Institute of Plant Genetics and Biotechnology SAS

Overview of Research Activities 2012-2015

Assessment of IPGB, Nitra, Nov. 25, 2016

- **Basic data**

- **Scientific productivity**

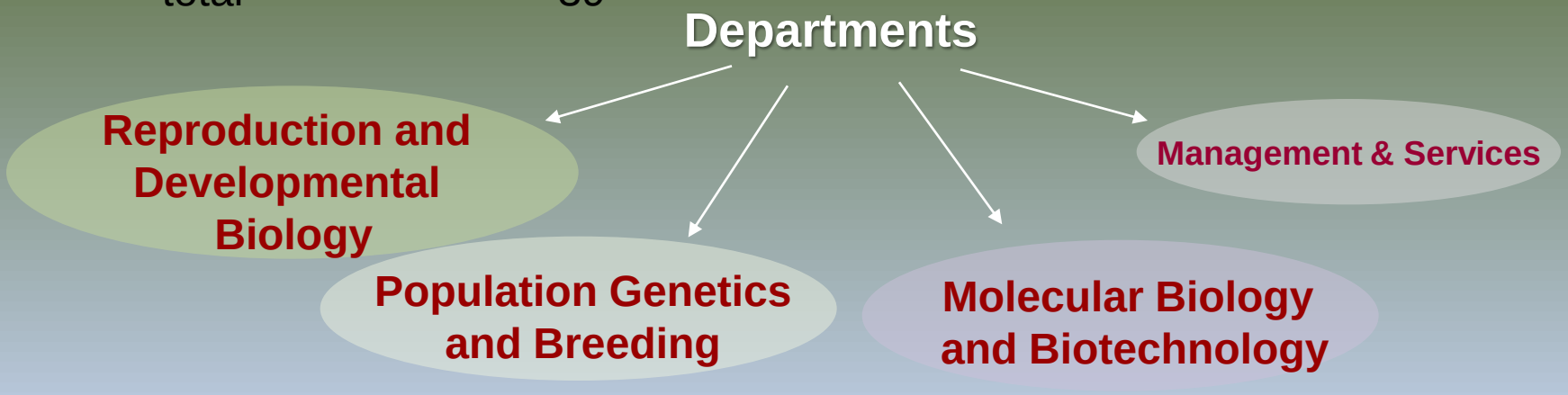
- **Social, cultural, and/or economic impact**

- **Future prospects**

  a) SWOT analysis
  b) Development potential

Basic data (Dec. 31, 2015)

Staff: researchers/PhD - 19/6
total - 39



Research fields:

- **Plant genetics** (population, ecological, breeding, etc.)
- **Reproduction biology** (*in situ* and *in vitro* embryogenesis, etc.)
- **Genetic engineering** (molecular biology, gene expression, etc.)
- **Stress biology** (drought, heavy metals, parasitic plants, radiation)
- **Plant proteomics** (radiation, allergens, embryogenesis, etc.)

Experimental material/plants:

- **Woody plants** (forest and small fruit species, etc.)
- **Model plants** (tobacco, arabidopsis, etc.)
- **Agricultural crops** (soybean, oilseed rape, maize, barley, flax, etc.)

Basic data

Major grant sources at the IPGB SAS during assessment period

Projects/funding	2012	2013	2014	2015	total
VEGA	7/53 613	8/62 018	7/60 430	6/55 019	231 080 € - 13
APVV	4/20 522	3/32 335	3/30 168	1/18 142	101 167 € - 5
EU SF	3/102 023	4/417 221	2/382 230	1/315 198	1 216 672 € - 4
COST	4/14 250	6/18 266	7/ 17 086	6/ 12 086	61 688 € - 10
7 FP	1/ 0	-	1/ 9 462	1/ 9 462	18 944 € - 2
Syngenta Biotechnology	45 010	-	-	-	45 010 € - 1

Salary budget	2012	2013	2014	2015	average
Institutional salary budget (thousands of €)	306,56	307,81	300,41	311,64	306,61
Other salary budget (thousands of €)	32,96	19,10	19,32	17,66	22,26

Scientific productivity

Publication outputs of the IPGB SAS during assessment period

Citations (without autocitations)	2011	2012	2013	2014	total
Web of Science / ISI	418	422	439	444	1723
SCOPUS	19	22	19	35	95
Other citations	25	33	29	27	114

