

20 years

of the National Programme
on Conservation and Utilization
of Plant Genetic Resources
and Agrobiodiversity



MINISTRY OF AGRICULTURE
OF THE CZECH REPUBLIC





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Introductory information

The beginning of the systematic and state-guaranteed conservation of plant genetic resources is dated back to the early 1990s, when together with the split of the former Czechoslovakia in 1993 an agreement was made to split also the collections of plant genetic resources. In the same year, the Ministry of Agriculture launched the National Programme on Conservation and Utilization of Plant Genetic Resources in order to support the continuity of work with plant genetic resources in the sovereign Czech Republic. This project was based on FAO recommendations and similar activities in other developed countries. Its main objectives were to ensure the coordination, financing and performing the necessary activities of the Genebank in Prague as well as all other related genebanks conserving the plant genetic resources.



The National Programme on Conservation and Utilization of Plant Genetic Resources and Agro-biodiversity is based on the applicable international documents, principles and methodologies that are stated in, e.g. the FAO Global Plan of Action, International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), Standard Material Transfer Agreement

(SMTA), European Cooperative Programme for Plant Genetic Resources Networks (ECPGR), or generally in the Convention on Biological Diversity (CBD). It is also based on relevant recommendations of the international organizations, e.g. Bioversity International and Global Crop Diversity Trust.

The existence and conditions of the National Programme are determined in the national legislation – in Act No. 148/2003 Coll., on Conservation and Utilization of Plant and Microbial Genetic Resources for Food and Agriculture and Decree No. 458/2003 Coll. The act and its implementing decree specify the mission as well as the factual aspects of the National Programme, define the rights and obligations of the participants to the National Programme and guarantee the accessibility of plant genetic resources and related services to other users.

The conservation and utilization of plant genetic resources is financially supported by the Ministry of Agriculture every year. It has been done through the specific programme integrated into the National Subsidy Programme. The concrete conditions of the financial support are stipulated within the annually updated Principles for providing subsidies on the genetic resources. The basic working procedures used within the National Programme are contained within the Framework Methodology that is updated as necessary. Specific methodologies emanating from the Framework Methodology are elaborated for particular groups of plant genetic resources.

The Ministry of Agriculture entrusted the Crop Research Institute in Prague-Ruzyně to coordinate the activities carried out within the National Programme on Conservation and Utilization of Plant Genetic Resources and Agro-biodiversity. Thus it is ensured that the related institutions cooperate in the areas of collection, documentation, characterization, evaluation, conservation and utilization of plant genetic resources for food and agriculture. Apart from the safe conservation, a lot of attention is being paid to gathering of information and experimental data. The information is further used especially in research, breeding and education. Therefore, the EVIGEZ information system was developed in order to collect, classify and make accessible all available data on plant genetic resources used.

More detailed information as well as current news about the NP and other national and international activities of its participants are available at the websites of the Crop Research Institute and Ministry of Agriculture.

Stanislav Kozák
*1st Deputy of Minister of Agriculture
of the Czech Republic*

Plant genetic resources and their importance

Until now, 290 thousand species of vascular plants have been taxonomically described, from which only about 7 thousand were cultivated by humans or collected for food or other purposes. Only about 100 plant species that belong to 37 genera constitute “major crops” and other 811 species belong to the so called “minor crops”. Due to their continuous growing and breeding immense genetic diversity was created at the species level. Genetic resources of a particular plant species and its gene pool can thus be characterized altogether by, e.g. newly bred crops, different landraces, crop wild relatives and other related genetic material. However, the crop genetic diversity has its foundations in wild relative species and has been evolving over time influenced by the processes of cultivation, selection and of course by the environmental conditions. All these factors resulted in the creation of a whole range of landraces which became at the turn of the 19th and 20th centuries the ground material for further breeding. New findings in genetics and related technologies were at that time already progressively used. At present, it is estimated that the world ex-situ collections hold 7.4 million accessions of genetic resources, from which approximately one third is located in Europe. The majority of these resources is held within national gene-banks (83 %), followed by the Centres of the

Consultative Group on International Agricultural Research - CGIAR (11 %).

The growing human population and its demand for food and natural resources bring new challenges in terms of enhancing the agricultural production and its quality. In this regard, the genetic improvement of crops becomes the primary tool to achieve the goals. New cultivars have a clear advantage – they do not have, due to their resistance to stresses and a better response to various growing conditions, a negative impact on the environment, on the contrary, their utilisation could reduce the impacts of fertilizers and pesticides over-use. Considering the enhancement of yields and production quality the limits of breeding are quite broad and its cost is relatively low in comparison to the above-mentioned chemical inputs. However, further progress in the crop breeding sector could be made only if the genetic resources exist in the desired quality and could be accessed openly without unreasonable restrictions. New technologies and their proper application have also the fundamental importance in further development of the breeding. The introduction and utilisation of brand-new methods is rather characteristic for this new era and should not only accelerate the creation of new cultivars but also allow for the development of new breeding goals.

The history of genetic resources in the Bohemia and Moravia regions

The activity of collecting genetic resources as the basic material for breeding is dated back to the beginning of the 20th century. First such information is available from the Agricultural-botanic Research Station in Tábor and refers to collecting and study of barley (1899) and wheat (1903) varieties. The station of the Czech Technical University, established in Jeneč (1898), tested the varieties of a range of different crops. In 1920 it was moved to the experimental farm in Uhřetěves (including the materials from Tábor), which was affiliated to the newly established Agricultural Research Institute in Prague. In 1948, the Institute moved to Doksany and in 1952 to the just established Crop Research Institute in Prague – Ruzyně. Concerning the Moravia Region, the Moravian Provincial Research Institutes were established in Brno in 1919. They were dealing with the collections of landraces and some already bred varieties. Another institution, active especially in the 1930s,



History of the work with the genetic resources of cereals (the Crop Research Institute in Prague).

was the Moravian Provincial Institute for Improving the Crops in Přerov. Regarding the extent of breeding, the crops introduced into the agricultural practice were at that time rather disparate. Nonetheless, the breeding methodology was managed well and the original Czech varieties, created either by the selection from landraces or combinatory crossing, come from this time. From 1951 to 1954, the genetic resources were transferred into newly built agricultural research institutes, in particular the Cereal Research Institute in Kroměříž, the Research Institute of Fodder Crops in Troubsko, the Research Institute of Grain Legumes and Fibre Crops in Šumperk and the Grassland Research Station in Rožnov pod Radhoštěm. Similarly, the genetic resources of the vegetatively-propagated crops were gradually gathered at the places where the relevant research institutions were located – fruit species in Holovousy, hop plants in Žatec and potatoes in Havlíčkův Brod. The majority of old landraces and bred varieties were thus preserved within these collections.



History of the work with the genetic resources of grass (the Grassland Research Station in Zubří).

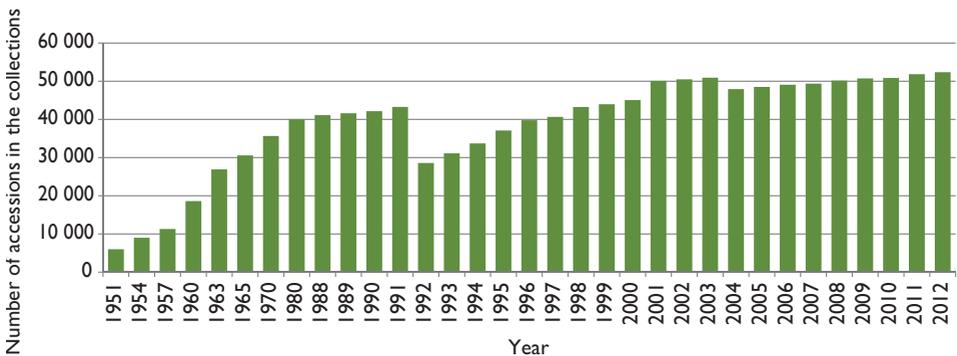
The rapid increase of the collections began in the 1950s and continued until the 1980s. For example, in 1951, the Czechoslovak collections held 6 thousand accessions, while in 1988 it was already 45.5 thousand. The majority of the former research institutes or their legal successors have been working with genetic resources and their collections up to the present days.

