Centre of Excellence
for Biodiversity and Molecular Plant Breeding
(CoE CroP-BioDiv): Objectives and Activities

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2014/2015

- 13 Centers of Excellence have been established

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<th>No.</th>
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<td>CoE for Advanced Materials and Sensing Devices</td>
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<td>CoE for Quantum and Complex Systems and Representation of Lie Algebras</td>
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<td>CoE for Biodiversity and Molecular Plant Breeding</td>
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- established for a period of five years
- status of the CoE may be prolonged for the next five years
THE PROJECT

2017
- call for projects
  financed by Ministry of Regional Development and EU Funds
  (European Structural and Investment Funds;
  Operational Programme Competitiveness and Cohesion 2014/20)
- for 10 CoE from a STEM field
- overall budget: ~50,000,000.00 EUR
- project
  Biodiversity and Molecular Plant Breeding
  Coordinated by: CoE CroP-BioDiv
  Start of project : 01/01/2018
  Duration: 5 years
  Budget: ~5,000,000.00 EUR
OBJECTIVES

Conservation of Plant Genetic Resources >> increase the benefits
Phenotyping >> high-throughput phenotyping (HTP) platforms
Genotyping >> next-generation sequencing (NGS) techniques
Bioinformatics >> genome-wide association studies (GWAS)
Dissemination >> workshops, summer schools
1 CONSERVATION OF PGR

Objective:
Increase of benefits arising out of use of plant genetic resources for food and agriculture

Background:
National Programme for Conservation and Sustainable Use of PGRFA
- numerous collections / limited budget

Tasks:
1. Further characterization and evaluation of accessions on agronomic, biochemical and genetic levels
2. Create a strong link between germplasm collections, scientific research and breeding programmes
Objective:
Apply novel phynotypic tools for the analysis of plant traits

Background:
- research infrastructure: many small research groups, underutilized equipment, obsolete technology
- new solutions: high-throughput phenotyping

Tasks:
1. Optimization of phenotyping protocols
2. Establish links with key institutions possessing infrastructure for high-throughput phenotyping
3 GENOTYPING

Objective:
Introduce novel genotyping methods

Background:
- research infrastructure: many small research groups, underutilized equipment, obsolete technology
- new solutions: next-generation sequencing techniques

Tasks:
1. Optimization of genotyping protocols
2. Evaluate and compare new genotyping methods according to the specific needs
Objective:
Implement novel statistical methodology

Background:
- hundreds of PCs; underutilized facilities at the University Computing Centre (SRCE) in Zagreb
- new solutions: genome-wide association studies (GWAS)

Tasks:
1. Relocate the data management and analysis processes from servers and PCs to computer clusters
2. Develop pipelines for big data bioinformatics
5 DISSEMINATION

Objective:

Communicate the activities of the CoE

Background:

- small and disconnected research groups
- ineffective transfer of knowledge
- general public: misconceptions about plant breeding

Tasks:

1. Academia: scientific papers, workshops, summer schools, scientific conference
2. Farmers and entrepreneurs in agriculture: joint activities, round tables
3. General public: popular articles, internet, radio, TV
MODEL PLANT SPECIES

Major Crops
- Maize
- Wheat
- Soybean

Traditional Crops
- Grape vine
- Olives

Promising Crops
- Brassicas
- Alliums
- Common bean
- Dalmatian pyrethrum
- Dalmatian sage
1 MAJOR CROPS

- maiz, wheat, soybean

**Background:**
- plant breeding programmes based on classical breeding methods

**Goal:**
- introduction of molecular breeding methods
- next-generation sequencing; GWAS
- traits: physiological traits
  quality traits
  resistance traits
Molecular data: DArTs
Statistical analysis: FCA

Country:
- Croatia
- Denmark
- France
- Germany
- Hungary
- Sweden
- United Kingdom

Pannonian Wheat Panel
2 TRADITIONAL CROPS

- grape vine, olives

Background:
- numerous traditional cultivars
- nursery production

Goal:
- detailed characterization of traditional cultivars (homonymy, synonymy, intracultivar diversity)
- introduction of molecular markers techniques in nursery production
- olives: phenotyping/genotyping of wild olive genetic resources
Molecular data: SSRs
Statistical analysis: FCA

e.g. OLIVES

Piculja
Mrčakinja

Southern Adriatic
Northern Adriatic
genuine wild olives
cultivars
feral olives
Genetic signatures of domestication

P01 Wild: Brijuni
P02 Wild: Pag
P03 Wild: Hvar
P04 Wild: Lastovo
P05 Wild: Pelješac
P06 Domesticated: Cultivars
3 PROMISING CROPS

- Brassicas/Alliums, common bean, Dalmatian pyrethrum/sage

Background:
- no breeding programme
- richness of plant genetic resources

Brassicas: traditional cultivars (collard greens: *B. oleracea* var. *acephala*)
  wild relatives (*B. incana, B. botterii, B. cazzae, B. mollis*)

Alliums: traditional cultivars (onion, garlic, shallot...)

Common bean: traditional cultivars

Dalmatian pyrethrum/sage: wild populations

Goal:

Brassicas/Alliums: biochemical/genetic analyses; phylogeny

Common bean: QTL for bioactive nutrient content

Dalmatian pyrethrum: population genetics; pyrethrins

Dalmatian sage: population genetics; chemotypes
Molecular data: SSRs
Statistical analysis: *structure*

Ecological niche modelling
Demographic history
Centre of Excellence for Biodiversity and Molecular Plant Breeding (CoE CroP-BioDiv)

Please visit: http://biodiv.iptpo.hr