Nikolaya Velcheva

Documentation of Plant Genetic Resources in Bulgaria: Progress and Perspective

Affilations
Agricultural Academy, Institute of Plant Genetic Resources "K. Malkov", Department of Plant Genetic Resources, 2 Druzhba Str., 4122 Sadovo, Plovdiv region, Bulgaria

Correspondence
Nikolaya Velcheva: nikolaya_velcheva@abv.bg

Abstract

Plant genetic resources for food and agriculture are critically important for the sustainable food production in conditions of an ever-growing population and climate change. One of the main priorities up to 2030 at the European level is to guarantee free access to the genebank collections of all users. In this connection information activities play a significant role in serving a large number of consumers as scientists, crop breeders, farmers, students, etc. The Institute in Sadovo is a National coordinator of all activities related to the conservation and management of plant genetic resources and represents Bulgaria in the European program (ECPGR) and EURISCO web catalogue. During the period 2021-2023, an information system "Genebank" was developed following the standard of FAO/Bioversity (2017). As well an electronic platform with free access to the local plant gene pool has been created, which includes accessions from traditional crops, used by local communities. The aim of the study is to explore the genebank documentation system in Bulgaria with a view to its active application at research and the agro-food system. The obtained results are used for the development of future perspectives, focused on (1) expanding the scope of intelligent systems and smart agriculture in conservation and use of plant diversity, and (2) valorization of traditional varieties in order to develop specific products with local identity.

Keywords

Plant diversity, database, information system, smart agriculture, European collaboration.

Introduction

The EU has attached great importance to the conservation and utilization of plant genetic resources for food and agriculture. The Second Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture addresses new challenges, such as climate change and food insecurity, as well as novel opportunities, including information activities, free access to the genebanks, development of international networks, etc. According to 18 priority activities it is focused in four main groups: *in situ* conservation and management; *ex situ* conservation; sustainable use; and building sustainable institutional and human capacities (Food and Agriculture Organization [FAO], 2011). The Global Plan has formulated and

perfected a series of regulations and has strengthened the management of plant genetic resources. In fact, lack of access to data and the scarce or absent exchange of information are key factors affecting the conservation and use of PGRFA. The need for documentation has been recognized by the Convention on Biological Diversity and it puts emphasis on the need to collect and standardizing the information to make it available through National Sharing Mechanisms and specialized global information systems. Through training and popularization of scientific knowledge related to genetic resources, public awareness has been promoted. Through the international cooperation and establishment of collaborative networks, it has promoted the exchange of information and germplasm. Through the implementation of various European programs and projects, the conservation system for plant genetic resources has been established and improved gradually to achieve the objectives of safe conservation and sustainable use of plant genetic resources, which has played a great role in plant breeding and food security.

Plant genetic resources are cultivated and wild forms, local populations, old, forgotten and improved varieties, carriers of a functional unit of heredity, and possessing real or potential value for science and practice practice (International Treaty on Plant Genetic Resources for Food and Agriculture [ITPGRFA], 2009); Mattana *et al.*, 2021). The main goal of their collection is the creation of well-documented, preserved and studied collections that represent the widest possible diversity of the gene pool (Engels & Ebert, 2021; Engels & Visser, 2008).

Maintaining plant genetic diversity through seeds of cultivated species and their wild relatives at national, regional, and international levels, and promoting access to and equitable sharing of benefits arising from the use of these resources and associated traditional knowledge is one of the objectives in the Sustainable Development Goals of FAO (https://www-.fao.org-/sustainable-development-goals/indicators/251a/en/).

Due to its specific geographical location, diverse relief and climatic features, our country is distinguished by a rich botanical diversity, which has been used for millennia in traditional Bulgarian cuisine and medicine. With its role as a national coordinator of plant genetic resources, IPGR-Sadovo follows international documents establishing obligations such as conducting measures for public awareness of the importance of plant genetic resources, cooperating with European partners to conduct scientific research for the transfer of new technologies, contributing to information exchange and increasing access and use of the gene pool (European Cooperative Programme for Plant Genetic Resources [ECPGR], 2021).