The beginning of the coordination activities and the commencement of the National Committee of the World Assortments of Crops falls also into the 1950s. The number of the Czechoslovak collections was gradually increasing - very quickly until 1980 and progressively after then. Since 1956, the Crop Research Institute in Prague (CRI) has been publishing the information on genetic resources through the publications called "Indexes seminum". Other institutes have done likewise since 1970. The first 21 crop descriptor lists were prepared in 1969 – 1972 and they found their later use also within the international cooperation. What followed was the development of the National information database system – EVIGEZ, which was in 1985 extended by all records stored within the CRI Genebank and has been used

since 1995 by all other participants to the National Programme in the Czech Republic.

From the 1970s most of the collection holders were testing the genetic resources extensively in the field trials, the area of which amounted in total to considerable 70 – 80 ha. Concurrently, a lot of material was sowed and planted for the purpose of its regeneration. The following evaluation focused primarily on the promising varieties of foreign origin and the possibility of their introduction, growing and further breeding in the Czech Republic. The work with the genetic resources thus substituted to a certain extent the missing international cooperation and improved the domestic situation in crop breeding and agricultural practice. Considering the generatively-propagated genetic resources, they were initially stored within the facilities not equipped with the proper humidity and temperature controlling mechanisms, and therefore, frequent regeneration was needed. Responding to these deficiencies, the preparation of the fully equipped air-conditioned store had started in the Crop Research Institute in the mid 1970s. The work was completed in 1998 and "the modern" genebank has been in the routine operation since then.

Increase of collections in the period of 1951-2012



The changes brought by the revolutionary 1989 and the following years, i.e. the split of the former Czechoslovakia and the privatization of most of the institutes dealing with plant genetic resources, required the necessary changes in the management of genetic resources as well. At the beginning of the 1990s, the genebanks did not have any guarantee of a stable financial support and it was only after the split of the Czechoslovakia, when an agreement on the split of the collections of genetic resources was made as well. The Ministry of Agriculture of the Czech Republic launched in 1993 in a reaction to this difficult situation the so called National Programme on Conservation and Utilization of Plant Genetic Resources (hereinafter referred to as "the NP"). Ensuring the coordination, financial stability and methodological guidance for all collections and genebanks were the main points of the NP from its very beginning. All these factors together with the strict adherence to the international standards enabled the further development of the NP and its participants and also their later active collaboration within the European Cooperative Programme for Plant Genetic Resources (ECPGR).

for Food and Agriculture (CGRFA) and other international commitments stemming from the relevant global agreements - the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), the Standard Material Transfer Agreement (SMTA) and the Convention on Biological Diversity (CBD). The NP outlines the basic conditions and requirements that are followed by the genebanks, i.e. the mutual cooperation in the areas of collecting, documentation, characterization, long-term conservation and sustainable utilisation of genetic resources. Apart from the safety preservation, a lot of attention is paid to the acquiring of data from regular working operations as well as experimental research. Further assortment of information is crucial, since the samples of genetic resources together with the relevant information are regularly provided to other users, especially other breeding, research and educational institutions. In accordance with the domestic needs and international priorities, the support of agro-biodiversity for sustainable development and its non-production purposes becomes a significant part of the NP.

The National Programme on Conservation and Utilization of Plant Genetic Resources and Agro-biodiversity

The NP is based on domestic traditions, national legislation, specifically Act. No. 148/2003 Coll., and FAO recommendations expressed in the Global Plan of Action. It also respects the international standards for genebanks set up by the FAO Commission on Genetic Resources

Structure of the NP and main activities of its participants

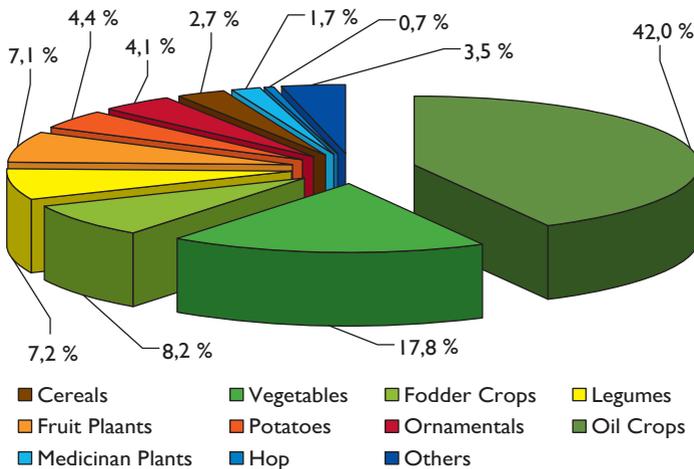
16 workplaces belonging to 12 legal entities cooperate under the framework of the NP. They are represented by the public research institutions, universities and private business companies. To the public research institutions belong the Crop Research Institute in Prague (the Genebank and Cryobank); the Centre of Applied Research of Vegetables and Special Crops of the Crop Research Institute in Olomouc; the Viticulture Research Station of the Crop Research

Institute in Karlštejn; the Silva Tarouca Research Institute for Landscape and Ornamental Gardening in Průhonice; and the Institute of Botany in Průhonice as a part of the Academy of Sciences of the Czech Republic. Universities are represented by the Mendel University in Brno and its Faculty of Horticulture in Lednice. The significant group of participants are private business companies that deal with the agriculture research - Agricultural Research Institute (ARI) Kroměříž, Ltd.; AGRITEC Research, Breeding and Services, Ltd.; Potato Research Institute Havlíčkův Brod, Ltd.; Hop Research Institute, Ltd.; Research and Breeding Institute of Pomology Holovousy, Ltd.; Research Institute of Fodder Crops Troubsko, Ltd.; OSEVA PRO Ltd. - Grassland Research Station Rožnov – Zubří; OSEVA PRO Ltd. - Research Institute of Oilseed Crops in Opava; and AMPELOS - Viticulture Breeding Station (VBS) in Znojmo, Plc. All the above-mentioned participants are described in more detail in an appropriate chapter of this publication.

The Genebank of the Crop Research Institute in Prague coordinates relevant activities of the NP participants and provides also for other services, e.g. the long-term storage of the seed samples and administration of the EVIGEZ information system. However, the genetic resources of vegetatively-propagated species are all stored within the respective genebanks responsible for this type of collections. These genetic resources are stored in field conditions or alternatively in in-vitro cultures (potatoes, selected ornamental species) or cryo-conditions. The genebanks have to ensure all necessary activities and services, i.e. long-term storage of genetic resources, providing and exchanging of their samples and providing information about these resources.

The NP is advised by the expert consultative body – the Plant Genetic Resources Board functioning by the Crop Research Institute. The Board consists of curators of the collections, other employees of the respective genebanks, representatives of the Ministry of Agriculture,

Crop structure of the Czech PGR collections





the number of 52.6 thousand. Apart from these resources, genebanks usually hold the so called „working collections“ containing material not ready yet to be permanently stored. These are for instance samples from recent collecting expeditions or material with incomplete characterization and evaluation. The species diversity of the Czech collections is rather high. There are 1173 species of crops and their wild relatives, which are conserved and provided to other users according to required standards. The proportion of generatively- to vegetatively-propagated species is 81,4 % to 18,6 % respectively. This rate is rather stable over time.

breeders, experts from universities and other people. The up-to-date procedures and standards are all gathered within the periodically reviewed Framework methodology of the NP (available at http://genbank.vurv.cz/genetic/nar_prog/).

At the end of 2012, the accessions of genetic resources within the active collections reached

The Crop Research Institute holds the largest collection (in total 26.7 thousand accessions representing 51 % of all national accessions). Large and valuable collections are nonetheless in possession of other participants to the NP as well. In terms of different proportion of crops them-



Collecting expeditions of crop wild relatives (up) and landraces (down) is one of the valuable sources of new genetic diversity.

