Utilization of Czech collection of wheat genetic resources in breeding

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

EUCARPIA, European Plant Genetic Resources Conference

Wageningen, The Netherlands April 5-7, 2011

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
  - **Passport data** - Catalogue Czech Crop Collections **EVIGEZ** http://genbank.vurv.cz/genetic/resources/ and/or in **EURISCO** 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 allels 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

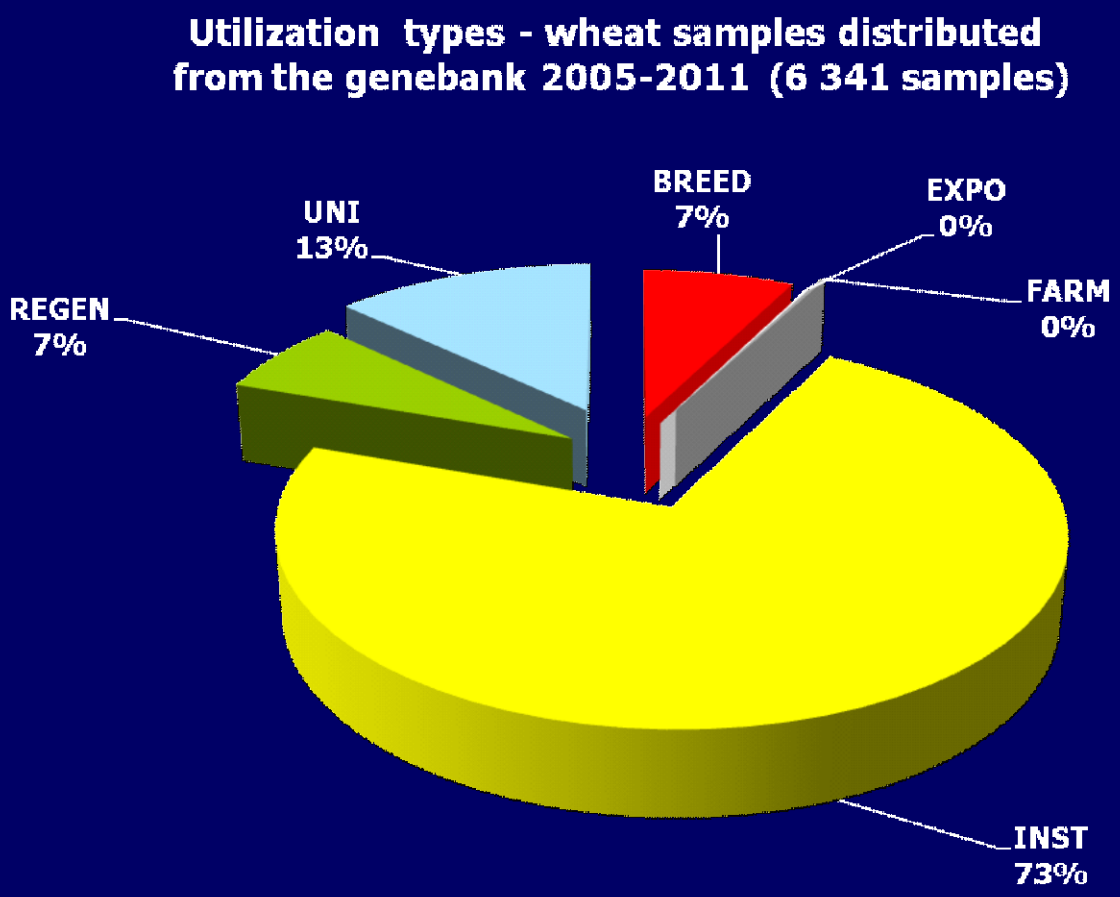
Wheat core collection(s)- further steps

- 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



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


Výzkumný ústav rostlinné výroby Praha – Ruzyně
Výzkumný a šlechtitelský ústav obilnářský Kroměříž

