Utilization of Czech collection of wheat genetic resources in breeding

Dotlačil L., Stehno Z., Faberová I., Hermuth, J.
Crop Research Institute Praha, Czech Republic

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Collection of wheat genetic resources

- Component of the Czech National Programme on Plant Genetic Resources
- 31 wheat species according to Dorofeev classification
- 10.7 thousand *Triticum* spp. accessions + 1.1 thousand wild relatives
- Winter forms - 60 %
Collection of wheat genetic resources

- **Documentation**
  - and/or in EURISCO [http://eurisco.ecpgr.org](http://eurisco.ecpgr.org)
  - Evaluation data - 72.2 % accessions - different extent
  - Pedigree - 80% bred cultivars
  - Almost completely stored - 97.7 % accessions
  - MTA based providing of samples
Characterization & Evaluation

- **Multiplication and preliminary evaluation**
  - Choice of valuable materials
    - (accession number - ECN)

- **Evaluation (basic) - all GR**
  - Non-replicated field trials in 2-3 years, lab tests
    - (descriptor list, check cultivars)
Characterization & Evaluation

- **Evaluation (advanced) - selected GR**
  - Replicated field trials (usually multi-site, 2-3 years), lab tests, characterization of GR, descriptor list + database of experimental data, molecular traits

- **Study of genetic diversity and choice of donors for users**
  - Research projects (often jointly with users)
Rationalization of wheat collections

- Core collection - to gather maximum of existing genetic diversity of entire collection in much smaller extent of accessions
Core collection

- General approach
  - clustering - maximize the variation between clusters and minimize the variation within clusters
  - precondition – reliable information on decisive parameters
Czech wheat core collections

- Winter x spring – different growing practices
- Parameters used
  - morphological and agronomical data
  - protein and DNA markers
  - results of pedigree analyses
Winter wheat core collection

- Entire collection
  - 5,857 accessions
  - evaluation data – 69 %
  - pedigree - 55.5 %
Winter wheat core collection

- Core collection development – procedure 1/2
  - Pedigree analysis (Martynov et al. 2003)
  - “Candidate” accessions
    - passport and evaluation data
    - HMW-Glu subunits
    - curator’s experience
  - 426 accessions selected
Winter wheat core collection

- Core collection development – procedure 2/2
  - DNA markers (SSR) in 426 accessions
  - close genetic distances - 74 accessions excluded
  - accessions with rare HMW-Glu alleles added

- Final core collection of winter wheat
  - 380 accessions
  - 6.5 % of the entire collection
Spring wheat core collection

- Entire collection
  - 4,252 accessions
  - evaluation data – 90%
  - pedigree - 51%

- Core collection development – procedure - as in winter wheat

- Final core collection of spring wheat
  - 184 accessions
  - 4.5% of the entire collection
Wheat core collection(s)- further steps

- Open-ended process
  - Characterization & Evaluation of new accessions
  - Additional evaluation/characterization (new demands of users and evaluation opportunities)
  - International/global core collections (e.g. AEGIS)

- Massive employment of molecular markers
  - Co-ordinated use of markers
  - Cheap and reliable technologies

- Collaborative approach (genotyping, phenotyping, needs of users)
Access to wheat genetic resources

- in harmony with ITPGRFA
- restrictions - technical circumstances
  - limited stock
  - regeneration needed
- 0.7 – 1.7 thousand wheat accessions provided annually
- national MTA → SMTA
Use of wheat genetic resources

Utilization types - wheat samples distributed from the genebank 2005-2011 (6341 samples)

- INST 73%
- BREED 7%
- REGEN 7%
- UNI 13%
- EXPO 0%
- FARM 0%
Use of wheat genetic resources

- Use in agricultural practice
  - to increase diversity within species
  - to extend spectra of cultivated wheat species
Increasing diversity within wheat species

- **Bread wheat** (*Triticum aestivum*)
  - advanced cultivars - required
  - landraces
    - selected lines
    - possible source of high quality
  - wild relatives – e.g.
    - *Triticum monococcum* – source of powdery mildew resistance
    - bread wheat cultivar Vlasta
Extending spectra of cultivated wheat species

- Users – small and/or organic farmers
- Wheat species
  - Spelt wheat (*Triticum spelta*) – developed 'spelt programme'
    - registered cultivar of winter spelt Rubiota
  - Emmer wheat (*T. dicoccon*)
    - legally protected cultivar Rudico
  - Einkorn wheat (*T. monococcum*)
    - evaluation and research
Use of wheat genetic resources - promotion

- Intensive use – preconditions
  - Information accessibility (on-line catalogues)
  - Seed samples availability (viable and healthy seeds – high lot quality)
Information accessibility

- **Passport data**
  - database of genetic resources in Czech collections
    http://genbank.vurv.cz/genetic/resources/
  - European wheat database
    http://genbank.vurv.cz/ewdb/

- **Pedigree data**
  - wheat pedigree and identified alleles database
    http://genbank.vurv.cz/wheat/pedigree/
Information accessibility

- **C & E data**
  - Provided annually to breeders
  - Data available on request
  - GRIN- Global deployment
Seed samples availability

- Almost completely available
- Seed quality
  - Improved storage conditions
Wheat samples distribution

Distribution of wheat samples 1995-2011
(total: 12 352 distributed samples)

Year

- **domestic - 63%**
- **foreign - 37%**
Thank you for your attention