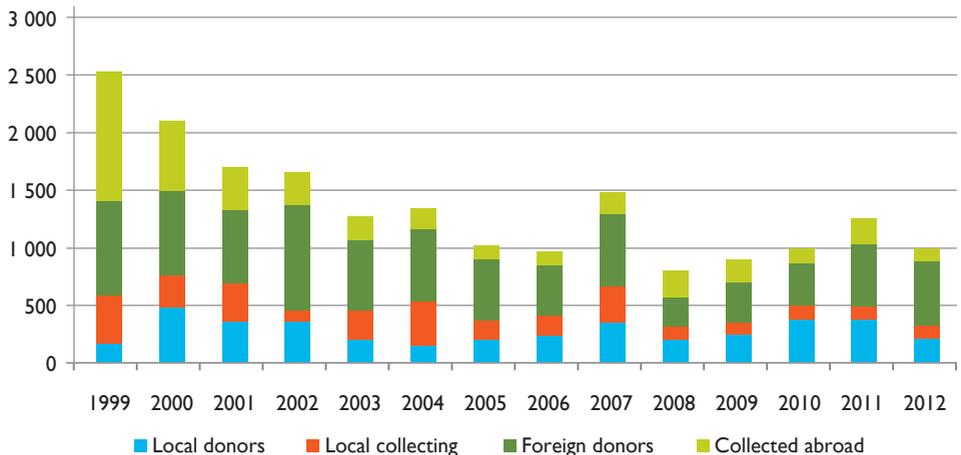
selves, the largest collections have cereals, followed by vegetables, fodder plants and potatoes. Significant are also fruit plants and other crops. In terms of their character, the bred varieties prevail with 64,7 %, followed by genetic lines with 16,7 % (i.e. material from research and breeding process that have not been registered as a new variety). Although landraces and crop wild relatives are significantly less abundant (7,4 % and 11,3 % respectively), they are very valuable as donors of a broad genetic diversity used in breeding. A general overview of the participants to the NP and the amount and type of genetic resources held is given later in this publication.

The strategy of the **enlargement of collections** is primarily aimed at (a) monitoring, collecting and preserving of genetic resources of the domestic provenance; (b) extension of genetic and crop diversity, according to the needs of researchers, breeders and agricultural practice; and (c) acquiring of donors of economically and biologically important characters used further in breeding and research.

The most significant providers of new genetic resources are foreign genebanks, research institutions, and to a certain extent also foreign breeders. Collecting expeditions within and outside of the Czech territory also add to the newly sourced genetic diversity. The proportion of new genetic resources obtained from abroad reaches 61 %, which only confirms and underlines the need and importance of international cooperation for the Czech Republic. However, not all genetic resources sourced in other countries meet the required standards and are not put into the database of active collections.

Providing the evidence and documentation about genetic resources is necessary to ensure their conservation and effective utilisation. For that purpose the EVIGEZ information system was established and all participants have been using it since 1994. The descriptive data were added into the application in 1998. The CRI in Prague manages the central database of all collections, while the curators have access to their local collections. However, the mutual exchange

New arrivals to PGR collections classified by the origin and source





Conservation of vegetatively-propagated species in *in-vitro* genebank (potatoes).

of information takes place on a regular basis in order to keep the data reviewed and updated. The information catalogue serves a range of domestic and foreign users as a source of information and also as a base to arrange their orders. Currently, all genetic resources are equipped with the passport data enabling their identification and evidence. Description data, which are of great importance for users, are available at different extent to 36 thousand genetic resources, i.e. 67 % of all accessions as a result of the field and laboratory tests. The information is often later supplemented with other genetic characteristics, e.g. identified genes, gene markers, etc., which even increase their utility value. The EVIGEZ information system is freely accessible at <http://www.genbank.vurv.cz/genetic/resources/>.

The **evaluation** of the genetic resources is one of the fundamental activities of the NP and it is actually the essential prerequisite for the knowledge about genetic resources and their further utilisation. The evaluation itself is conducted in accordance with the NP Methodology and national descriptor lists that correspond

to specific plant species, or possibly genera. Genetic resources are for this purpose regularly tested in the field conditions in two or three-year intervals and the results are inserted into the EVIGEZ information system. The field trials are usually complemented by laboratory tests according to specific needs of some crops. In order to develop further the evaluation of genetic resources, new descriptor lists need to be prepared and applied into the practice.

In terms of quantity, there are 6 – 8 thousand accessions evaluated every year (in 2012 it was 6 716 accessions). It is highly useful to monitor this indicator as well, given the fact that the description data are being inserted into the EVIGEZ information system only after the 2 or 3 year period of field testing (could be a longer time with perennial plants). The number of described characters differs according to species. However, the general rule is that just a few characters are being evaluated in wild crop relative species and minor crops and the number increases with the importance of the crop



Food value test of potato genetic resources.

concerned. Quite extensive evaluations are carried out in perennial species, e.g. potatoes, fruit trees or hop plants, where 50 – 70 characters are normally monitored. The evaluations in the laboratories usually do not exceed 30 characters, e.g. 27 in apples, 25 in sour cherry, etc. For instance, the highest number (72 characters) needs to be monitored in grapevines. The **characterization data** have the growing importance for both the managers of the collections as well as their users. This information enables not only clear identification of a particular genetic resource, but also the evaluation of the genetic distance within one group of genetic resources. Sometimes they can be also used as markers of some significant traits. Apart from morphological attributes, DNA markers and protein characteristics gradually gain their importance. However, the extent of utilisation of these methods depends largely on financial and human resources available.



Seed Genebank - drying.



Storage of genetic resources for long-term conservation.

The precondition of **long-term preservation** of genetic resources is their periodic regeneration and subsequent conservation. For all generatively-propagated plant collections is the conservation service provided by the CRI Genebank in Prague. The cooperating seed collections are responsible for the regeneration of this material. The permanent conservation can be successful only if two fundamental conditions are met – high quality of the seed material and its careful preparation for the conservation. The long-term viability of the seeds (30 years and more) is usually achieved in two steps - careful drying at the temperature up to 20 °C followed by the storage at -18° C. The Genebank stores approximately 95 % of all 42.5 thousands generatively-propagated genetic resources. This per-

centage corresponds almost to a total number, but some parts of the collections are always at the stage of regeneration. Another 10.5 thousand accessions are stored in the working collections – for immediate utilisation by cooperating institutions and participants to the NP. In addition, the samples and DNA standards of selected species (2.3 thousand accessions) are deposited here as well. The Genebank has the ISO 9001 methodology and quality controlling system standards.

Vegetatively-propagated species are stored in field collections (orchards, vineyards and hop gardens), in in-vitro cultures (potatoes, some ornamental plants, together 2.8 thousand genetic resources) and for some species the cryo-conservation proves to be very successful and gains its importance (garlic, hop plants, potatoes, grapevines, and assorted species of fruit trees, together approximately 300 genetic resources).



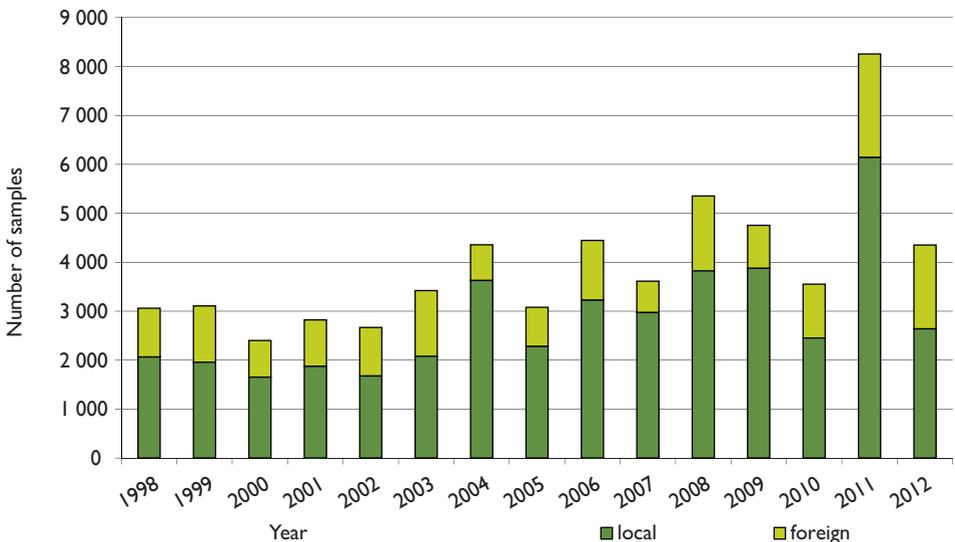
Conservation of vegetatively-propagated species in field (grapevine).

