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CONSERVATION AND MANAGEMENT OF PLANT GENETIC RESOURCES FROM CULTURAL AND WILDLIFE IN BULGARIA AND THEIR USE IN THE BREEDING PROGRAM

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Abstract

Preservation of plant biodiversity from cultural and wildlife is a priority activity of the Institute of Plant Genetic Resources, Sadovo. This is the first scientific agricultural center of Bulgaria, where it began introduction of new species and varieties and today in IPGR are collected and stored a rich variety of species and a variety of local and foreign germ plasm. The aim of the paper is to focus on the preservation and use of existing plant wealth of usable germ plasm and establishment of science-based strategy for management and conservation of biodiversity. Using the method of remote hybridization between common winter wheat and durum wheat. The received lines poses genes for resistance to biotic and abiotic stress factors and a better quality of the grain.

Introduction

The preservation of plant biodiversity of Bulgarian flora is the main priority in the scientific activities of IPGR – Sadovo that is a part of the National programme in Plant Genetic resources (PGR) through realization of the ”Conservation, Management and Use of PGR in Bulgaria” Project. The main goal of the project is conservation of the national plant biodiversity.

Material and Methods

Trends of research of PGR are created using the shuttle system, descriptive, evaluative and analytical methods, laboratory analyzes of seeds. For evaluation of the species werealso used descriptors European program for PGR, SEEDnet, international classifications of UPOV and specific methods for some species (Angelova S. et.al,1998; Koeva R.et.al, 1995).

Results and discussion

Enrichment.The enrichment of the collections with plant germplasm of established groups of crops is mainly realized through free exchange with foreign partners, through expeditions and interchange. During the recentyears collection is focused mainly on local varieties and populations of wild species and their wild relatives, rare, threatened or endemic species and foreign varieties and models to produce valuable qualities.

During the period 2009-2013 was performed enrichment of the collections with a total of 5086 samples (Koeva R. 1987). The largest share of 3062 species are samples received from expeditions mainly from our native flora and abroad / 132 number from China, Romania, Slovakia, Slovenia and Macedonia /.

Through international exchanges with 40 countries were received and registered 1762 passport data samples.

Enrichment of the collections with 393 samples and valuable breeding lines with Bulgarian origin had been made due to internalexchange.

Maintenance. Maintaining of thecollected plant gene pool is done by applying appropriate methods according to the specific requirements of each culture:

• Annual reproducing for deposit in long-term and short-term storage of an average over 2000 samples. For the recovery of samples with reduced germination - 150-300 pieces are reproduced each year.

• In the *ex situ* field collections are maintained over 780 samples of vegetatively propagated crops: cereals, medicinal, ornamental forage, etc.
• *In situ* are maintained several localities of wild fodder and medicinal species.
• In recent years, through the implementation of international projects are collected original old varieties and forms from different regions in Bulgaria.
• In *in vitro* collections are maintained about 350 samples vegetatively propagated species (potato vine, mint, hops, medicinal and essential oil), rare, protected and endemic plants (Dimitrova, D. et al, 2009).
• In the botanical garden *in vivo* collection is enriched with local germplasm and in 2013 had a total of 470 species from 45 plant families.

Storage in the National genebank. The National gene bank was built in 1984 and carry out science program for long-term storage of germplasm seed under controlled conditions in accordance with the FAO (1980/1995g), (Stoyanova S. 2005, 2007). Maintaining the diversity of cultural plant species and their wild relatives is done in three collections:

Baseline Collection - Long-term is storage of samples in a confined airtight containers at -18°C.

Work collection - Ensure storage of seeds from three to ten years at +60 ° C.

Exchange collection - It provides free exchange with partners from national and international system.

National gene bank supports over 56 000 samples of 2670 plant species. In the base collection are stored 39,340 samples.

The specific activity of the existing laboratory at the National Genebank includes: seed control analyzes and preparation of samples for storage, checks the status of the seeds, keeping the exchange collection and organization of free exchange, identify the variety in methods of ISTA and UPOV.