The Nagoya Protocol (Convention on Biological Diversity [CBD], 2011) recognizes that countries have sovereign rights over their genetic resources and provides a framework for domestic legislations on Access and Benefit-Sharing. Although the ITPGRFA's Multilateral System of Access and Benefit-Sharing provides opportunities for easier access to plant genetic resources for food and agriculture (International Treaty on Plant Genetic Resources for Food and Agriculture [ITPGRFA], 2009), genebanks face increasing complexity in their

operation. Adding material to genebank collections has become more difficult, not only because collecting missions need to be negotiated with national and local authorities, but also because acquiring material from other collections is possible if the origin of the material is properly documented and is done in compliance with regulations (Brink & van Hintum, 2020; Halewood *et al.*, 2018; Mendel *et al.*, 2019; Pilling *et al.*, 2020; Weise et al., 2021; Weise *et al.*, 2020).

The aim of the study is to explore the genebank documentation system in Bulgaria with a view to its active application in research and the agro-food system.

Materials and Methods

The Center for information and documentation of plant genetic resources at IPGR-Sadovo has been established in 1982 and completely renovated in the period 2021-2023. It works according to the international standard of FAO/Bioversity (Food and Agriculture Organization [FAO] & Bioversity International, 2017).

The National Genebank of Bulgaria, situated at IPGR-Sadovo, was built in 1984 and carries out a scientific program for the long-term preservation of germplasm with seeds under controlled conditions in accordance with the standards developed by FAO (Food and Agriculture Organization [FAO], 2013). The genebank facilities are designed both for long-term storage and medium-term storage.

Annually, accessions from foreign genebanks are introduced, registrated in the IPGR database, studied and maintained. Expeditions in different geographical regions of the country are conducted and valuable local varieties and crop wild relatives are collected. In the fund of the genebank are stored new improved varieties with Bulgarian origin from the specialized breeding institutes.

The electronic database contains the following passport information: taxonomy, catalogue number of accessions, acquisition date, country of origin, donor of the sample, collection site, ecology-geographical characterization, biological status, type of storage: base collection (long-term), exchange collection (medium-term), work collection (short-term), *in vitro* and/or field collection, botanical garden, etc. The taxonomic description of the crops is under the nomenclature of the USDA (Genetic Resources Information Network [GRIN], 2015).

The National Genebank is nominated as a focal point in the European Search Catalogue for Plant Genetic Resources – EURISCO (http://eurisco.ecpgr.org). EURISCO is an open access network, providing information about *ex situ* plant collections in Europe (Dias *et al.*, 2013; Hintum & Knüpffer, 2010; Kreide et al., 2019; Weise et al., 2019). It provides information at the accession level about more than 2 million samples from 6,736 genera and 45,171 species, conserved in European genebanks. Numerous ECPGR Central Crop Databases are *on line* available, as well as knowledge on their potential for use (Gass *et al.*, 1997). Through EURISCO the information about the Bulgarian National Inventory is accessible in other international databases, such as A European Genebank Integrated System – AEGIS (Engels & Maggioni, 2012; Hintum *et al.*, 2021), the World

Information and Early Warning System – WIEWS (Food and Agriculture Organization (FAO), 2020) and the electronic platform for Plant Genetic Resources for Food and Agriculture, conserved in genebanks worldwide - GENESYS (GENESYS, 2015).

In 2023 intelligent documentation system with specialized software, functional ontologies for free access to plant genetic resources for all stakeholders and assured security of records through blockchain technologies is established (https://genbank.uni-plovdiv.net/). Starting with the use of field books, a gradual development of electronic data base as national register, nowadays the intelligent data management system aims to improve the availability of conserved seed accessions in genebank to users (Dou-kovska, 2021; Doychev *et al.*, 2020; Stoyanova-Doycheva *et al.*, 2020). As well an electronic platform with free access for local plant gene pool has been created, which includes accessions from traditional crops, used by local communities (https://plantsdigcatalog.agriacad.bg/).

Results and Analysis

Collections of plant genetic resources and a set of technologies for their conservation, study and practical use are now the basis of bioeconomy, biosafety and food security. It is the foundation underpinning production chains, leading from basic research to various technological areas and industries.

There are 66,399 preserved seed accessions in IPGR-Sadovo from 70,834 totally registered plant germplasm in Bulgaria (http://eurisco.ecpgr.org), where 18,846 accessions have local origin (Table 1).