The samples of genetic resources are **provided to users** free of charge for the purpose of further breeding, research and education (not for commercial purposes) in accordance with Act No. 148/2003 Coll. and relevant international agreements (ITPGRFA, SMTA). Effective utilisation of genetic resources is directly proportional to their accessibility and the extent and quality of the provided information. In 2011, the number of genetic resources provided to users reached its record – 8.3 thousand, while the average number is about 3 – 4.5 thousand. The number of genetic resources supplied by the CRI Genebank increase every year and it is also noticeable that the structure of users changes over time. The most frequent user is now the research sector followed by the breeding sector. In general, the distribution of genetic resources differs in years and basically copies the demand of foreign and domestic users.

ers. However, from the long-term perspective, the growing interest about genetic resources is clearly visible with the dominance of users from the Czech Republic.

The **international cooperation** is one of the crucial activities of the work with plant genetic resources. The European Cooperative Programme for Plant Genetic Resources (ECPGR) is a key plant genetic project in Europe. It was launched already in 1980 and 44 countries participate in it now. The Czech institutions joined the programme in 1983 and have been taking an active part since then. Within the ongoing phase VIII (2009 – 2013) the ECPGR activities considerably grew dealing now with the European genebank integration project - AEGIS. Its aim is to strengthen the cooperation in Europe and integrate the capacities while ensuring the highest quality standards and guarantee the ac-

Number of PGR samples provided to local and foreign users by all participants of the National Programme (1998 - 2012)





Field testing of grass genetic resources.

cessibility of genetic resources to their users. 8 participants to the NP have become the associate AEGIS members since 2012 being thus the integral part of A Euroean Genebank Integrated System (AEGIS).

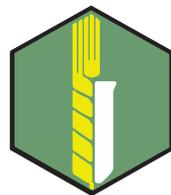
The participation of the Czech Republic to the ECPGR is a matter of prestige. The access to the latest technologies, know-how and effective division of labour are just some examples of clear advantages of participating in this programme. It also guarantees the free exchange of genetic resources within the European region. For these reasons, the ECPGR goals are

also declared within the NP assignments and goals. Some of the Czech genebanks also take part in other international projects (GENRES, COST, CONTACT, and other). Furthermore, implementation of the bilateral international agreements on cooperation with other partner institutions, preparation of joint projects and effective exchange of genetic resources are other crucial activities carried out. It needs to be pointed out that the most developed cooperation is established with the Slovak genebank in Piešťany, where the safety duplications of selected genetic resources are stored.

Crop Research Institute (CRI) Genebank Department

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Systematic gathering of PGR has begun in the CRI since the early 1950s. Since the 1960s the Institute provided central introduction of PGR, organized the preparation of the National Descriptor Lists and Information System (EVI-GEZ). The preparation of the Seed Genebank started in the late 1970s and the facility was put into operation in 1988. In the same period the international collaboration slowly started to evolve as well. In 1993 the Czech Ministry of Agriculture launched the National Programme on PGR (NP) and the CRI was entrusted with its management and coordination. The overall activities are governed by Act No. 148/2003 Coll., on plant and microorganism genetic resources.

The Genebank Department is responsible for the NP **coordination**, its guidance and international collaboration. The administration of the NP, maintenance of the **National information system on PGR** - EVIGEZ and provision of related services to NP participants and other users belong to its additional important tasks. EVIGEZ stores the passport and evaluation data on approximately 53 thousand genetic resources. The **Genebank** conserves the samples of all seed-propagated PGR, i.e. approximately 40 thousand PGR covering almost



Seed Genebank.

95 % of all accessions in the Czech Republic. The long-term conservation is based on cautious seed drying and consequent storage in vapour-proof jars with added silica-gel bags under the temperature of -18 °C. The seed viability is then regularly monitored and the resources are regenerated, if needed. The safe conservation of the selected vegetatively-propagated crop species is provided in liquid nitrogen within the **Cryobank**, which is the part of the CRI Molecular Biology Department.

The **crop collections** include 16,3 thousand PGR with the domination of cereals (91 %), especially wheat collection (11 thousand accessions), followed by winter barley and triticale. Collections of some neglected and minor crops are also being held here, e.g. buckwheat, millet, sorghum, *Amaranth* sp. and other crops, comprising altogether of 415 accessions. In some crop collections, e.g. beet, maize and sunflower only the regeneration and conservation parts are carried out. The collections are regularly supplemented by new PGR that need to be firstly tested and evaluated within the field and laboratory conditions. The evaluation is aimed at economically important characters and donors of new genetic diversity that may

be used at the later stages in further breeding and research processes. The samples of genetic resources are for the research, breeding and education purposes usually **provided to other users free of charge**. This practice follows the commitments made by the Czech Republic under the International Treaty on PGR and Standard Material Transfer Agreement. The amount of distributed PGR varies among years; it is usually 2-5 thousand samples. The Genebank also coordinates the activities linked to **international collaboration**, e.g. ECPGR and FAO. As an AEGIS associated member it actively contributes to the project of the European Genebank.

Crop	Number of accessions
Wheat	10 988
Winter barley	2 004
Triticale	577
Wild <i>Triticeae</i> sp.	1173
Buckwheat	152
Millet	175
Other species	1137



Evaluation of wheat collection.

Agricultural Research Institute (ARI) Kroměříž, Ltd.

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vukrom@vukrom.cz



ARI Kroměříž has been closely involved in the study of cereal genetic resources since 1952. Currently, the Institute holds in total 5 914 accessions gathered in the cereal collections, from which 3030 are of spring barley, followed by 2 157 of oat and 727 rye accessions. Our Institute benefits from the participation in the National Programme, when cooperation is realized in several areas of work, e.g. provision of services of the seed gene bank, provision of data to the information database system EVI-GEZ, working further on safe conservation (including safe duplicates), detailed documentation and establishment of the „core“collections of spring barley and oats.

Spring barley collection - is the second largest collection of genetic resources in the Czech Republic. It includes barley accessions from more than 70 countries in 69 varieties of the genus *Hordeum* L. The collection contains valuable landraces, obsolete and modern cultivars of domestic and European origin and also accessions from other continents. Bred cultivars (79 %) and breeders' lines (16 %) are prevailing, whereas landraces (4 %) and wild relatives (1 %) are represented in much lower numbers. The valuable donors of important characters were identified and utilized in breeding. The collection is well documented (full passport data and evaluation data being available in 95 % accessions). Extensive evaluation data on phenological, biological, morphological and economical characters are available to other users.

Oat and rye collections - the oat collection includes 7 species, among them *Avena sativa* L. is the dominant one (1976 accessions), followed by *Avena byzantica* C.KOCH. (90 accessions). Other species are marginal (1-6 accessions). *Avena sativa* L. is represented by 19 varieties - the most common are *mutica* ALEF. and *aurea* KÖRN. The collection includes also oat cultivars with black grain (within *Avena strigosa*



Evaluation of barley collection.



SCHREB., *A. sativa* L. or *A. byzantina* C.KOCH). Genetic resources with the high nutritional value (higher content of β -glucans or fat) or materials with hull-less grain are important in breeding of cultivars for the food industry. The rye collection consists almost exclusively of *Secale cereale*; passport data are usually available, whereas evaluation data are present only rarely.

The ARI Kroměříž participates in the **international collaboration**, mainly within the Euro-

pean Programme (ECPGR), in working groups for Barley and Avena and in the project „A European Genebank Integrated System – AEGIS (associated member since 2011). Participation of collection curators in research projects enables the deeper study of the collections, provides data on selected valuable donors and stimulates their utilization in the breeding of new cultivars. Gathered collections are also utilized for needs of research projects and plans, as well as for educational purposes.



Evaluation of oat collection.

AGRITEC Research, Breeding and Services, Ltd.



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Zemědělská 16, 787 01, Šumperk

<http://www.agritec.cz/new/>

The beginning of the work with grain legumes and fibre crops collections falls into the period from the 1950s till the 1960s. It was initiated with the connection of the establishment of the German Research Institute in Šumperk in 1942. The former Genebank was based on the utilisation of old German breeding lines of fibre flax, linseed and the combination of both types. Systematic collection and maintenance of grain legumes genetic resources begun in 1963 and continues up to the present days.