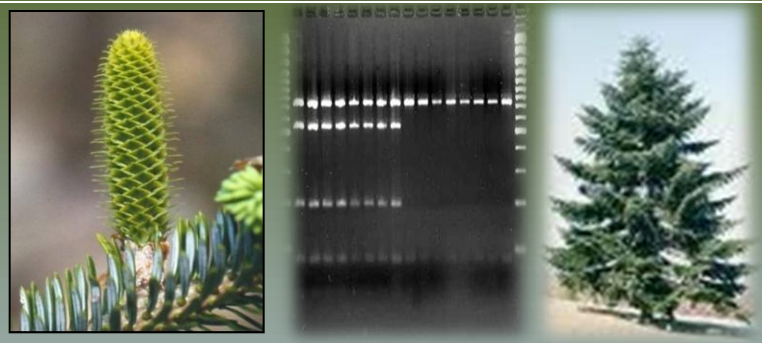
Progress in the outputs of the IPGB SAS among previous assessment periods

Research outputs	1995-1999	1999-2003	2003-2006	2007-2011	2012-2015
Book chapters	2	4	13	20	2
CC/WOS publications	43	56	70	71	69
Publications (other)	45	81	90	27	64
Abstracts (international)	118	139	142	135	117
Citations WOS, Scopus/other	176	575	867/ 167	1660/ 249	1818/114

Genetics

Genetics of woody plants:

- **population genetics**
- **breeding**: controlled pollination and hybridization



High importance for Slovak forestry!

Theoretical contribution:

Evolutionary relationships of conifer tree populations (*Abies*, *Pinus*) in Slovakia

Practical contribution:

Interspecific *Abies* hybrids (resistance potential) - permanent research plots

Valuable hybrid seeds for *in vitro* experiments (SE)

Mutation breeding:

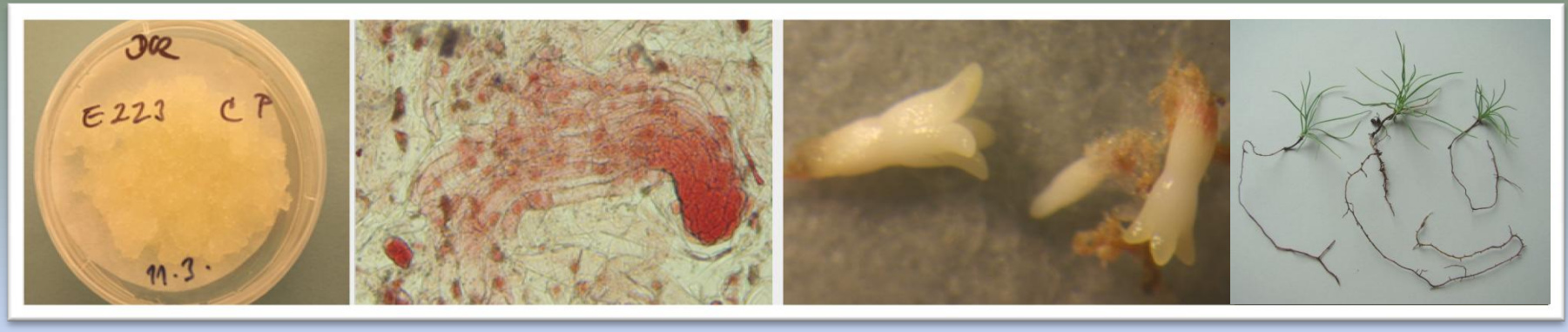
- amaranth

Green biotechnology – *in vitro* approaches

The only institute in SR – high international standart !

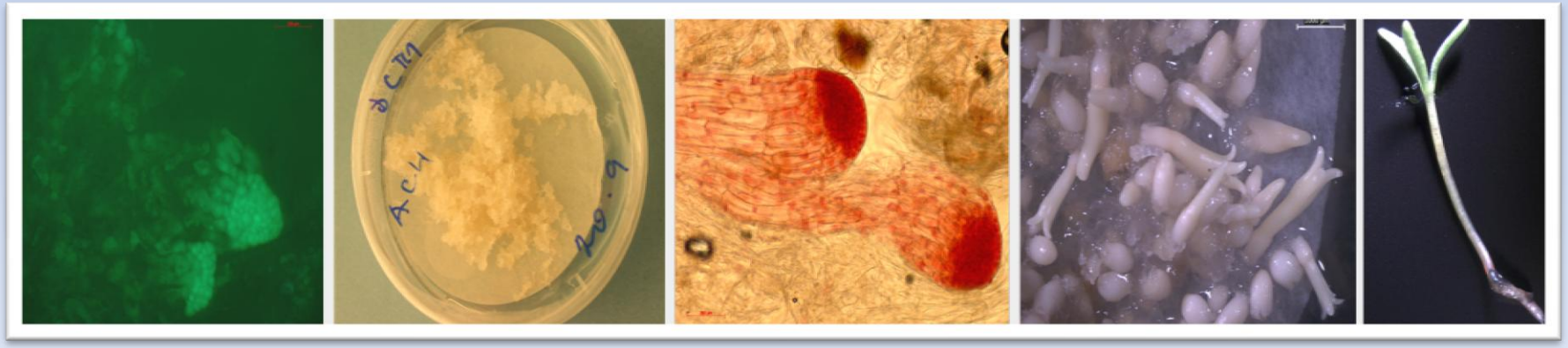
Micropropagation of coniferous plants:

- through somatic embryogenesis



Long-term preservation of embryogenic tissues:

- by cryo-conservation

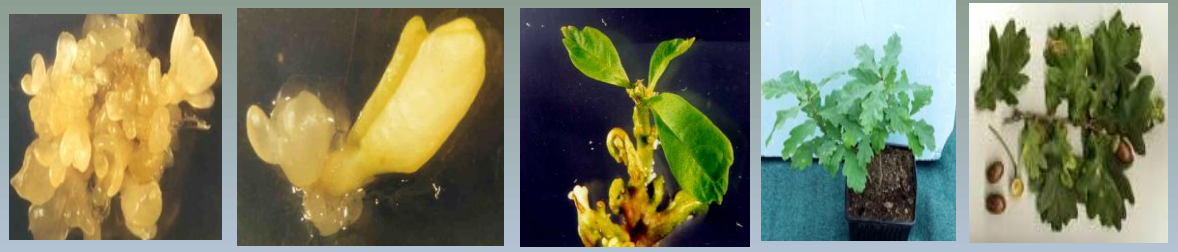


(Katholic University Leuven, Belgium)

Green biotechnology – strong national position

Plant micropropagation *in vitro*

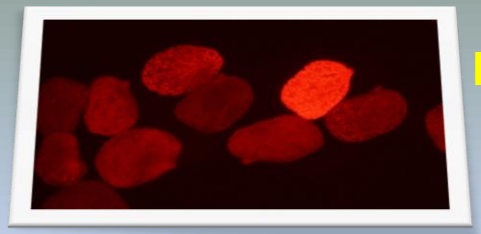
Large-scale propagation of high quality planting material

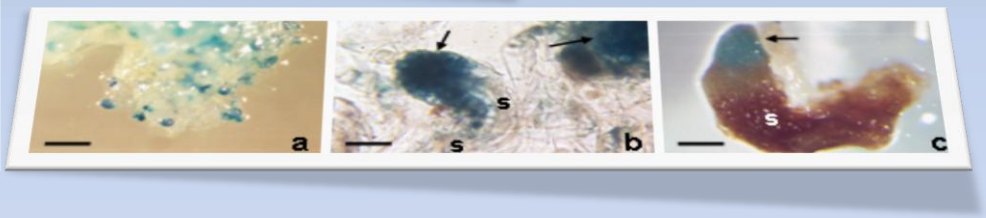


Green biotechnology

Genetic engineering:

- establishment of **transformation protocols** (tobacco, rape, flax, potato, woody plants, etc.)
- generation of **marker-free plants**
- **specific transgene expression**





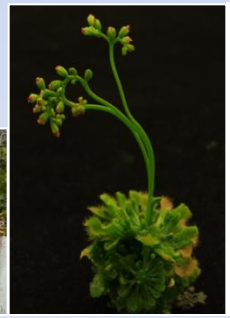
Environmental safety!

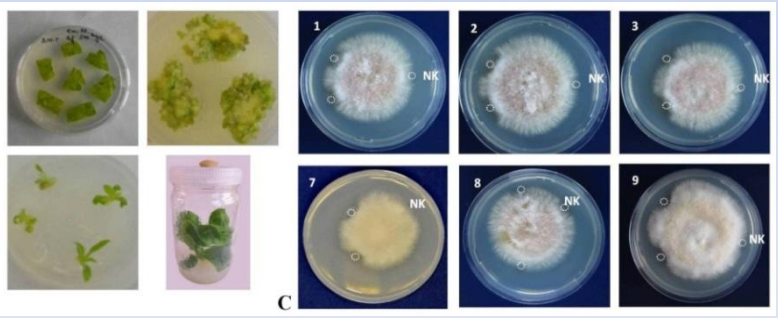
GMO acceptance!