The National collection of plant genetic resources consists of cultivated species and their wild relatives, local and foreign varieties, populations, breeding lines, and samples, as well as threatened and endangered species.

During the period 1982-2024, the fund of the National Genebank in IPGR-Sadovo was enriched with accessions, distributed according to their status and acquisition source (Fig. 1).
Through conducted expeditions, 11,067 accessions - great diversity of cereals, grain legumes, and vegetable local varieties (called also farmers' varieties or landraces) from home gardens and crop wild relatives from natural habitats, were collected. Local plant genetic resources comprise 20% of the genebank enrichment.

The first direction of expeditions is the collection of cultural forms from field and vegetable crops. Traditional accessions from tomato, pepper, cucumber, pumpkin, melon, watermelon, onion, lettuce, adapted to the specific agro-ecological conditions, characterized with valuable traits such as early maturity, resistance to biotic and abiotic stress, high biological content, were found in home gardens. For cereals and grain legumes the attention is directed to collecting of primitive wheat accessions, old and local populations of corn, bean, cowpea, lentil, chickpea, fava bean, etc. Of particular interest is the species diversity of forgotten spices and medicinal plants, which are being rediscovered for the purposes of dietary, healthy nutrition and applied in therapies for the alternative treatment of a number of diseases.

Another focus of expeditions is the preservation of wild, semi-natural diversity

and crop wild relatives. The high urbanization, developed transport infrastructure and ecological threats put a large number of wild species of different botanical families at great risk.

The described ecologi-geographical characteristic of the collected accessions makes it possible to return the local varieties to the regions of origin through the seed samples, stored in the *ex situ* collections.

The foreign germplasm comprises 68% of the genebank enrichment. 36,911 accessions from advanced varieties and breeding lines of diverse geographical origin were introduced for evaluation in our conditions and for use as donors of valuable economic traits in crop breeding. The germplasm free exchange significantly contributes to the enrichment of the plant diversity and expands the possibilities for accelerating the breeding process of peanut and sesame. Active international contacts with centers of plant genetic resources from all over the world are maintained. The main partners in free germplasm exchange of the National genebank are: USDA (USA), ICARDA (Syria), VIR (Russia), NordGen (Sweden), IPK (Germany), INRA (France), John Innes Center (Great Britain). The institute maintains collective membership in the international organizations ECPGR (European Cooperative Program for Plant Genetic Resources) and EUCARPIA (European Association for Research on Plant Breeding). There are working contacts, joint research and development of international projects with scientific teams of foreign scientific organizations as Swedish Biodiversity Center (SEEDNet) - Sweden; CIMMYT-FAWWON (Facultative and Winter Wheat Observation Nursery) – Mexico/Turkey; Svalbard Global Seed Vault – Norway; Global Crop Diversity Trust; Heilongjiang Agricultural Academy - Harbin, China; Center for Plant Genetic Resources - Norway; International Biodiversity Institute, Rome, Italy (Bioversity International); Norwegian Center for Plant Genetic Resources - Ashe; Institute of Plant Breeding, Chinese Academy of Agricultural Sciences - Beijing, China; Hokkaido Agricultural Research Center, Japan; Polytechnic Institute - Beja, Portugal; Research Center for Plant Breeding at Trakya University - Edirne, Turkey; Institute of Field and Vegetable Crops - Novi Sad, Serbia, have been created.

Analyzing the status of newly registered accessions during the period, a relatively low percentage (12%) of the enrichment with new Bulgarian varieties and breeding lines was found. 6,224 advanced cultivars and breeding lines from breeding institutes in Bulgaria are conserved in IPGR-Sadovo.