Genebank in Šumperk covers all activities associated with the National Information System of the evidence of genetic resources (EVIGEZ) under the National Programme for genetic resources of cultivated plants. Currently the collections include in total 2 949 genetic resources of **legumes** (1 375 GR of *Pisum* genus, 252 of species *Vicia sativa*, 23 of species *Vicia pannonica*, 63 species of *Vicia villosa*, 391 of species *Vicia faba*, 243 of species *Glycine max*, 164 of species *Lens culinaris*, 106 of genus *Lupinus*, 68 of species *Cicer arietinum*, 264 of *Phaseolus* sp.). Collection of **fibre plants** includes in total 2 160 items of *Linum usitatissimum* L species. (521 landraces, 557 samples of breeding material and 1 088 items of commercial varieties)

and also 21 recorded items of *Cannabis sativa* L species. Overall, the collection of fibre plants contains 2 187 items and together with the legumes it is 5 136 accessions of different genetic resources.



Czech and Russian flax in field trial.



AGRITEC Ltd. is also responsible for the management and coordination of the **International Flax Data Base (IFDB)** that is working under the FAO and Bioversity International Networks, specifically ESCORENA FAO Flax and other Bast Plants Network and Sugar, Starch, Fibre Crops & Medicine and Aromatic Plants Network. It uses the system of Multi

Crop Passport Descriptors - MCPD in order to map 50 % of all European and overseas flax genetic resources, which counts to almost 27 000 items. Organizationally, it is included in a new working group for flax and hemp in the framework of Sugar, Starch, Fibre Crops & Medicine and Aromatic Plants Network and currently records over 11 000 items.



Regeneration of pea.

Potato Research Institute Havlíčkův Brod, Ltd.

The Department of Genetic Resources

Dobrovského 2366, 580 01 Havl. Brod

www.vubhb.cz



The Potato Research Institute Havlíčkův Brod (PRI) has been engaged in gathering, study and maintenance of the potato genetic resources since 1952. The initial genetic resources maintenance relied on the field replanting of tubers. This practice showed to be unsuitable due to high natural infection pressure. Therefore, it has been gradually replaced since 1986 by *in vitro* cultures, the method of which is now solely applied. Since 1993 the PRI has been the only institution responsible for working with the potato gene pool within the National Programme for plant genetic resources in the Czech Republic.



Diversity of potato genetic resources.



Accessions of genetic resources after one year of storage in *in vitro* conditions.

The Department of Genetic Resources provides for the following interlinked services and activities: gathering, reliable maintenance, systematic study and characterization, documentation, international cooperation and providing of genetic resources and information about the collections held within the genebank. At present, the **in vitro Genebank** involves 2439 genotypes (varieties, tetraploid hybrids of *Solanum tuberosum*, induced dihaploids of *Solanum tuberosum*, cultivated *Solanum* as well as wild *Solanum* species and specific *Solanum* hybrids). Every year, under **field conditions** and after the harvest, 44 morphological and 12 agronomic traits and characteristics are evaluated using 9-point scale for approximately 100 accessions. The level of resistance to 12 pests and diseases is also tested and described. All information gathered is then inserted into the EVIGEZ National Information System and into the international database - The European Cultivated Po-



Evaluation of samples for potato chips production.

tato Database (EUROPOTATO). PRI is also an associate member of the European Genebank project (AEGIS).



Evaluation of potato genetic resources in field conditions.

Hop Research Institute, Ltd.

Department of Genetics and Breeding

Kadaňská 2525, 438 46 Žatec

www.chizatec.cz



Hop genetic resources have been maintained and studied in Žatec since 1927. The beginning of the work is connected with the most famous Czech hop breeder Dr. Karel Osvald, who studied 25 hop varieties (8 Czech and 17 foreign). His follower, Mr. Antipovič, was responsible for the maintenance of the collection from the year 1955 until 1961. At that time he observed 59 hop cultivars including 33 foreign ones. His successor, Dr. Zelenka, worked further on breeding of these genetic resources. The collection continuously grew during the following years and the research and maintenance became a separate project. Dr. Zelenka extended the collection to 260 genetic resources originating from 20 countries. In the 1990s, the work with the collections passed over to Mr. Rígr, the author of *Humulus* genus descriptor list. Since 2003, Dr. Nesvadba has been responsible for this work.

The Department of Genetics and Breeding of HRI in Žatec maintains the field collection of hop genetic resources. It contains all registered Czech varieties, regional cultivars and the already restricted varieties. Apart from the bred cultivars, genetic stock and wild hops collected since 2012 within the Czech Republic territo-



Hop flower.

ry as well as abroad are also part of the collection. It consists nowadays of 67 Czech and 305 foreign hop accessions having their origin in 23 countries.

The collections are continuously increased by new genetic resources in order to gain genetic diversity and donors of important characters. What is important is the ongoing characterization and evaluation process that aims to record all 73 descriptors. The evaluation is focused on important morphological, biological, econom-

ic and supplementary characters that are of breeders' interest. Samples of genetic resources are available free of charge for the purpose of further breeding, research and education to all domestic as well as foreign users. Safe duplicates of selected materials are maintained within the cryo-conditions in the CRI in Prague Ruzyně.



Mature hops growing in a hop yard.

Country of origin	Number of GR held
Czech Republic	77
Germany	36
Russia	22
Ukraine	31
Poland	26
Bulgaria	3
Slovenia	13
United States	35
Switzerland	3
Austria	3
United Kingdom	44
New Zealand	2
Japan	12
Australia	2
South Africa	4
France	11
Yugoslavia	11
Canada	3
Belgium	13
Latvia	5
Denmark	2
Sweden	1
Spain	2
Hungary	1

Centre of Applied Research of Vegetables and Special Crops of the Crop Research Institute (CRI)

Department of Genetic Resources of Vegetables, Medicinal and Special Plants

Šlechtitelů 29, 783 71 Olomouc

www.vurv.cz; www.cr-hana.eu



Department of Genetic Resources of Vegetables, Medicinal and Special Plants in Olomouc has been involved in the National Programme for conservation and utilisation of genetic resources (NP) since 1993. Mainly vegetables, medicinal, aromatic and culinary plants (MAPs) of the Central European origin are gathered and maintained here. Regarding to their extent and species representation, the collections have a great importance in the European context and currently (November 2012) **include 9 245 accessions of vegetables and 928 accessions of MAPs**. Internationally recognized is the collection of vegetatively propagated species of the genus *Allium* L. of long-day growing character and also the MAPs collections of caraway (*Carum carvi* L.), oregano (*Origanum vulgare* L.) and lavender (*Lavandula* L.) are considered as valuable and important. The main activities carried out are regeneration of accessions and their systematic characterization and evaluation.

The majority of MAPs are allogamous and insect-pollinated, therefore multiplication and controlled pollination is needed to get good-quality and sufficient amount of seed. The long-lasting experiences with seed production under controlled pollination led to the

publication of a Methodology for using **insect pollinators** in heterogamous species, grown in technical isolation. We have been using the top-class equipment and facilities that are rather unique in the Central European region and that enabled us the effective production of high quality seed. Seed produced under the controlled pollination have high germination and thousand-seed weight. There are also 144 stable **technical isolators** and mobile isolation cages



Phenotypic variability of seeds in the genus *Pisum* L.

available, which help us to regenerate annually about 200 accessions of generatively propagated genetic resources. Two insect species, honey bee (*Apis mellifera* L.) and bumble bee (*Bombus terrestris* L.) are traditionally used as pollinators. In 2010, our own apiary was founded (today comprising of 18 colonies) that is going to be extended.

The experimental plots include **infested field** by clubroot (*Plasmodiophora brassicae* Woron.), where the fiercest races from different localities in the Czech Republic have been collected. Infested field serves for verification of results from laboratory tests under the field conditions. Activities and results related to the National Programme are presented on the “Field and Bee Days” organized at the workplace as well as in national and international exhibitions (e.g. Flora Olomouc, Prague Botanical Garden in Troja), where valuable



Apiary.

expositions popularizing work with genetic resources of vegetables and MAPs are traditionally prepared.



Clubroot (*Plasmodiophora brassicae*) in Chinese cabbage.

Research and Breeding Institute of Pomology Holovousy, Ltd.

