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The Study of Biodiversity of Thirty Two Families of Useful Plants Existed in Georgia

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***Abstract*—**The article deals with the database, which was created by the authors, related to biodiversity of some families of useful plants (medicinal, aromatic, spices, dye and poisonous) existing in Georgia considering important taxonomy. Our country is also rich with endemic genera. The results of monitoring of the phytogenetic resources to reveal perspective species and situation of endemic species and resources are also discussed in this paper. To get some new medicinal and preventive treatments using plant raw material in the phytomedicine, phytocosmetics and phytoculinary, the unique phytogenetic resources should be protected because the application of useful plants is becoming irreversible. This can be observed along with intensification and sustainable use of ethnobotanical traditions and promotion of phytoproduction based on the international requirements on biodiversity (Convention on Biological Diversity - CBD). Though Georgian phytopharmacy has the centuries-old traditions, today it is becoming the main concern.

***Keywords*—**Aromatic, medicinal, poisonous, spicy, dye plants, endemic biodiversity, endemic, ELISA, GIS.

I. Introduction

IN recent years, interest in most useful plants (medicinal, aromatic, spicy, dye and poisonous) has been increased in Georgia and the potential of their use has progress in modern medicine, cosmetology or cookery, though there are a lot of synthetic-chemical means. The application of the synthetic raw materials and drugs is often followed by side effects, like allergies, while medicines produced from plants have no harmful side effects because of high biological activity and less toxicity. It is possible to use them for various chronic and acute diseases, often spread released among human population as well as animals.

The process mentioned above has a great importance as in metabolic processes taking place in ontogenesis period of plants, there are formed very significant and precious compounds, like essential oils, alkaloids, antioxidants, glycosides, tanning matters, vitamins or biologically active substances that have soft and long-term effects on the human body and have stable results. They also have positive physiologic effect on the live organisms.

After the ban on application of antibiotics in several countries, Georgia has a unique chance to become one of the main manufacturers of biologically active natural substances for human food and animal forage. Its product could occupy an important share of world market and become profitable because of its unique ecologically clean endemic genetic resources.

Monitoring and conservation of species (among them endemics) and habitats of Georgia is an important data source for nature protection in country and is the bases for decision-making, reasoning and professional preparation of documentation for natural protection as well as evaluation of biodiversity objectives achieved during 2002-2017.

A rich and unique phytogenetic fund of Georgia represents a natural-historic treasure and requires permanent conservation-rehabilitation-multiplication, as it progressively exterminates or changes under the influence of various natural disasters or anthropological impact. The problem is important for our country, because there are spread economically profitable cultivated plants and their unique endemic wild relatives such as unique endemic and most useful plants (medicinal, aromatic, spicy, dye and poisonous) in Georgia, which cannot be found anywhere in the world. Due to their current state, most of these plants are on the verge of extinction. The erosive process of genetic resources and uncontrolled export is going on. Therefore, it is necessary to preserve a biodiversity through ensuring *in-situ* and *ex-situ/on farm*, as well as conservation in international seed banks like Svalbard Global Seed vault [1], [4].

Development of infrastructure of most useful plants and the establishment of production plantations has many side effects in Georgia. With every passing year, strategic plan directions are developed:

a) Ecological factors - Cultivation of useful plants and rational usage of natural genetic recourses will promote maintenance of biodiversity of the country and protection of its unique gene pool.
b) Pharmacological factors - Commodity price of useful plants is assigned according to the concentration of pharmacologically active substances and tests on ecological purity. Due to positive influence of intensive agrotechnical polices, quality indicators of cultivated plants greatly exceed the test results of correspondent wild relatives. Moreover, our ecosystem is less polluted by heavy metals and undesirable tests.
c) Economic factors - production of ecologically pure products and standard seed from useful plants provides for stable and guaranteed income due to great demand, and the process becomes more and more irreversible. Development of flexible marketing model will promote production of cheap local medications, development of priority farms, and monetary and credit relations. At the

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same time, this priority implies a huge potential for export.

d) In the future, useful plants medications of organic origin and a base for pharmaceutical industry will be established in the purposes of production-technology, management and scientific-research; ecologically pure, high quality products will be produced through organic agriculture; recording and cataloguing of wild and cultivated plants of Georgian flora will be carried out. Development of conditions for production, drying, processing, storage of useful plants in purpose of their rational use [2], [5].

Nowadays climate change has become increasingly recognized as one of the greatest problems. Genetic resource of endemic populations with biological criteria will assist its rational use-conservation-defense in our country. Accordingly, while making cultivated plantations in farming sectors, it has to be taken into account the following issues of the system: environment-soil-climate-plant-fertilization-productivity, their criteria, biological peculiarities of the plant, it should be selected optimal technologies for reproduction relevant region, in case of right management of the processes, ecologically pure raw product with high productivity and standard content of pharmacologically active substances and production will be obtained and plants with unique genetic resources will be maintained [1].

II. Discussion

The main idea of the scientific research is monitoring, collection, evaluation, documentation of genetic resources and ethnobotanical data of useful plants (among them endemics, which goes in separate way). This scientific work is conducted in the different ecosystem zones of Georgia by different ways-genebanks, field, laboratory, etc. For realization of the goals of the research, the following activities were carried out:

1. In the different ecosystems of Georgia, inventory of germplasm of useful plants, including rare, endemic and endangered ones, scientific investigation of habitat, status, biomorphological and if necessary chemical composition and preparation of data base;
2. Collection of ethnobotanical skills distributed in different parts of Georgia concerning the investigated plants and preparation of electronic database with special computer program;
3. Creation of strategy and recommendations on *ex-sit, in-situ/on farm* conservation of rare, endemic and endangered species with proven value for country;
4. *On farm* conservation of selected plants, for creation of seed bank and future production of row materials for further sustainability of research;
5. Management of the sustainable use of most useful plants – preparation of phytoproduction, optimization of regimes of drying, processing and preservation;
6. Preparation of all seed materials for the sending and conservation in International seed banks like Svalbard Global Seed vault [3], [6], [8].