The research work of the IPGR-Sadovo team is aimed at breeding-genetic, immunity, and biotechnological studies to create new varieties of common wheat, rice, peanuts, and sesame, through the methods of classical breeding and plant biotechnology; develops methods of variety maintenance and production of pre-basic and basic seeds; develops and improves methods and means for increasing the productivity of plants and the quality of production. The wheat breeding started in 1902 as a part of the first program of the Agricultural Experimental Station in Sadovo. The institute is unique in the Bulgarian state system with complex scientific research in the field of breeding-genetics and agrotechnics with peanut, sesame and rice crops. The main areas of research are introduction and evaluation of

new varieties of peanuts and sesame for the purposes of genetic improvement and crop production; creation of early-ripening, high-yielding, disease-resistant, with good economic qualities, suitable for mechanized inspection and harvesting; development and optimization of individual units of the technology for growing and harvesting peanuts and sesame; the improvement of methods for assessing the strength of the attached placenta in sesame. The directions of research and applied activity in rice breeding are collection, study, enrichment, storage and reproduction of rice accessions, creation and implementation of new high-yielding with high grain quality and short vegetation period varieties resistant to abiotic and biotic stress factors.

In carrying out the research work over enrichment of *ex situ* collections, IPGR-Sadovo maintains partnerships with all bioresource institutes through the country as Crop Research Instituties in the Agricultural Academy, Institute of Plant Genetics and Physiology, Institute of Biodiversity and Ecosystem Research at the Bulgarian Academ of Sciense, University Botanical Garden – Sofia; Agricultural University - Plovdiv, Faculty of Agriculture at Trakya University – Stara Zagora and Forestry University - Sofia; Primary and secondary schools; Agricultural cooperatives; Associations of agricultural producers; farmers, trading companies, etc.

The enrichment of the *ex situ* collections is divided into seven crop groups: cereals (62 %), grain legumes (16 %), forages (3 %), oil and technical crops (8 %), vegetables (10 %), medicinal and aromatic plants (1 %).

A database of marked and surveyed localities for *in situ* maintenance of wild species in Strandja, South Dobrudja, the North Black Sea, and part of the East and West Rhodopes regions has been created.

Development of *in situ* conservation is focused on crop wild relatives. The starting point of the crop wild relatives taxa list comprises 5,088 species from 137 plant families. The biggest number belongs to *Asteraceae* (632 species), followed by *Fabaceae* (469 species) and *Poaceae* (419 species). The priority taxa includes 81 population from 27 plant genera /*Allium, Anethum, Apium, Daucus, Lathyrus, Lotus, Lupinus, Medicago, Melilotus, Mentha, Pisum, Trifolium, Vicia, Lamiaceae, Salvia, Sideritis, Aegilops, Avena, Bromus, Dactilis, Festuca, Hordeum, Lolium, Poa, Rosa, Secale, Valeriana*/. The structure of the national database is following the standard format of EURISCO for *in situ* crop wild relatives descriptors. In 2023, passport data describing the first 20 populations, totally 15 species from the priority taxa: *Glycirrhiza, Silene, Trifolium, Heracleum, Calamagrostis, Dactylis, Bromus, Mentha, Stachys, Lepidium, Clinopodium, Achillea, Daucus, Lotus, Mentha* from Bulgaria were uploaded to the EURISCO web page using the Intranet *in situ* crop wild relatives.

Systematic investigation of the genetic diversity may contribute effectively to the conservation of endemic, rare and threatened plant species in Bulgaria and may help preserve the natural genetic patterns of species in the wild when restoration measures are carried out. Especially due to the vulnerability status of these plant taxa, extensive studies on vegetative multiplication, the development of optimal *in vitro* propagation protocols

and strategic conservation programs are required (Kovács *et al.*, 2021).

The documentation system optimizes the data management of collection activities in the process of registration, storage, study, reproduction and distribution. The National Register is characterized by 3,701 taxonomic descriptions, distributed in 122 botanical families. The number of addresses of foreign partners in germplasm exchange is 203.

According to the open access catalogue EURISCO (data check – June, 2024) Bulgaria maintains the richest plant genetic resources collection in the Southeast European region. The national collection is the 7th biggest in Europe and has a share of 3,5%, after Great Britain, Russia, Germany, Ukraine, Poland and Spain. In connection to its taxonomic composition, the preserved accessions belong to 532 genera and 1,927 plant species.

Bulgarian National Inventory is a part of a "virtual" European Genebank Integrated System (AEGIS). The status of the Bulgarian collection amounts to 391 local accessions and it is presented in Figure 2.

