Szűčová
+420585634940
lucie.szucova@upol.cz

Price and other terms

Individual – according to scale and specification of the service.
Feel free to ask for preliminary consultation

Contact information

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Centre of the Region Haná for Biotechnological and Agricultural Research

Šlechtitelů 813/21, 783 71, Olomouc – Holice, Czech Republic

Phone: +420 585 634 970, +420 585 634 971, +420 585 634 979

E-mail: projekty_eu@upol.cz; Web pages: www.cr-hana.eu

Ivo Frébort
Executive Director

Jaroslav Doležel
Scientific Director

Regional Branch Office of European Federation of Biotechnology for the Czech Republic


C. R. HANÁ
Olomouc Biotech 2013
Plant Biotechnology: Green for Good II
June 17 – 21, 2013

New premises

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to be open soon …