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WILD MEDICAL PLANTS IN THE PHYTOCENOSES OF THE NORTHERN KAZAKHSTAN

GALINA SHTEPHAN

A.I. Barayev Green Farming Scientific Production Center , Kazakhstan

The mobilization of genetic resources and their preservation for practical use have been actively pursued since the mid 80s of the 20th century and retain its position in the current millennium. The expedition survey specified habitats and provided assessment of wild species. The expedition collected seeds for future study and ex situ conservation of the gene pool, using them in the selection process as well. Survey areas with natural vegetation showed a downward trend in habitat, reducing of natural resources and the disappearance of some taxa of medicinal plants. In the northern regions of the country areas of *Helichrysum arenarium (L.) Moench., Plantago major L., Rosa majalis Herrm, Patrinia intermedia Roem. et Schult., Phlojodicarpus sibiricum K Pol.* have fallen sharply and, today, their distribution is patchy. *Adonis vernalis L.* does not form growing thickets of industrial value. This class has a high genetic erosion and is listed in the "Red Book". Stocks of many wild species of medicinal plants are depleted. These results suggest the need to preserve the natural plant communities and the introduction to the culture of a number of valuable wild medicinal plants.

Keywords: Biodiversity, natural phytocenoses, genetic resources, medicinal plants

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Introduction

Based on evolutionary theory each type and ecotype of plants is a unique creation of nature that emerged in the long process of natural selection, and occupies a certain ecological niche (Qualset and Shands, 2005).

The loss of wild species is particularly irreplaceable, only keeping them gives us the stability of the natural potential and the possibility of rational use of natural biodiversity. In the world there is the problem of the study and conservation of valuable medicinal plants, which are widely used by leading companies in pharmacology as a raw material. Currently, in the global pharmaceuticals market share of vegetable origin is more than 40% (Adekenov, 2003). Moreover, in recent years there has been a strong tendency to its increase. According to WHO prognosis during the nearest ten years the share of herbal medicines in the total amount of drugs will exceed 60% (Adekenov, 2003). Today plant raw materials are the only noteworthy base for manufacturing essential anti-cancer, antiarrhythmic, cardiac, and other drugs.

Human activities over the past decade in all areas of the economy and socially life was accompanied by considerable destruction of the environment and this process still continues (Urazaliev, Kenenbaev, and Esimbekova, 2004; Alimgazinova, 2004). Preservation of the national plant wealth and its species diversity remains one of the most topical issues nowadays. Natural resource material, adapted cultural flora and their wild relatives, introduced genetic resources, selection material all are the carriers of valuable features and properties (Monoharan, Yang, and Hsu, 2007; Belonogova, Yakovlev, Oleshko, and Kuritsyn, 2006).

The disappearance of genetic resources caused by destruction of their habitats has reached essential level; it is forecasted that the variety of the world could be reduced by 10% by the 2015 (Khalikulov and Street, 2004).

Literature review

In Kazakhstan there are over 6 000 species of plants, of which one tenth belongs to the endangered species, more than 120 species are wild relatives of agricultural plants, 70 species of 29 genera are forage crops, more than 700 species of medicinal plants are mentioned in folk medicine and 263 plants - in the scientific (Urazaliev et al., 2004).

Many works on the determining medicinal and aromatic plants, development of regional and global databases, studying and conservation of genetic resources are maintained in almost all developed countries: Japan, Israel, Canada, Slovakia, Belarus, Russia (Gorham, Tori, and Asakawa 1995; Dudai, Larkov, and Putievsky, 2001; Pedneault, Angers, and Gosselin, 2006; Vaverkova, 2009; Grib, 1996; Maskay, Street, Zuev, Mitrofanova, and Konopka, 2009; Tkachenko, 2003).

In Kazakhstan, whose territory is located at the junction of three genetic centers of cultivated plants origin selected by Vavilov (1926), the diversity of soil and climatic conditions entails a very large species and population diversity of cultural and wild plants. The richness of the vegetation of Kazakhstan has always been the object of research for scientists (Ivanov and Buhteeva, 1981). Studies of flora in Kazakhstan, Siberia and the Altai were carried out by botanists for over 200 years ago. Plant resources of Kazakhstan were mainly studied by geobotanists and florists. Constantly operating agro botanical expeditions to collect source materials were organized by All-Russian Institute of Plant (AIP) named after I. N. Vavilov in the 1969-1979 years (Vavilov, 1965). In addition to AIP staff in the expeditions took part scientists from research organization of Kazakhstan and Russia.