Storage in the Botanical garden. The Botanical garden is a specialised unit of the Programme of Plant Genetic Resources of IPGR – Sadovo. It was established in 2002 with its main goal being the preservation of local resources through in vivo and in garden conservation. Rare, endemic, and endangered plants are kept there belonging to 54 families. Out of their total number, 8 are Balkan endemits – *Achilleaclypeolata, Allisoidesbulgaricum*, *Knautiamacedonica, Chamaecitisusjanke,* Iris reichenbachii, Iris suaveolens, Aegilopscylindrica, Haberlearhodopensis, which is also rare; 5 are Bulgraianendemits - *Allium rhodopaeum, Sedum album, Viciaincisa, Aegilopsneglecta , Soldanella rhodopaea*; 4 are endangered plants – *Leucoyum aestivum, Artemisia pedemontana, Anemone sylvestris, Pyracanth acoccinea*; 11 are rare plants - *Meumathamanticum, Artemisia lerchiana, Artemisia pontica, Leontopodium alpinum, Leucanthemum vilgare, Andrachne telephioides, Aegilopstriuncialis ,Koeleriabrevis, Secalecereale var. perene, Clematis alpina, Paeoniatenuifolia.* The medical plant collection that is kept in the botanical garden comprises 51 species. The specimens in the Botanical Garden are divided thematically as follows: essential –oil plants; grasses; forage crops; ornamental plants; rare and endangered plants; crop wild relatives; introduced plant species. Demonstrative collections in the botanical garden are made of species that include crop wild relatives, old varieties and ecotypes: *Beta maritima, Trigonellacoerulea, Luffaacutangula*; old pea varieties as well as introduced plant species- *Physalisperuviana, Cynarascolymus, Cynaracardunculus*.

Herbarium collection. Enriched with samples from expeditions, a herbarium collection was created at the IPGR - Sadovo, including rare, endangered and endemic species: Dracunculus vulgaris – endangered; *Artemisia chamaemelifolia; Centaureaparilica* – rare, Balkan endemic plant; *Ligulariasibirica* – endangered; *Anthemissancti-johannis* – rare, Bulgarian endemic plant; *Onosmarhodopaea* – endangered, Balkan endemic plant; *Tracheliumrumelianum* – rare, Balkan endemic plant; *Astragalusphysocalix* – Balkan endemic plant; *Gentianapunctata* – endangered; *Liliumrhodopaeum* – rare, Balkan endemic plant*; Geumrhodopaeum* – rare, Bulgarian endemic plant; *Origanumvulgare*.

Use of PGR in wheat breeding program. Plant breeding selection of cereals in IPGR-Sadovo is aimed at creating varieties with high drought tolerance, ecological plasticity and adaptability to adverse factors. The most valuable accessions are included in the hybridization schemes for the creation of genetic diversity on the signs: frost and drought tolerance in common wheat. Optimizing embryo rescue methods to overcome not cross embryonic and postembryonic incompatibility arising from hybridization between distant species. The wild relatives of the common wheat, maintained in IRGR – Sadovo comprise species as *Tr. monococcum, Tr.dicoccum, Tr. dicoccon, Tr. turgidum, Tr. monococcum, Tr. boeoticum, Tr. polonicum, Tr. sphaerococcum, Tr. aegilopoides, Tr. dicoccoides, Tr. cartlicum, Tr. spelta, Tr. timopheevi* were tested to abiotic stress. The best frost resistance show the following species: *Tr. sphaerococcum* (containing chromosomes from D genome) and *Tr. boeoticum*- A genome (Uhr et al., 2007a). Eighteen species from genus *Aegilops*are studied -*Ae. biuncialis, Ae. caudata L. , Ae. comosa, Ae. crassaAe. cylindrica, Ae. geniculata, Ae. juvenalis, Ae. kotschyi* идр. The majority of accessions of *Ae.biuncialis* and *Ae. triuncialis* are resistant to brown rust (Pucciniarecontita) and those from Ae. cylindrica are highly sensitive. Many of the accessions of Ae. neglecta, Ae. ovata and Ae. triuncialis are characterized by resistance to yellow rust (*Puccinia striiformis*), while good cold resistance is exhibited by *Ae. crassa* and *Ae. tauschii* (containing chromosomes of the D genome) and *Ae. speltoides* (G genome). In

the group which are most sensitive to coldare are samples of *Ae. caudata*.

These species of genus *Aegilops* are used in as a source for the selection. Hybridization between them and Bulgarian winter wheat varieties was made. The received plants are F2, or the selection process is still at a very early stage. At advanced stage of selection process (microtrial) are tested 18 lines, received through remote hybridization between common winter wheat and durum wheat. The received lines poses genes for resistance to biotic and abiotic stress factors and a better quality of the grain.

Conclusion

Priorities for future activities within the PGR Programme in the IPGR – Sadovo should be closer interaction with the scientific and educational centres in Bulgaria; collection of the existing old varieties and populations of vegetables, grain legumes, cereals, forage, ornamental and other crops; establishment of new territories and producers for in situ and on farm conservation; creation of demonstrative collections and trials for educational and practical purposes (with wild species, very old varieties, plants interesting for cultivation, etc.); creation of seed plots with wild forage, medical, oil and other plant species for reintroduction or improvement of areas of high natural value; preparation of a plan for interaction between biodiversity, agriculture and good practices.

Modern agriculture is based on a limited range of varieties and a few species. Generations before us have used countless local forms with large genetic variation, even within one country and region. The conservation and use of old plant material provides researchers, now and in the future, with valuable germplasm resistant to biotic and abiotic factors, many of which are stored only in the gene bank of PGRI - Sadovo.

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