Department of Genebank

Holovousy I, 508 01 Hořice

www.vsuo.cz



In 1951, the germplasm of fruit species was transferred to at that time newly established Research Institute of Pomology (RIP). The establishment of RBIP was done in the framework of reorganisation of Fruit and Viticulture Institute in Prague and Gardening Institute in Průhonice. In the course of the following years, field collections of cultivars were broadened in the framework of international cooperation and due to collecting of original domestic landraces. Currently, there are in total 2 325 accessions of 23 fruit species maintained in our Institute. Numbers of genetic resources of important fruit species are stated in the table.

Fruit species	No. GR
Apple	1 104
Pear	137
Plum	271
Sweet cherry	347
Sour cherry	108
Strawberry	75
Raspberry	54
Red currant	31
Black currant	37
Gooseberry	49



Cultivar of gooseberry 'Český zázrak'.

The Institute cooperates with more than 40 countries worldwide by exchanging of the fruit plants genetic resources. Promising cultivars are introduced to support breeding programmes with suitable genotypes with valuable characters (resistance to diseases, pests and unfavourable environmental conditions). Using the lists of descriptors, pomological and economically important traits are evaluated. Data are regularly handed over to the EVIGEZ National Information System. Collecting activities are carried out in order to rescue the original traditional fruit cultivars grown on the territory of the Czech Republic for the last centuries. These cultivars represent indeed the cultural wealth of a particular region and the nation as well. We believe that the human craft, skills and breeding knowledge resulting from the needs, tradition, habits and cultural environment are conserved in them.

In recent years, we have established the on farm plantations for the maintenance of the continuity of landraces in given areas. Cultivars are planted traditionally on seedling rootstocks in the form of high-stem trees. It is a model system for the long-term maintenance of landrac-



On farm plantation Orchard of reconciliation in Neratov.

es in original areas. On farm plantations are established in the Giant Mountains and Bohemian Forest national parks and in the Orchard of Reconciliation in Neratov in the Orlické Mountains. In the framework of international cooperation, we are taking an active part in working groups of Prunus, Malus, Pyrus and in the EU-FRIN section. We are also participating in the FruitBreedomics project covered by the 7th EU Framework Action Programme.

Cultivar of highbush blueberry 'Duke'.

Silva Tarouca Research Institute for Landscape and Ornamental gardening

Květnové náměstí 391, 252 43 Průhonice

www.vukoz.cz



The evaluation of ornamental plant collections in Průhonice has had a long tradition. The collecting of important genera started already in the 1950s in the framework of then ongoing research on world ornamental plant assortments. The close cooperation with the Genebank of the Crop Research Institute in Prague (CRI) has been in place since 1988.

The current objective is to conserve in a necessary extent those varieties (and/or species) of ornamental plants that represent a significant genetic potential. The Research Institute maintains in total ten collections with **more than 1 800 accessions**. Concerning **ornamental tree species** extensive collections of taxa (varieties and original species) are maintained and traits important for breeding and utilization in landscaping are evaluated and described, including a continuous revision of the collection (varietal or species classification). The largest collection is that of **rhododendrons and azaleas** (*Rhododendron*) containing more than 500 items, followed by the collection of domestic varieties of all groups of roses (*Rosa*) and permanent plantation of ornamental apple-trees (*Malus*) in the Dendrological Garden. Regarding **flowers** the aim is

to conserve collections of varieties and native species, mainly of domestic origin. It includes regenerations, maximum control of the health status and evaluation of accessions according to the descriptor lists.



Rhododendron x hybridum 'Kokořín'.

Bulbous and tuberous plants are maintained in extensive collections containing more than 700 items: dahlias (*Dahlia*) are regenerated by vegetative re-propagation of tubers by means of cuttings from plant apices. In sword lilies (*Gladiolus*) it is necessary to prevent and eliminate a disease caused by the fungus *Fusarium oxysporum* f. *gladiolii*. Excellent quality is characteristic for original local varieties of tulips (*Tulipa*). Their typical resistance to viral diseases is also one of the main evaluation criteria. Smaller collections exist in **vegetatively propagated annuals**, cascading petunias (*Petunia x atkinsiana*) and domestic varieties of garden chrysanthemums (*Chrysanthemum x grandiflorum*) which need to be regenerated once to three times per year. The last collection of more than 250 accessions contains **generatively propagated species** - annuals, biennials, perennials and greenhouse plants. The means of annual regeneration is determined by the amount of seed and the level of their germination in accessions maintained in the CRI Genebank.



Dahlia pinnata 'Viktorka'.



Godetia grandiflora 'Duc of York'.

Research Institute of Fodder Crops Troubsko, Ltd.

Department of Genetic Resources

Zahradní I, 664 41 Troubsko

www.vupt.cz



The institute holds collections of **clovers and other fodder crops, with the exception of grasses**. Studies on genetic resources of *Fabaceae* sp. started already in the 1950s. The Department of Genetic Resources takes care about all **newly bred and selected Czech and foreign varieties**. New genetic resources are obtained directly from their breeders or owners and also through **collecting of wild species** and ecotypes in their natural habitats within the Czech Republic territory as well as abroad. The samples of species of interest are then tested and evaluated under the field and laboratory conditions.

Morphological traits are evaluated directly in individual plantations, which are established using the pre-grown plants in pots. Pre-grown seedlings are planted on 50 x 50cm plots. Each genetic resource is described according to the relevant descriptor list. **Biological traits and economic parameters** are evaluated directly in stand plots of the size of 10 m². Experiments are established in three replications grown also for seed production. **Characteristics of fodder and seed material** are evaluated in laboratory conditions. Seed samples of generatively propagated species are conserved in the CRI

Genebank in Prague Ruzyně. The most valuable samples of the Czech origin are stored as safety duplication in the Slovak Genebank in Piešťany.

The total number of accessions in the collections of the CRI in Troubsko involves **2230 genetic resources**; of which, 1405 items are available for users. The Genebank stores altogether 2132 seed samples, while the records of evaluation data exist in 1553 accessions. The major part of collections represents traditional



Individual plantations of the *Lotus*.



fodder crops, as e.g. alfalfa (548 accessions), red clover (355 acc.) and white clover (295 acc.). The collections involve local varieties and ecotypes, old and new bred Czech and foreign varieties and also some wild plant species. The collection of marginal cultural species (*Trifolium alexandrinum* L., *T. incarnatum* L., *T. resupinatum* L., etc.) as well as some wild clover species

(*T. medium* L., *T. montanum* L., *T. pannonicum* Jacq. etc.) is relatively extensive. Groups of *Lathyrus* spp. and *Vicia* spp. consist mainly of wild forms of these species. The group of plants of flowering meadows involves wild species belonging to other families which can be used in permanent grassland stands. Plants of the *Carthamus tinctorius* species are also a part of this collection.



Collection of *Medicago* sp.

OSEVA PRO, Ltd. Grassland Research Station Rožnov – Zubří

Hamerská 698, 756 54 Zubří

www.oseva.cz



The first documented work on grass genetic resources is linked to the establishment and development of the Grassland Research Station (GRS) in Rožnov pod Radhoštěm in 1920. Since 1964, the collection management has been methodically co-ordinated by the CRI in Prague and, in the middle of 1970s, activities started to be focused more on the performance itself of the resources tested. Since 1993, the continuation of work has been enabled through the financial support from the Ministry of Agriculture due to the adoption of the National Programme on Conservation and Utilisation of Plant Genetic Resources. The long-term and unified approach to the work was ensured by the adoption of plant-specific methodologies and related legislation. Since 2003, the GRS Zubří has become a participant to the National Programme with the responsibility for the collections of grasses and grass-like species.

The collection consists now of 2357 accessions, however, the related descriptive data are available for 1569 of them. 172 genetic resources are available in the *ex-situ* collection of vegetatively propagated ornamental species. The Station is involved in the following main activities. **Collecting** of grass genetic resources has been

focused on the germplasm autochthonous for the Czech Republic since the early 1990s. The ecotypes of both cultivated and wild species, newly bred varieties as well as selected foreign varieties normally grown in the Czech Republic territory all belong to this group. **Documentation** is provided by the Genebank of the CRI in Prague, through the national information system (EVIGEZ). **Evaluation** is carried out in four types of field collections according to the way the resources will be further practically used – i.e. species for forage, turf, ornamental and growing in the natural wild conditions. The main goal of the **regeneration** is to obtain the suffi-



Historical harvest in grass trials.

cient quantity of high-quality seed. **Long-term preservation** of seed grass is provided by the Genebank of the CRI in Prague. Vegetatively propagated genetic resources of ornamental grasses are maintained in the field Genebank in Zubří. **Utilization** of grass resources consists of providing their samples to other users for the purpose of further research, breeding and training. We also actively raise awareness and invite other stakeholders and a broad public to our lectures and exhibitions. Considering the **international co-operation**, the Station participates in the ECPGR programme and related work in the Forages Working Group. Since 2011, the GRS has become an associate member of the European Genebank project (AEGIS).