Carnivorous plants:

- new sources of anti-fungal proteins
- chitinase and glucanase genes

Strong national position!

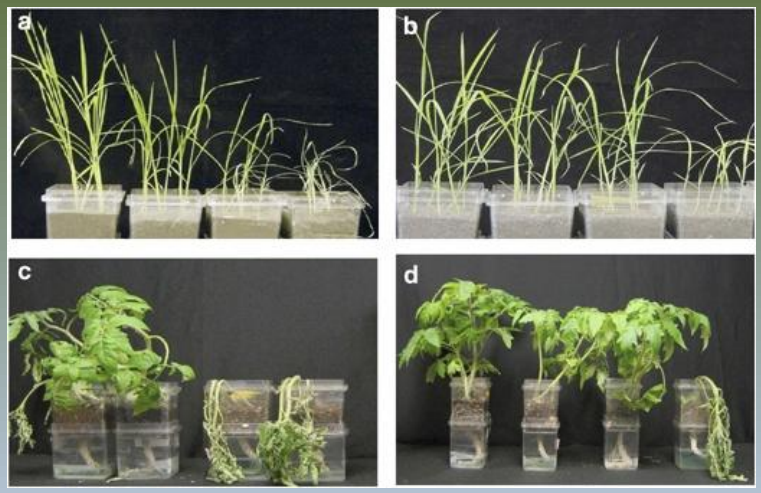




Stress response – agricultural practice

Abiotic stress:

- (wheat, soybean, etc.)
- **heavy metals**
- **drought**



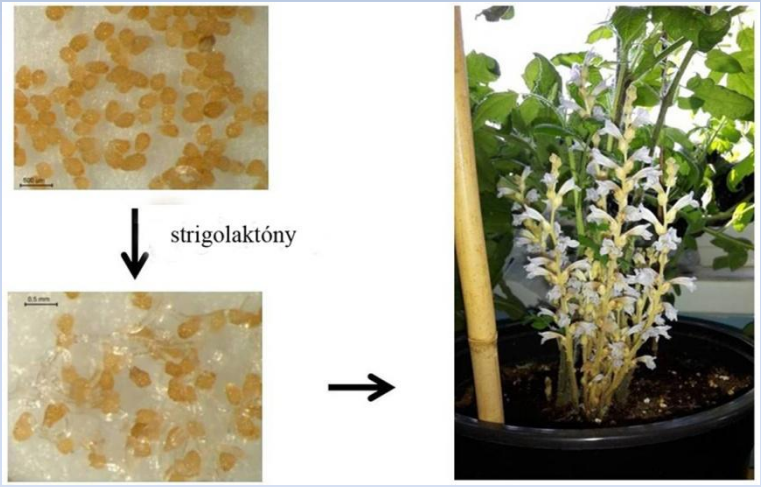
Genes of resistance:

- Marker Assisted Selection
  (Res. Inst. of Plant Production, Piešťany)

Biotic stress

- parasitic plants (Orobanchaceae fam.)
- strigolactons - inducing germination
  of parasitic plants
  (Wageningen UR, The Netherlands)

High importance for crop production!



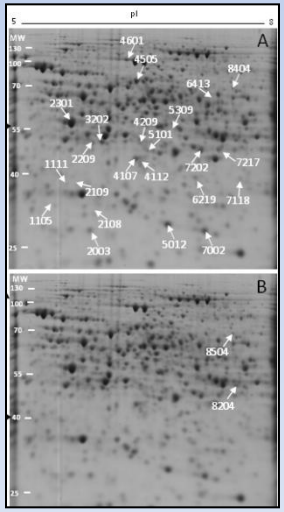
Strong international position ! The most cited publications!

Proteomics

Defence of plants against different types of stress:

- impact of radiation on plants – **Černobyľ** (Inst. Cell Biology and Genetic Engineering, Kyiv, Ukraine)

- **drought resistance and tolerance to heavy metals** (UK, Germany, CzR, Ukraine, Portugal, Russia, Belarus)
- **flooding** (Japan)
- **embryogenesis** (Taiwan)



Popularization of science:* *PR !!!