The new national documentation intelligent system improves the management of all processes related to conservation, study, and access to the stored plant gene pool. Basic elements of the ontology are the taxonomic description and EURISCO descriptors. It is possible to supplement the passport information with characterization and evaluation data and photos. The built server infrastructure "GenBank - plant genetic resources" will be used for the purposes of the other research projects. The overall goal of the program is to conduct fundamental and applied scientific research to create models for diagnosis and forecasting through digital methods for managing agricultural holdings in crop production and ensuring a sustainable and efficient food system (Doukovska, 2021).

Conclusions

Although Bulgaria has gained remarkable achievements in conservation and documentation of plant genetic resources, there are still a number of challenges. The study presents an analysis of the current state and an assessment of the prospects for the development of germplasm collections in Bulgaria.

In the National Genebank there is an important number of conserved plant genetic resources with a high degree of diversity and wide representation in European networks.

A great diversity of farmers' varieties and landraces from home gardens and crop wild relatives from natural habitats were collected, but further work on evaluation and characterization of these valuable accessions continues.

Future perspectives are focused on expanding the scope of intelligent systems and smart agriculture in conservation and use of plant diversity, and valorization of traditional varieties in order to develop specific products with local identity.

The intelligent documentation system is a 'knowledge bank' and a platform for collaboration between researchers, plant breeders and all users of conserved plant genetic resources.

The improvement of documentation of plant genetic resources is greatly contributing to food security, rapid development of national economy and increase in farmers' income.

Acknowledgements

This research work was carried out with the support of Bulgarian National Science Fund under the project "DIGIVALPGR Digitalization and valorisation of local plant genetic resources in Bulgaria and Slovakia in the framework of maintaining compatibility and interoperability in the European area", Contract Number KP-06-Slovakia/9/13.08.2024.

References

Brink, M., & van Hintum, T. (2020). Genebank operation in the arena of access and benefit-sharing policies. *Frontiers in Plant Science, 10,* 1712. https://doi.org/10.3389-/fpls.2019.01712

Convention on Biological Diversity (CBD). (2011). *Nagoya protocol on access to genetic resources and the fair and equitable sharing of benefits arising from their utilisation to the Convention on Biological Diversity.* United Nations Environment Programme. https://www.cbd.int/abs/

Dias, S., Dulloo, M., & Arnaud, E. (2012). The role of EURISCO in promoting the use of agricultural biodiversity. In *Agrobiodiversity Conservation: Securing the Diversity of Crop Wild Relatives and Landraces* (pp. 270–277). CABI.

Doukovska, L. (2021). Artificial intelligence to support Bulgarian crop production. *Engineering Sciences, 58*(4), 30–48. https://doi.org/10.7546/EngSci.LV-III.21.04.03

Doychev, E., Malinov, P., Velcheva, N., & Duchev, Z. (2020). A Genebank architecture: A distributed system for management of plant genetic resources. In *2020 IEEE 10th International Conference on Intelligent Systems* (pp. 580–583). IEEE. https://doi.org/10.1109/IS48319.2020.9199972

European Cooperative Programme for Plant Genetic Resources (ECPGR). (2021). *Plant genetic resources strategy for Europe.* Rome, Italy. https://www.ecpgr.cgiar.org-/fileadmin/bioversity/publications/pdfs/PGR_STRATEGY_LP_22_Nov_revised.pdf

Engels, J., & Ebert, A. (2021). A critical review of the current global ex situ conservation system for plant agrobiodiversity. I. History of the development of the global system in the context of the political/legal framework and its major conservation components. *Plants, 10*(8), 1557. https://doi.org/-10.3390/plants10081557

Engels, J., & Maggioni, L. (2012). AEGIS: A regionally based approach to PGR conservation. In *Agrobiodiversity Conse-rvation: Securing the Diversity of Crop Wild Relatives and Landraces* (pp. 321–326). CABI.

Engels, J., & Visser, L. (2008). *A guide to effective management of germplasm collections.* IPGRI Handbooks for Genebanks No. 6. Rome, Italy. https://www.bioversityinternational.org/e-library/publications/detail/

Food and Agriculture Organization (FAO). (2011). *Second global plan of action for plant genetic resources for food and*

agriculture. Commission on Genetic Resources for Food and Agriculture. http://www.-fao.org/docrep/015/i2624e/i2624e00.pdf

Food and Agriculture Organization (FAO). (2013). *Genebank standards for plant genetic resources for food and agriculture.* Rome, Italy. ISBN 9789251082621.