Genus	Number of PGR
<i>Lolium</i>	644
<i>Festuca</i>	489
<i>Poa</i>	269
<i>Dactylis</i>	174
<i>Phleum</i>	144
<i>Arrhenatherum</i>	95
<i>Agrostis</i>	84
<i>Bromus</i>	63
Other	395



Collection of ornamental grasses.

OSEVA PRO, Ltd. Research Institute of Oilseed Crops in Opava

Purkyňova 10, 746 01 Opava

www.oseva.cz



The Agricultural Research Station in Opava was founded in 1921. It started to specialise in oilseed crops in the 2nd half of the 1950s. The independent Research Institute of Oilseed Crops was established in 1990 and after its privatization in 1993 it was called OSEVA PRO Ltd., division Research Institute of Oilseed Crops in

Opava. The collection of genetic resources began its work in the 1960s. Those materials were primarily used for breeding purposes. In 1984 the Institute developed the national descriptor list for *Brassica napus* L. and *Brassica rapa* L. It was subsequently updated in 2001 and 2008 and in addition the national descriptor list for *Papaver somniferum* L. was published.



Oilseed Rape.

Our division specialises in oilseed plants that are of major as well as minor importance. We acquire genetic resources with valuable properties from domestic and foreign sources and also gather them during collection expeditions. The collected items go through detailed **evaluation** of their morphological and biological characters in multiannual field trials. Their economic and yield criteria and characteristics are tested. We possess an extensive **photographic documentation**. After the evaluation cycle is completed some materials are put into the collection, the **seed material** for the needs of users is stored in the CRI Genebank in Prague and obtained **passport and evaluation data** are put into the **EVIGEZ** Information System. We also provide seed samples to other users free of charge for the purpose of their further research, breeding or education.



There are around **1400 genetic resources** in our collection. The most widespread is Oilseed Rape - winter form (43 %), Oilseed Rape - spring form (13 %), Opium Poppy (14 %) and White Mustard (8 %). In the collection there are also 9 minority crops. The increased emphasis is put on the quality of work with genetic resources, especially with the aim to **prevent potential genetic erosion** during the process of regeneration in isolation cages.

Crop	Number of gen. res.
Oilseed Rape- winter	602
Oilseed Rape- spring	178
Turnip-rape winter	32
Turnip-rape spring	44
White Mustard	114
Black Mustard	26
Chinese Mustard	85
Opium Poppy	189
Gold-of-pleasure	88
Fodder Radish	8
Crambe	12
Rocket-salad	14
Rutabaga	3



Opium Poppy.

Crop Research Institute

Division of Field Experiments
- Viticulture Research Station

Karlštejn 98, 267 18

www.vurv.cz



The Viticulture Research Station in Karlštejn was established in 1919 as an isolated viticulture location for preservation of *Vitis* genetic material in case of any potential pest or disease outbreak as was, e.g. the case of Phylloxera incidence at the end of 19th century. The development of the whole *Vitis* collection was thus a natural continuation of the initial activities. However, the proper official foundation of the collection was initiated in Karlštejn in 1979. Since the beginning of the National Programme the Station has been coordinating the related activities of all other Czech national *Vitis* collections (AMPELOS in Znojmo-Vrbovec and MENDELU, Horticultural Faculty in Lednice). Priorities were and still nowadays are aimed at local and neglected varieties and their mutations. Therefore, accessions like Portugieser gruen and grau, Traminer weiss, Budinka, Hans, Froehlich's silvaner, Kilmanův hrozen, Pinot Meunier or Chasselas cioutat etc. (see more on <http://genbank.vurv.cz/genetic/resources>) are part of our collection. Other accessions were added taking into account their breeding potential for the specific geographical conditions of the Czech Republic. Up to date 274 accessions belonging to 172 varieties are preserved in total. 269 accessions represent *Vitis vinifera* L.



Growing of plants in *in vitro* conditions.

and 5 qualify for *V.vinifera_x_wild_species* (interspecific crosses).

The Station is closely involved in the activities related to the development of **the European Genebank Integrated System (AEGIS)**. The main efforts are aimed at preserving the maximum of genetic diversity with a minimum necessary number of accessions – establishing core collection. Apart from that, many accessions are being continuously characterized and evaluated. We are focusing on selected ampelographic, ampelometric and enological traits with the highest informative value. The list of traits is indicated in the European project **RESGEN06**, in which we are taking part. We also participate in the ongoing international project called **COST FA1003** that is aimed at optimization of evaluation of traits through phenotyping and

use of molecular markers. High percentage of duplicates and difficulties linked with accession names like synonyms and homonyms in all European collections demand specific tools for their distinction. One of the methods used is SSR markers, which help to distinguish the varieties based on their DNA diversity. This kind of mapping of the collections connected also with their evaluation is now in progress. Beside the field collection we have also started to develop an **in vitro** collection which currently contains 53 accessions. It allows us not only to carry out studies on specific media composition for particular cultivars but also opens the possibility for future conservation in cryo conditions. All preserved materials are freely available to other users for the purpose of research, breeding and education.



Vineyard with grown plants.

Mendel University in Brno

Faculty of Horticulture
in Lednice, 69144

<http://www.zf.mendelu.cz/cz>



Fruit plant collections held in the Faculty of Horticulture, Lednice

Apricots - the beginning of the apricot collections dates back to the 1960s when it was set up to support the research activities within the former Fruit and Viticulture Department. Well-known persons were responsible for the collection development, as Prof. Z. Vachůn and Prof. M. Vávra. However, the accession of the Faculty to the National Programme has initiated systematic work on genetic resources. The collection currently contains 311 accessions representing all ecological and geographical groups, several clones of Velkopavlovická variety and donors of specific traits for breeding.

Peaches - first activities related to the collection of peach genetic resources date also back to the 1960s. They were further promoted in 1995 when the Faculty joined the National Programme and Mr. I. Oukropec supervised the collection. At present, the collection contains varieties grown on the territory of the former Czechoslovakia, and also some material from

China - altogether 200 varieties of peaches and nectarines and 15 varieties of almonds.

Grapes - the collection is focussed on inter-specific varieties possessing resistance to fungal pathogens and winter frosts. At present there are approximately 230 different varieties, which are evaluated in ampelographic and ampelometric characters. Donors of resistance to



Apricot 'Betinka'.

pests and diseases, e.g. powdery mildew, downy mildew and Phylloxera are used in breeding.

Less commonly grown fruits - this group covers species such as quince (32 accessions), Japanese quince (3), sea buckthorn (13), cornelian cherry (14), honeysuckle (23), medlar (2), mulberry (3), European cranberry bush (3), rose hip (2) and service berry (7) and some other species. They represent trees and bushes which are relatively easy to grow, often even in extreme conditions. Among their advantages are the high nutritional value of their fruits, early maturation and bearing of fruits, high yields and regular fruiting. The collections are regularly evaluated and selected materials are recommended for specific agro-ecological conditions.

Flowers - collections of *Callistephus* (135 varieties), *Tagetes* (46 varieties), *Salvia* (30 varieties), *Carthamus* (20 varieties) and *Zinnia* (44 varieties) represent labour-intensive annuals (therophytes). Collection of *Canna* lilies (36 varieties) is maintained vegetatively.

Medicinal herbs and perennial plants - the group includes liquorice, yarrow, rhubarb, asparagus and horseradish. Apart from the evaluating morphological characteristics, the attention is given to horticultural attributes.



Honeysuckle 'Morena'.

