

## Grain legumes collection in the Czech Republic

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### Holders

Institutions dealing with grain legumes collections in the Czech Republic:

- 1) AGRITEC, Research, Breeding & Services, Ltd., Šumperk, holding the collection of grain legumes (*Pisum*, *Vicia*, *Phaseolus*, *Glycine*, *Lupinus*, *Lens* and *Cicer*)
- 2) Research Institute of Crop Production, Praha, workplace Olomouc maintaining collection of grain legumes used as vegetables (*Pisum* /garden pea/, *Vicia faba*, *Phaseolus*).
- 3) Research Institute for Fodder Crops, Ltd. Troubsko, holding the collection of fodder legumes (*Lupinus*, *Vicia*, *Cicer*, *Lathyrus*).

### Documentation

Passport and evaluation data of grain legumes collections are part of EVIGEZ, the national information system provided by the Research Institute of Crop Production (RICP), Gene Bank, Praha-Ruzyně. The passport data are available at URL <<http://www.genbank.vurv.cz/genetic/resources/>>.

The list of genuses, status and evaluation data are documented in Table 1. The actual collections status consists passport data of 4 710 accessions and evaluation data for 82% of items have been entered into the information system by the holders of the collections. Accessions of all the genera are evaluated in the field in randomized complete block and three years results are recorded into the database. Descriptor lists or lists of minimum descriptors for all cited crops are available and were cited in previous report (Hýbl 2002).

**Table 1.** Status of grain legumes collection in the Czech Republic by 30. 9. 2007

(MS Excel 00)

### Conservation and utilization

The recent status of conservation and distribution of grain legumes is given in Table 2.

All the accessions are conserved in *ex situ* collections. 4 425 and 1 200 accessions have been stored in the active or base collection under the control conditions of the Gene Bank at RICP Praha respectively. Safety duplication in cooperation with the Slovak Gene Bank were organized; about 1.5% of the stored accessions have been safety-duplicated. Total 304 and 378 accessions was distributed by the Gene Bank and AGRITEC for research purposes in 2007 and 2006.

Two joint collection missions and several individual collecting activities were organized in the Czech Republic during 2006 – 2007. The collecting mission „Novohradské hory“ was organised in 2006 and two seed samples of wild *Lathyrus* ssp. and one sample of *Lupinus polyphyllus* were gathered. The collecting expedition „Southern Moravia“ was organised in 2007 and altogether 5 accessions of wild *Lathyrus* and *Vicia* species were collected.

Czech partners also participated in 3 international collecting missions: to Slovakia (Polana region, 2007) and to Slovenia (Koroško region, 2006 and Bela Krajina region, 2007). All the expeditions to Slovakia and Slovenia were rich in collecting cultivated *Phaseolus* spp. (62 samples from Slovakia and 31 from Slovenia). Also *Vicia faba*, *Pisum sativum* and *Lupinus albus* were gathered. Among wild species mostly the seed samples of *Vicia* and *Lathyrus* ssp. were collected.

**Table 2.** Storage by type of collection and distribution by 30. 9. 2007

(MS Excel 00)

## Regeneration

The regeneration process of the active collection was finished in 2005. New entries and accessions with limited seed amount are regenerated only. New entries are multiplied in glasshouse and afterwards in field conditions together with evaluation process. Accessions with limited seed amount are multiplied in the field trials and after harvest the seeds are separated, dried, cooled and stored in the glass jars. Cross-pollinated species are kept in space isolation; self pollinated crops in normal plot design. Vetches are regenerated in the field conditions in the mixture with cereals, because of the lodging susceptibility. Winter forms are sown with *Triticale* and spring forms with spring wheat. Field and fodder peas are regenerated in monoculture. Regenerated and adjusted seeds are stored in long-term Gene Bank storage.

## Research activities

Peas are the most widespread food and feed grain legume and germplasm collection is the biggest of all grain legumes collections in the CR. Thus the study of genetic diversity in view of both germplasm management and breeding perspective was started, following the introduction of core collection concept by Frankel and Brown (1984).