KLASIFIKÁTOR
КЛАССИФИКАТОР
DESCRIPTORS LIST

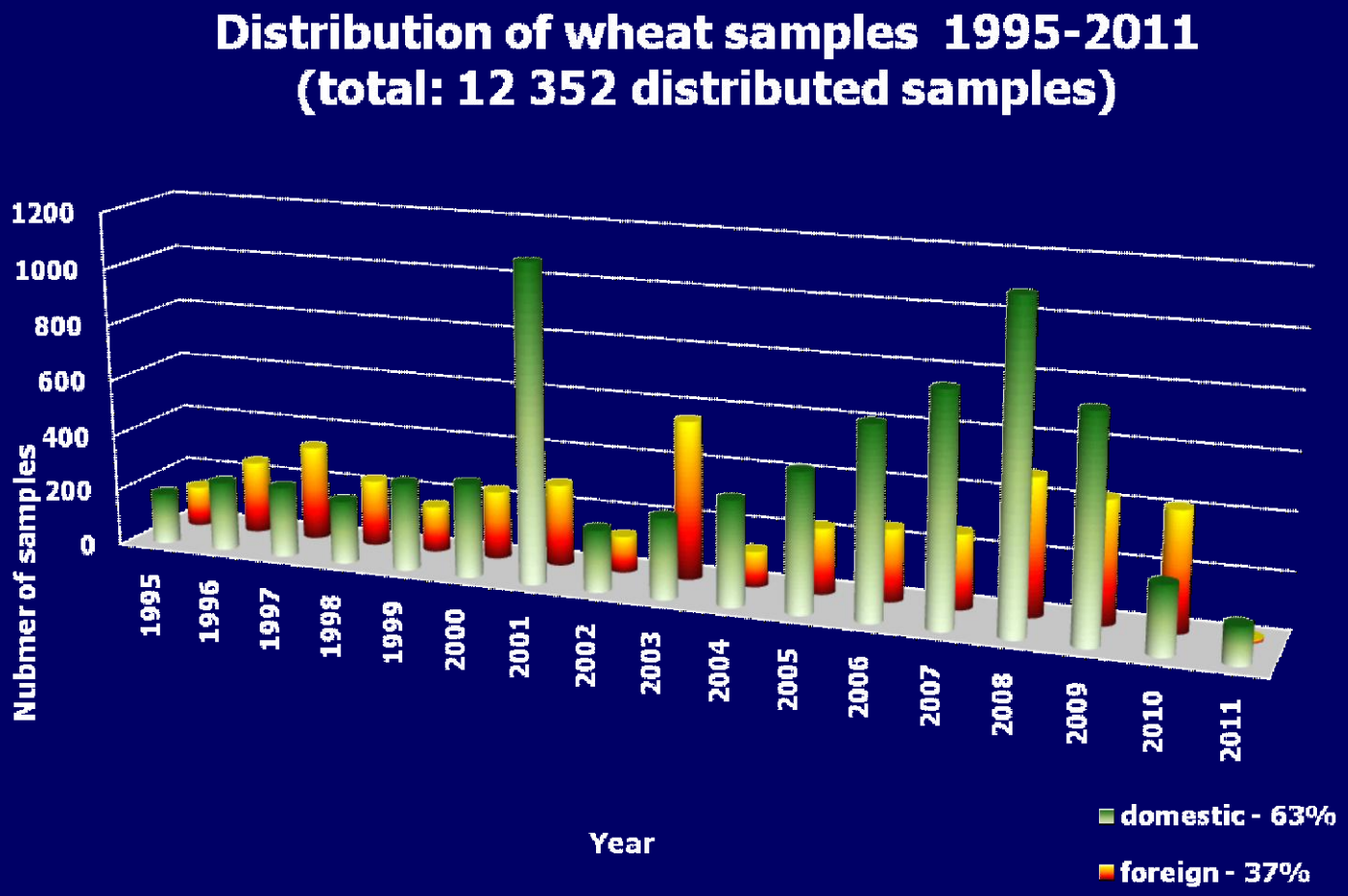
genus TRITICUM L.

Praha, 1985

Seed samples availability

- Almost completely available
- Seed quality
  - Improved storage conditions

Wheat samples distribution



Thank you for your attention