In the recent years, investigation of the natural flora in order to determine species composition, habitat of wild medicinal plants was of a fragmentary nature and did not reflect the comprehencive picture. Currently, a number of expeditions have been organized to investigate natural plant communities and to collect wild medicinal plant species seeds. Researchers at the Institute of Botany and Phyto Introduction have conducted resource examinations of medicinal plants in the flora of the Altai, Tarbagatai, Tien Shan, Trans-Ili Alatau (Kukenov, 1996; Egeubaeva, 2002), Central Kazakhstan (Shaushekov, 2004), and Northern Kazakhstan (Shtefan, 2004; Shtefan, 2001).

The best way to preserve natural plant communities is to ensure the possibility of their existence in natural habitats. Such *in situ* conservation is possible in nature reserves, national parks, and in plantation forests.

The *ex situ* preservation complements the *in situ* conservation. The former one is organized on the bases of scientific research institutes in the plant introduction nurseries. The disadvantage of this method of preservation is the need to involve large areas for cultivation of crops. However, at the same time, it includes study, plant reproduction and their introduction to the culture. It should be noted that the introduction of wild species with a large habitat and multiple forms which have ecological flexibility and ability to variability are the source material for breeding of medicinal crops.

Expeditionary examination of natural cenoses

After a long break, members of the A.I. Barayev Green Farming Scientific Production Center renewed examination of the natural vegetation of the northern regions of Kazakhstan and the local Eastern and Central Kazakhstan. It has been revealed the loss of biodiversity and the absence of certain species of fodder and medicinal plants previously being cenoses. Significant depletion of medicinal plants, and often the loss of taxa occur due to the haphazard and rude harvesting of wild medicinal herbs. The natural vegetation, represented by the meadow-forest, meadow-steppe and fescue-feather grass and mixed grass species, has preserved only on lands out of agricultural use (Kurkin, 1998).

In the flora of northern Kazakhstan there are about 80 species of medicinal plants, mostly meadow-steppe type: *Achillea millefolium L., Taraxacum officinale Wigg, Salvia stepposa Shost.,*

Plantago lanceolate L., Capsella bursa pastoris Megis., Tanace-tum vulgare L., Equisetum arvense L. These widely used in medicine plants take place in small clumps, and often solitary in the mixed grass communities.

Surveys in Akmola, North Kazakhstan, Kostanay found the lack of large natural phytogenesis, referring to the extensive land cultivation. Plant communities located in forest-steppe and steppe vegetation-soil zones were investigated. The most common soils in these areas are the ordinary and southern chernozems, meadow and meadow-chernozem soil, as well as salt licks, and their complexes. The natural vegetation, represented by meadow-forest, meadow-steppe and fescue-feather grass and forb species, preserved in places occupied by birch, birch-aspen groves and forests, in land depressions and follows of no agricultural use. Some places show secondary mixed grass communities where living individual plant species serve as indicators of human impact on nature (Kleptsova, Volkotrub, and Karavayev, 2001; Tkachenko, 2006)

Arrays of *Phlojodicarpus sibiricus (Steph.) K.Pol., Ziziphora bungeana Gus.,* dominant in the sagebrush-forb cenosis, take place on the stony-gravelly soils on the slopes of hills in the North-Kazakhstan region. In all areas, preferring moist sites, grows *Plantago major L.; Plantago media L, Rumex confertus Willd., Galium boreale L.*

In the mixed grass meadows, among scrublands in Kostanai region remained arrays (0.2-0.5 m) of *Echinops sphaerocephalus L., Eryndium planum L., Sanguisorba offfici-nalis L. Salvia nutans L.* occurs occasionally. Well lighted margins in birch forests reveal the *Thymus marschallianus Willd., Thymus serphyllum L., Echinops ritro L., Filipendula ulmaria (L.) Maxim., Phlomis tuberosa L.*

Cichorium intybus L., Bidens tripartite L., Helichrysum arenarium (L.) Moench are widespread in the secondary mixed grass cenoses. The later plant has a very wide application in medicine, being an excellent raw material for production of choleretic action drugs (Sokolov and Zamotaev, 1991). However, the decreasing of Helichrysum propagation area in nature has led to the need to cultivate it in the culture. *Urtica dioica, Artemisia dracunculus L.* crop up in man-made forests.