The set of the most polymorphic and informative retrotransposon RBIPs markers, together with microsatellite SSR loci and isozymes were selected, to investigate genetic diversity. In addition to DNA markers, the relations among varieties were estimated by 42 morphological qualitative and quantitative characters according to descriptor list of genus *Pisum* L. (Pavelková *et al.* 1982). 164 accessions from Czechoslovak pea collection were as the most valuable part evaluated in the first step, Russian, German and the Netherlands collections ensued.

High Polymorphic Information Content values were on average at 0.892 and 0.730 for 10 SSR loci and 31 RBIP markers respectively. For identifying 9 clusters from molecular and 5 to 7 clusters for morphological characters was adopted the Silhouette method after the Ward clustering to obtain the most probable estimate. Bayesian method was applied to enable integration of DNA and morphological data. Morphology data resulted in three clusters identification, with clearly differentiated fodder, dry seed and *afila* types. These were further refined by DNA data into 12, 17 and 4 sub-clusters respectively. The principal component analysis on 9 qualitative morphological parameters explained over 90% of total variability in first three axes. Studied accessions were divided into 3 breeding periods according to registration year. It showed no significant decrease in genetic diversity over time. A 48 accessions model core collection was formulated on the basis of Bayesian analysis. Average values of gene diversity (0.63, 0.37) and allelic richness (4.72, 2.43) for SSR and RBIP loci were for the model core collection similar to the corresponding values for the entire collection (0.61, 0.39 and 4.78, 2.82 respectively). Finally, Shannon-Weaver Diversity Indexes of morphologic data showed also good representation of the model core selection (0.95 compare to 0.97).

The main aim of those procedures (Smýkal *et al.* 2007) was the application and adaptation of accessible statistical methods for the most effective procedure of core collection formation which will be used breeders and scientists.

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**Table 1.**

<b>Crop/Genus</b>	<b>Advanced cultivar</b>	<b>Landrace</b>	<b>Breeder's line</b>	<b>Wild</b>	<b>Not specified</b>	<b>Total passport</b>	<b>Characterization /Evaluation data</b>
<i>Pisum</i>	1777	64	297	111	12	2261	2261
<i>Vicia faba</i>	307	22	57	4	1	391	118
<i>Vicia</i> ssp.	271	16	22	96	11	416	179
<i>Phaseolus</i>	984	110	18	3	8	1123	1023
<i>Glycine</i>	201	4	13	0	16	234	218
<i>Lupinus</i>	66	9	4	18	0	97	48
<i>Lens</i>	9	2	3	0	67	81	13
<i>Cicer</i>	66	0	0	0	0	66	12
<i>Lathyrus</i>	1	0	1	39	0	41	0
<b>Total</b>	<b>3682</b>	<b>227</b>	<b>415</b>	<b>271</b>	<b>115</b>	<b>4710</b>	<b>3872</b>

**Table 2.**

<b>Crop/Genus</b>	<b>Total stored</b>	<b>Active</b>	<b>Base</b>	<b>Safety duplication</b>	<b>Distribution 2007</b>	<b>Distribution 2006</b>
<i>Pisum</i>	2208	2177	430	40	182	180
<i>Vicia faba</i>	381	378	138	0	2	2
<i>Vicia</i> ssp.	392	317	181	0	3	3
<i>Phaseolus</i>	1150	1137	310	0	90	129
<i>Glycine</i>	233	233	79	21	2	43
<i>Lupinus</i>	89	73	24	1	20	0
<i>Lens</i>	81	81	1	0	1	12
<i>Cicer</i>	24	24	1	0	4	0
<i>Lathyrus</i>	39	5	36	0	0	9
<b>Total</b>	<b>4597</b>	<b>4425</b>	<b>1200</b>	<b>62</b>	<b>304</b>	<b>378</b>