- responses in international media
- discussions and debates
- television and radio appearance

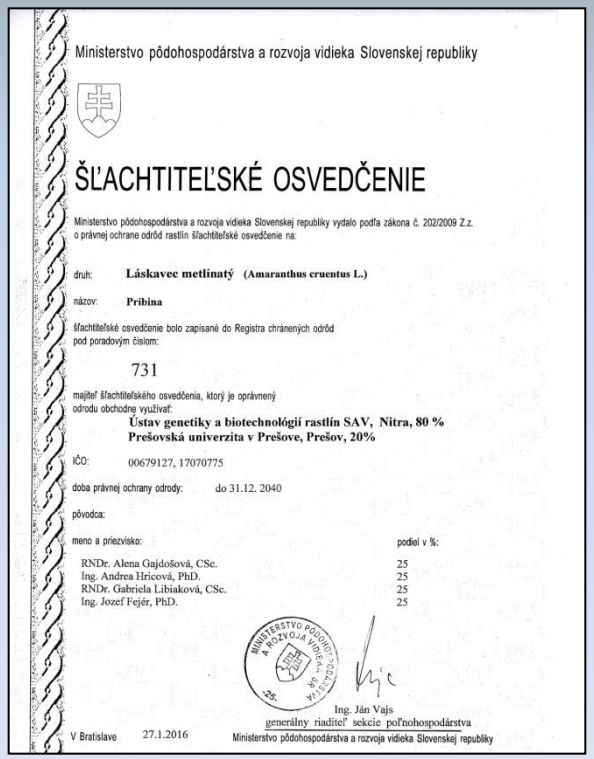
High international standart! Worldwide acclaim!!!

Social, cultural, and/or economic impact

Awards for IPGB SAS:

Breeder´s certificate – new amaranth variety „Pribina“

„Golden sickle“ AX 2015 - Ministry of Agriculture SR



Ministerstvo pôdohospodárstva a rozvoja vidieka Slovenskej republiky

ŠĽACHTITEĽSKÉ OSVEDČENIE

Ministerstvo pôdohospodárstva a rozvoja vidieka Slovenskej republiky vydalo podľa zákona č. 202/2009 Z.z. o právnej ochrane odrôd rastlín šľachtiteľské osvedčenie na:

druh: **Láskavec metlinatý (Amaranthus cruentus L.)**

názov: **Pribina**

šľachtiteľské osvedčenie bolo zapísané do Registra chránených odrôd pod poradovým číslom:

731

majiteľ šľachtiteľského osvedčenia, ktorý je oprávnený odrodu obchodne využívať:

Ústav genetiky a biotechnológií rastlín SAV, Nitra, 80 %
Prešovská univerzita v Prešove, Prešov, 20%

IČO: 00679127, 17070775

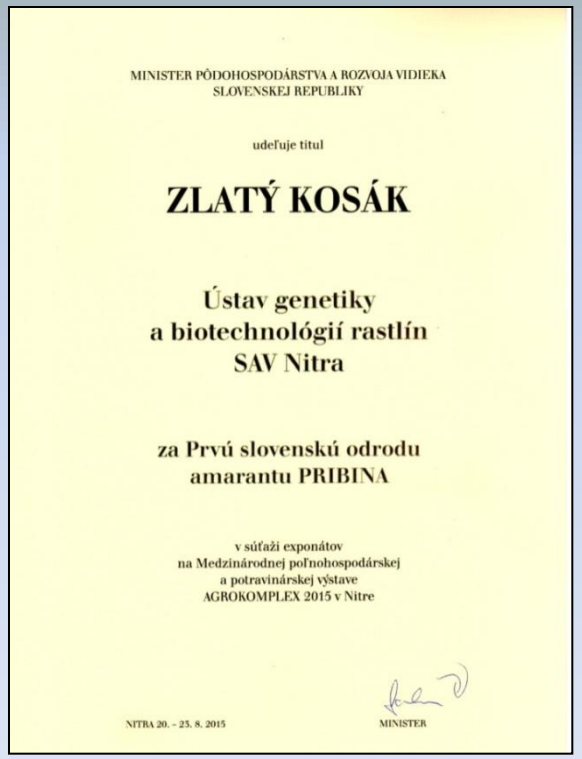
doba právnej ochrany odrody: do 31.12. 2040

pôvodca:

meno a priezvisko:	podiel v %:
RNDr. Alena Gajdošová, CSc.	25
Ing. Andrea Hricová, PhD.	25
RNDr. Gabriela Libiaková, CSc.	25
Ing. Jozef Fejér, PhD.	25

Ing. Ján Vajs
generálny riaditeľ sekcie poľnohospodárstva
Ministerstvo pôdohospodárstva a rozvoja vidieka Slovenskej republiky