Institute of Botany The Academy of Sciences of the Czech Republic

Botanical Garden of Průhonice

Zámek I, 252 43 Průhonice

www.ibot.cas.cz, www.ibotky.cz



Botanical garden of Průhonice was founded fifty years ago in 1963. There have been collected numerous collections of irises, roses, peonies, daylilies and rhododendrons in the garden during its existence. The aim is to gather collections and present original botanical species as well as their variability to the public, and to show the progression of historical breeding from varieties cultivated in the Middle Ages up to the latest trends in breeding.

The **collection of bearded irises** is thoroughly systematic and chronologically organized. **Historic irises** are unique, old, previously commonly grown in the gardens and appearing now time to time as hybrids in nature. Some of them were originally described as the botanical species - for example, german iris (*Iris germanica*) and elder – scanted iris (*I. sambucina*). There are irises which are usually well known by their own name and are being grown sometimes, though still rarely, and might possibly totally disappear from the gardens. Their identification is often problematic without comparison with living plants. The collection of historic irises in the Botanical garden of Průhonice is one of the largest in the world.

Apart from the above mentioned, the collection is being focused on wide range of garden varieties of bearded iris (*I. barbata* hort.) and emphasises significant milestones of breeding. Particu-



Iris sambucina.

lar attention is given to the **varieties of the Czech origin** and their main genetic resources. There are also irises of other groups, especially the **Siberian irises, water irises and spuria irises**. The last one is a major group of **beardless iris varieties** of Czech origin. The collection of irises has been involved in the National program in 2006. The Descriptor List of the genus *Iris* L. was prepared in 2007 - 2008. Plants are grown and organized in field collection accessible to the public within the garden called iridarium as well as in the production and treatment areas.

Amount of genetic resources of genus *Iris* in field Genebank in 2013

Pogoniris/Barbata	362
Protected species - Pogoniris/Barbata with limited availability	4
Beardless irises - Apogon/Spuria	46
Total amount of genetic resources of genus <i>Iris</i> in GB	412



The Botanical Garden in Průhonice.

Viticulture Breeding Station (VBS) Znojmo, Plc.

67124 Vrbovec 274

www.ampelos.cz

 AMPELOS

The Viticulture Station in Vrbovec is the oldest station in the Czech Republic, which has been engaged in grape vine breeding and its gene pool conservation. It was founded in 1859 as an imperial-royal technical station for the purpose of Phylloxera control in Moravia. In that time, the viticulture in Moravia was facing economic and agronomic problems due to newly emerged fungal diseases and also other pests as e.g. Phylloxera. The solution was found in the procedure of grafting on resistant stocks and it was supplemented by chemical protection against fungi diseases. This approach has been still valid up to the present. However, the breeding of cultivars tolerant to pathogens proved to be a valid alternative procedure. It is based on the crosses between high-quality European cvs. and wild resistant American sources. Since the Station was founded, Moravian and European cultivars were being collected and maintained there, together with wild American species and their hybrids. The results on crossings and bred clones have been recorded since 1920.

The essential task of the Station is the **conservation** of the collected genetic resources for their present and future utilization. The collection consists of 286 grape vine accessions in total. Another important activity,



Cultivar Vrboška.

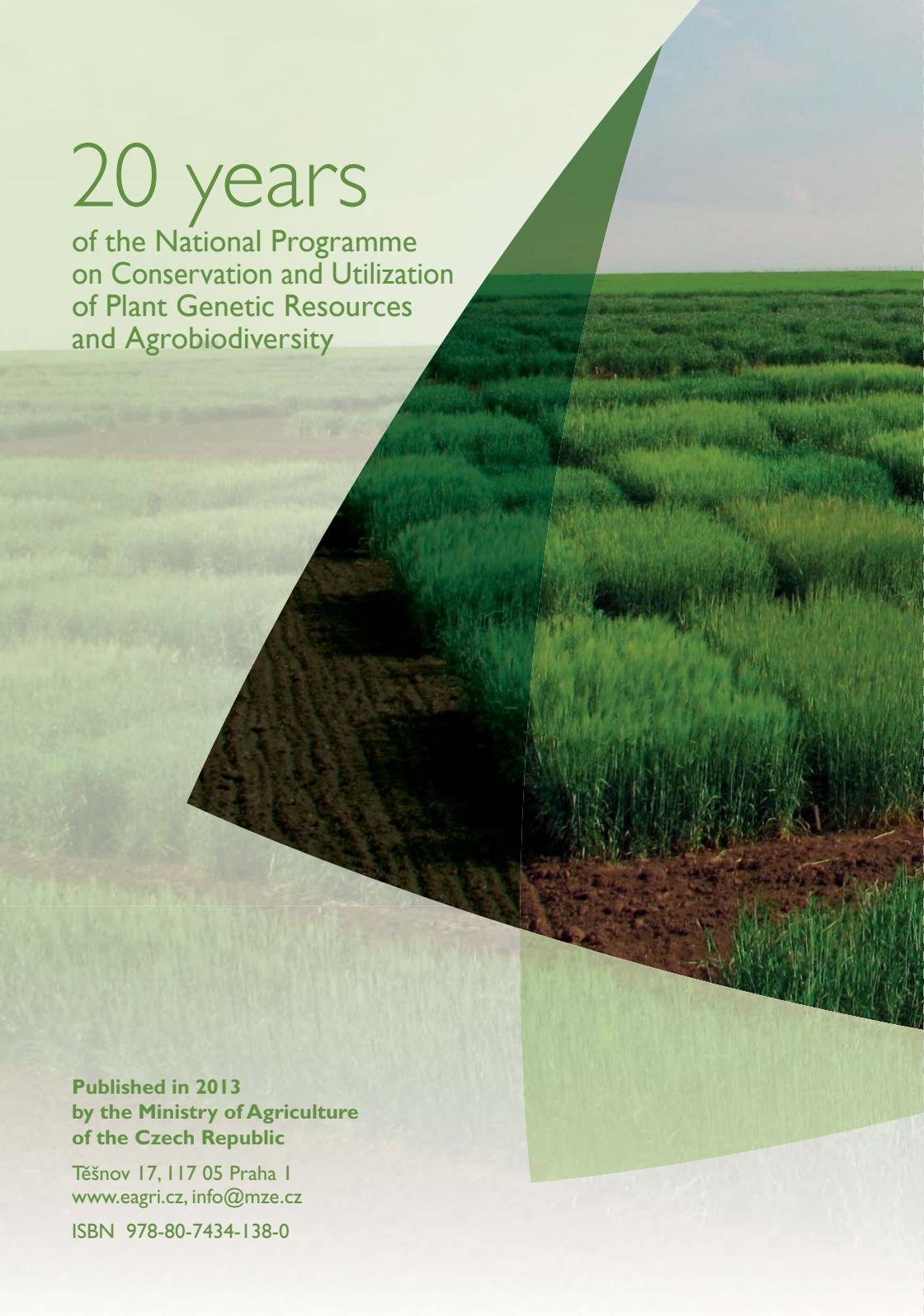


beside the conservation in the field Genebank, is the **evaluation** of genetic resources using the Descriptor List for *Vitis* with 72 characters. Selected valuable cultivars are often being introduced to the practice (e.g. Müller Thurgau, Hibernál, Zweigeltrebe). **Utilization of genetic resources** in breeding programmes remains the most important way of their use; e.g. in breeding of Vrboška and Veritas cultivars or clones recently sent to the variety testing trials (Ampel, Diti and Zora). The VBS Znojmo is also engaged in **re-introduction** of some local or old cvs. with specific quality characters for breeding and commercial growing (e.g. cvs. Kamenorůžák bílý, Muškát traminer, Ryzlink buketový, Veltlínské červenobílé, Semillon). The Station also arranged for the repatriation of cv. Muškát Tairovskij.

New modern and careful processing technologies and related analytic evaluation during the processing allow finding and maintaining a range of new tastes and flavours in **obsolete and neglected cvs.** Such cvs. as e.g. Červenošpičák, Sylvánské zelené, Bouvieruův hrozen can then meet the market demand as high-quality or special vines. Currently, complete regeneration of the grape vine collection is carried out with the aim of increasing the security of conservation and access to all genetic resources. The Breeding Station has extensive professional contacts and visitors from the Czech Republic, Slovakia and Austria often appreciate our seminars and workshops.



Field Genebank.



20 years

of the National Programme
on Conservation and Utilization
of Plant Genetic Resources
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