Food and Agriculture Organization (FAO). (2020). *World information and early warning system on plant genetic resources for food and agriculture (WIEWS).* http://www.fao.org/wiews/

Food and Agriculture Organization (FAO) & Bioversity International. (2017). *Multi-crop passport descriptors.* Rome, Italy. https://www.ecpgr.cgiar.org/fileadmin/templates/ecpgr.org/upload/EURISCO/EURISCO_MCPD2_descriptors_updated_November_2017.pdf

Gass, T., Lipman, E., & Maggioni, L. (1997). The role of central crop databases in the European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR). In *Central Crop DB: Tools for PGR Management* (pp. 22–29). ECPGR Networks, Rome, Italy.

GENESYS. (2015). *The global gateway to genetic resources.* https://www.genesys-pgr.org/

Genetic Resources Information Network (GRIN). (2015). *Taxonomy for plants.* USDA.

Halewood, M., Chiurugwi, T., Sackville Hamilton, R., Kurtz, B., Marden, E., Welch, E., Michiels, F., Mozafari, J., Sabran, M., Patron, N., Kersey, P., Bastow, R., Dorius, S., Dias, S., McCouch, S., & Powell, W. (2018). Plant genetic resources for food and agriculture: Opportunities and challenges emerging from the science and information technology revolution. *New Phytologist, 217*(4), 1407–1419. https://doi.org/10.1111-/nph.14993

Hintum, T. van, Engels, J., & Maggioni, L. (2021). AEGIS, the virtual European Genebank: Why it is such a good idea, why it is not working, and how it could be improved. *Plants, 10*(10), 2165. https://doi.org/10.3390/plants10102165

Hintum, T. van, & Knüpffer, H. (2010). Current taxonomic composition of European genebank material documented in EURISCO. *Plant Genetic Resources, 8*(2), 182–188.

International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). (2009). *International treaty on plant genetic resources for food and agriculture.* Rome, Italy. https://www.fao.-org/plant-treaty/en/

Kovács, Zs., Csergő, A. M., Csontos, P., & Höhn, M. (2021). Ex situ conservation in botanical gardens – Challenges and scientific potential preserving plant biodiversity. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca, 49*(2), Article 12334. https://doi.org/10.15835/nbha4921-2334

Kreide, S., Oppermann, M., & Weise, S. (2019). Advancement of taxonomic searches in the European search catalogue for plant genetic resources. *Plant Genetic Resources: Characterization and Utilization, 17*(6), 559–561. https://doi.org-/10.1017/S1479262119000339

Mattana, E., Ulian, T., & Pritchard, H. (2021). Seeds as natural capital. *Trends in Plant Science, 27*(2), 139–146. https://-doi.org/10.1016/j.tplants.2021.08.008

Mendel, Ľ., Hauptvogel, P., & Čičová, I. (2019). Plant genetic resources information system of Slovakia as the primary source of the information. In *Agrobiodiversity for Improving Nutrition, Health, and Quality of Life* (Vol. 3, pp. 178–185). SPU; Kyiv. https://doi.org/10.15414/agrobiodiver-sity.2019.2585-8246.178-185

Pilling, D., Bélanger, J., Diulgheroff, S., Koskela, J., Leroy, G., Mair, G., & Hoffmann, I. (2020). Global status of genetic resources for food and agriculture: Challenges and research needs. *Genetic Resources, 1*(1), 4–16. https://doi.org/10.-46265/gen-resj.2020.1.4-16

Stoyanova-Doycheva, A., Ivanova, V., Doychev, E., & Spassova, K. (2020). Development of an ontology in plant genetic resources. In *2020 IEEE 10th International Conference on Intelligent Systems* (pp. 246–251). https://doi.org/10.-1109/IS48319.2020.9199935

Weise, S. (2021). Data management for preserving genetic diversity: Experiences and challenges. In *34th Meeting EUCARPIA Fodder Crops* (pp. 12–16). https://doi.org/10.5507/vup.21.24459677

Weise, S., Lohwasser, U., & Oppermann, M. (2020). Document or lose it – On the importance of information management for genetic resources conservation in genebanks. *Plants, 9*(8), 1050. https://doi.-org/10.3390/plants9081050