Hummocky semi-desert area of Karaganda region appears as separate hills with uniform vegetation. Mainly xeromorphic species take place in this zone: *Artemisia, Testuca sulcata (Hack.) Nym., Stipa sapillata L., Ceratocarpus are-narius L.*; on the slopes of the hills - *Silene multiflora* Pers., *Thymus serpyllum L.* (very small plants, height not exceeding 6 cm), *Caragana frumex (L.) C.Koch.* In the lower areas of the hills the species composition is broader. The mixed grass cenoses show *Bromus arvensis L., Clycyrrhiza uralensis Fisch., Onobryshis arenaria (Kit.) Ser., Xanthium strumarium L., Thermopsis lanceolata R.Br., Salvia stepposa Shost., Ammophila arenaria (L.) Link. Clycyrrhiza uralensis* in the licorice herbal association makes almost 50-60%.

The floristic composition of plant cenoses of the steppe zone of Pavlodar region is not rich and is represented largely by xerophytes: *Caragana frutex (L.) C.Koch., Stipa capillata L., Calamagrostis epigeios (L.) Roth.* From medicinal plants the *Eryngium planum L., Linaria vulgaris Mill., Thymus serpyllum L* are spread insignificantly.

Expedition route to the East Kazakhstan region passed through the steppe zone plains with the transition to the to the Altai foothills (piedmont steppe zone).

The steppe zone is an extension of the West Siberian Plain. The soils are mainly dark-brown containing loam and sandy loam structures. Climatic conditions of the steppe zone are characterized by aridity and constant winds. Annual precipitation is 250-270 mm. Vegetation is mainly represented by feathergrass-fescue communities, in lows - by grass-forb, in the presence of salinity - by sagebrush-grass mix-associations. Exodynamic succession caused formation of secondary cenoses where wild species of weeds were superseded by cultivated plants. *Salvia stipposa Shost, Plantago major L., Verbascum thapsus L., Echinops ritro L., Malva pussila* are found in the grass-mixed grass communities. Natural plant communities take place among the ribbon-like pine forests. There are some medicinal plants such as

Helichrysum arenarium Moench., Artemisia dracunculus L., Potentilla erecta (L.) Racusch. However, they do not form the thickets of industrial significance.

A number of crops of medicinal importance are met on Altai hills and foothills; but they grow in small clumps, or sparsely. *Origanum vulgare L., Hypericum scabrum L., Ziziphora bungeana Jus., Phlojodicarpus sibiricus (Steph.) K.Pol., Echinops sphaerocephalus L., Achillea mileffolium L.* are among them.

Glycyrrhiza uralensis Fisch., and *G. Korshinsskyi Grig.*A take a special place among the medicinal plants of Kazakhstan. Their main thickets of industrial value are located in the south where their area cover more than 30 thousand hectares, and in the north - where licorice natural populations occur as separate arrays of 0.5 to 2.5 hectares in Kostanay, North Kazakhstan regions in the hollows, lows, alkaline meadows.

Adonis vernalis L. does not form growing thickets of industrial value. This class has a high genetic erosion and is listed in the "Red Book". However, concentration of cardiac glycosides in this plant makes it indispensable in the treatment of cardiovascular disease (Sokolov and Zamotaev, 1991).

Conclusion

Expeditionary examination showed the present state of natural vegetation funds considering a significant change in species composition in natural cenoses, reduction the area of medicinal plants and decrease the wild stocks of raw materials. *Ex situ* collections allow saving wild species, examining them in cultural environment, and giving necessary recommendations to regulate the collection of plant raw materials in nature. At the same time a number of medicinal crops such as *Helichrysum arenarium (L.) Moench., Plantago major L., Rosa majalis Herrm, Adonis vernalis L., Valeriana offisinalis L.* will require plantation cultivation to meet the needs of pharmaceutical base development. Saving and restoration of natural ecosystems is only possible when given a reasonable management based on scientific and legal bases. We should not forget the importance of conservation of genetic resources not only for biological diversity and ecological balance, but also for their use in practical breeding.

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