The study of most useful plants is conducted in three main directions:

1. Ethnobotanical study;
2. Study of germplasm resources and management of sustainable use;
3. *In-situ/on farm* Conservation of selected plants.

Ethnobotanical study based on survey of local population, the questionnaire is designed to focus on the local names of plants, and methods and recipes of their various applications, and investigation of germplasm resources is done according to IUCN categories;

Method of inventory of most useful plants is done for the species included in the existing short list of rare plant species that have medicinal/decorative properties and are known to be threatened on a global level by anthropogenic stresses and/or impacted by natural hazards in the region, on the bases of quantitative evaluation of threat levels according to literature data. Biomorphological study is conducted by classical inventory method within the period of orthogenesis considering different ecological parameters (high mountains and lowlands, populated area and wild nature) in accordance with electronic data programs.

Biologically and chemically active substances are determined by using the respective approved technique, ELISA technology in diagnosis and research [4], [7].

We have elaborated database of Georgian species (among them endemics) and habitats for which extensive research was conducted to the ethnobotanical direction considering to the different ecosystems of country. There are given some information about the most useful plants existed in Georgia:

1. Alliaceae - There are spread one genera and 40 species in Georgia; Number of Georgian endemics - 1;
2. Amaranthaceae - There are spread nine species in Georgia;
3. Amaryllidaceae - There are spread four genera and 13 species in Georgia;
4. Apocynaceae - There are spread two genera and four species in Georgia;
5. Asparagaceae - There are spread one genus and three species in Georgia;
6. Asteraceae – (Compositae) - Number of species - 566; Total number of endemics - 132; Number of Caucasian endemics - 88; Number of Georgian endemics - 44;
7. Apiaceae (Umbelliferae) - Number of species - 179; Total number of endemics - 58; Number of Caucasian endemics - 37; Number of Georgian endemics - 21;
8. Berberidaceae - There are spread four genera and seven species in Georgia, among them one endemic species;
9. Boraginaceae - There are spread five species of this genera in Georgia;
10. Brassicaceae (Cruciferae) - Number of species - 186; Total number of endemics - 34; Number of Caucasian endemics - 23; Number of Georgian endemics - 11;
11. Campanulaceae - There are spread five genera and 75 species in Georgia;
12. Caryophyllaceae - There are spread 30 genera and 150 species in Georgia, among them four endemic species;
13. Caprifoliaceae - There are spread four genera and 12 species in Georgia;

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14. Convallariaceae - There are spread three genera and seven species in Georgia;
15. Fabaceae (Leguminosae) - Number of species - 317; Total number of endemics - 79; Number of Caucasian endemics - 45; number of Georgian endemics - 34;
16. Gentianaceae - There are spread eight genera and 27 species in Georgia;
17. Helleboraceae - There are spread 18 species and among them 13 are Caucasus endemic;
18. Hyacinthaceae - There are spread five genera and 33 species in Georgia;
19. Iridaceae - There are spread three genera and 22 species in Georgia, among them one endemic species;
20. Lamiaceae (Labiatae) - Number of species - 150; Total number of endemics - 26; Number of Caucasian endemics - 17; Number of Georgian endemics - 9;
21. Lauraceae - Total number of species is 3000 and 45 genera, among them one species is spread in Georgia;
22. Liliaceae - There are spread six genera and 31 species in Georgia;
23. Lythraceae - There are seven species of this genera identified in Caucasus, three species in Georgia, two of them are endemic to the Caucasus;
24. Oleaceae - There are spread five genera and five species in Georgia;
25. Paeoniaceae - There are 10 species identified in Georgia, among them nine are endemic of Caucasus and Georgia;
26. Papaveraceae - There are spread five genera and 19 species in Georgia;
27. Plantaginaceae - There are spread 11 species of this genera in Georgia.
28. Polygonaceae - There are spread five genera and 50 species in Georgia;
29. Rosaceae - Number of species - 237; Total number of endemics - 221; Number of Caucasian endemics - 58; number of Georgian endemics - 63;
30. Solanaceae - There are spread 26 species in Georgia
31. Scrophulariaceae - There are spread about 30 genera and 180 species in Georgia; Number of species - 181; Total number of endemics - 52; number of Caucasian endemics - 38; Number of Georgian endemics - 14;
32. Valerianaceae - There are spread four genera and 24 species in Georgia. One of them - Valeriana colchica Utk. is endemic to the Caucasus [7], [9].

According to scientists, Georgian flora contains 4130 species of highest plants, 873 (21.1%) out of which 568 are Caucasian endemics, and 305 are Georgian endemics [9].



Sambucus nigra



Verbascum Pyramidatum



Verbascum Densiflorum



Valeriana officinalis

Fig. 1 Georgian endemic useful plants (Photos by T. Kacharava)

III. Conclusion

Endemic most useful plants are distinguished not only by their adaptability to local ecosystems, but also by stability to various diseases, pests and pathogenic agents as well as by high productivity and quality of production. Strategy of biodiversity protection includes conservation of cultivated plants with their allied wild forms and all forest plants along with the whole ecosystem. Raising awareness on conservation of genetic and varietal diversity and rational usage of the unique flora of Georgia is gaining the most importance. This can be observed along with intensification and sustainable use of ethnobotanical traditions and promotion of phytoproduction for phototherapy use, based on the rights acquired from the biodiversity of Georgia convention, through integration of the benefits distribution principles.

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