Weise, S., Oppermann, M., Maggioni, L., Hintum, T. van, & Knüpffer, H. (2017). EURISCO: The European search catalogue for plant genetic resources. *Nucleic Acids Research, 45*(D1), D1003–D1008. https://-doi.org/10.1093/nar/gkw755

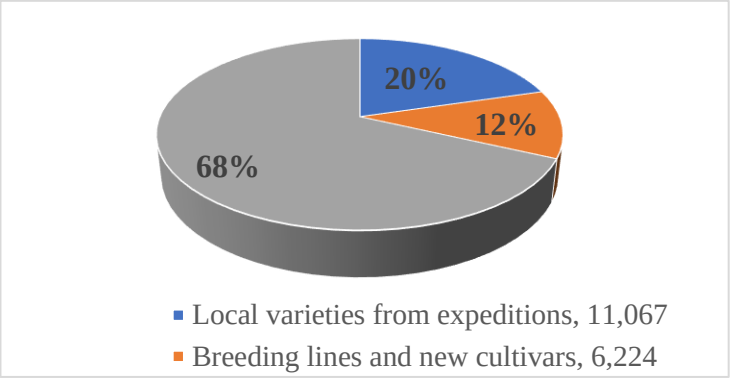

Fig. 1. Enrichment of conserved plant diversity in Bulgarian seed genebank (1982-2024).

Table 1. Holding institutes of the Bulgarian National Inventory.

INSTCODE	Holding institute name	Number of accessions	Accessions of Bulgarian origin
BGR001	Institute for Plant Genetic Resources, Sadovo	66,399	16,998
BGR005	Institute of Rose and Essential-oil Plants, Kazanlak	563	4
BGR007	Institute of Maize, Knega	13	13
BGR015	Institute of Forage Crops, Pleven	2	2
BGR029	Dobrudja Agricultural Institute, General Toshevo	3,857	1,829
	Total	70,834	18,846

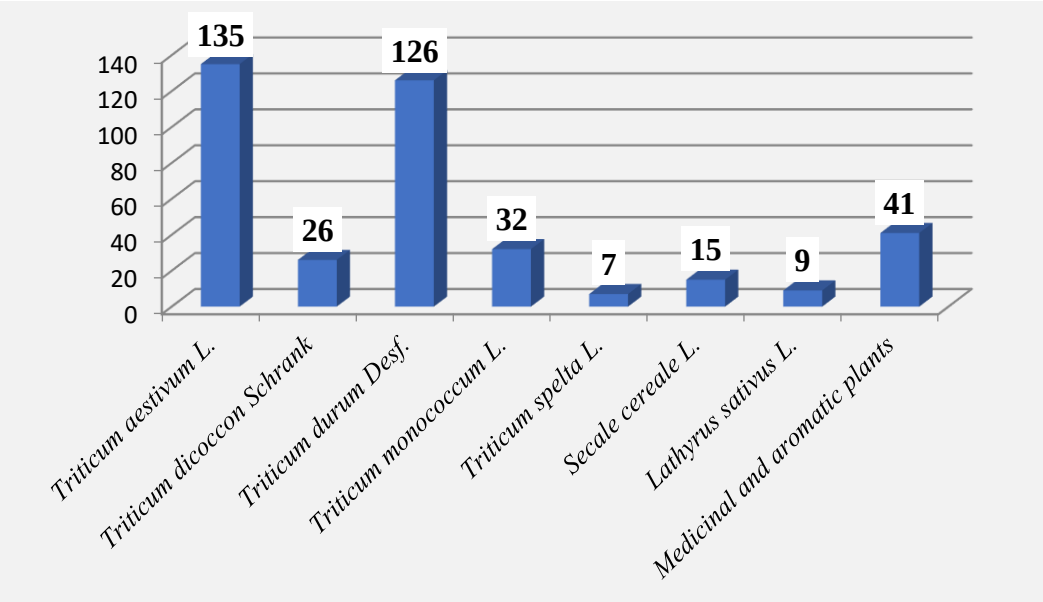

Fig. 2. Distribution of Bulgarian local accesions in AEGIS database by crop species.