V Bratislave 27.1.2016



MINISTER PÔDOHOSPODÁRSTVA A ROZVOJA VIDIEKA SLOVENSKEJ REPUBLIKY

udeľuje titul

ZLATÝ KOSÁK

Ústav genetiky
a biotechnológií rastlín
SAV Nitra

za Prvú slovenskú odrodu
amarantu PRIBINA

v súťaži exponátov
na Medzinárodnej poľnohospodárskej
a potravinárskej výstave
AGROKOMPLEX 2015 v Nitre

NITRA 20. - 23. 8. 2015

MINISTER

Social, cultural, and/or economic impact - infrastructure

Project of EU SF – AgroBioTech (945 595 €)

New laboratories and equipment

Social, cultural, and/or economic impact - cooperation

International:

Austria	- Austrian Institute of Technology, Tulln
Belgium	- Katholieke Universiteit, Leuven,
Czech Rep.	- Institute of Experimental Botany, CAS, Prague
Poland	- Institute of Plant Physiology, PAS, Krakow
	- Institute of Dendrology, PAS, Kornik
Serbia	- Fruit Research Institute, Čačak
Ukraine	- Institute of Cell Biology and Genetic Engineering NAS, Kyiv
USA	- Missouri University
Taiwan	- National Taiwan University, Taipei

National:

Universities (SAU, CFU, CU, TUZVO, PU) – PhD programmes, teaching, research

Resort institutions (RIPP, Piešťany; breeding stations) – research

Companies - collection/providing of plant material (forestry comp./ nurseries, breeders)
- collection/exchange of plant material/ protocols (Wellberry)

SWOT – Strengths: PhD study + higher qualification level

Accredited PhD programmes

PhD programmes	No.	University
Genetics	4. 2. 4	Faculty of Science CU, Bratislava
Biotechnology	5. 2. 25	Faculty of Science CU, Bratislava Faculty of Biotechnology and Food Science, SAU Nitra
Agrobiotechnology	6. 1. 18	Faculty of Biotechnology and Food Science, SAU Nitra

Stefan Schwarz fellowship

Ing. Martin Jopčík, PhD

Mgr. Katarina Klubicová, PhD

Ing. Eva Boszorádová, PhD

Mgr. Martin Hajduch, DrSc.

RNDr. Terézia Salaj, DrSc.

Committee for defending of DrSc thesis: A. Kormuťák and J. Salaj

- Botany (010601)
- Plant Physiology (010606)

SWOT – Strengths: International contacts/cooperation

International: Austria, Belgium, Czech Rep., Israel, Japan, The Netherlands, Ukraine, USA, Taiwan...

National: Comenius Univ., BA; SAU Nitra; CFU Nitra; TUZVO Zvolen, PU Prešov;
+ Inst. of Virology SAS, BA; Inst. of Chemistry, BA;
Res. Inst. Plant Production Piešťany;
breeding stations, forestry nurseries, SMEs...

International exchange of researchers:

- from abroad: Bulgaria, Canada, Egypt, France, India, Poland, Serbia, Taiwan,Turkey, Ukraine ... (53)

- from IPGB: Austria, Belgium, Czech Rep., Poland, Portugal, Roumania, Serbia, Switzerland, Taiwan, The Netherlands, USA ...(23)

SWOT - Weaknesses

Reducing the number of researchers: 2012 - 23
2015 - **19**

Poor age structure of researchers:

Age structure (years)	< 31	31-35	36-40	41-45	46-50	51-55	56-60	61-65	> 65
Male	1	2	0	1	0	0	0	1	1
Female	0	0	1	2	7	0	2	1	0

Reducing the wage bill: valorisation
upskilling
treatment by law (salary levels)

Employment of post-docs:

- PhD study 2012-2015: 8 students
- engagement: 1 post-doc

- reducing the number of researchers **= less acquired projects!!!**

?

Future prospects - Development potential

To focus on:

Genetics - breeding activities (high importance for agricultural practice!)

Green biotechnology - *in vitro* approaches/SE woody species
(the only institute in SR!)

Genetic engineering - GM of important crops
- environmentally friendly transgenic plants
- exploring of new genetic resources for biotechnology
- public acceptance of GMO

Stress physiology/ MolBio - marker genes of abiotic stress
- life cycle of parasitic plants (biotic stress)

Higly requested by agricultural practice !

Proteomics - heavy metals/radiation adaptation

Global importance!

January 1, 2017 - merging into bigger body:
„Plant Science and Biodiversity Centre SAS“
(Institute of Botany SAS and IPGB SAS)

Thank you for your attention