БИОЛОГИЯ
BIOLOGY

UDC 581.527.2 (035.3)

S.A. Aipeisova[1], N.A. Utarbaeva[2], E.T. Kazkeev[1]

[1]S. Baishev Aktobe University, Kazakhstan;
[2]K. Zhubanov Aktobe Regional State University, Kazakhstan
(E-mail: nurlygul.utarbaeva@mail.ru)

Useful plants of the flora of Aktobe region

In the article the results of long-term studies of useful plants of Aktobe region were presented, which is particularly interesting in terms of the botanical and geographical location. This region is located at the *boundary* between *Europe and Asia*. Seven groups of useful plants were identified: forage, medicinal, food, meadow, technical, ornamental, poisonous. According to the results of research, 876 species, which possess certain properties used by humans, have been identified in the region. It constitutes 59.4 % of the total number of flora species in Aktobe region. It was revealed that the largest number of species are presented in the following groups: medicinal plants — 593 species (40.2 %), forage plants — 428 species (29 %), ornamental — 253 species (17.2 %) of the region's flora. The smallest group are poisonous plants — 114 species. Many species have complex utility value. The most common species are in Aktobe region, such as: *Agropyron cristatum, Bromopsis inermis, Eremopyrum orientale, Festuca valesiaca, Phleum phleoides, Poa pratensis*, etc. *Agropyron cristatum* and *Secale sylvestre* may be of interest for breeding.

Keywords: flora, useful plants, Aktobe region, herbs, technical plants, raw materials.

Introduction

Aktobe region has an interesting geographical position, located at the junction of Europe and Asia, the boundary of which are the southern spurs of the Urals — the small Mugodzhary Mountains. The region is located on the Caspian lowland in the west, the Ustyurt plateau in the south, the Turan lowland in the southeast, and Mugodzhary in the center from north to south. Most of the region is a plain with heights of 100–200 m, dissected by river valleys; in the middle part are the Mugodzhary Mountains. The western part of Aktobe region is occupied by the Ural Plateau; in the southeast, arrays of hilly sands stretch — Big and Small Badgers. The Turgai Plateau enters the northeast of Aktobe region [1].

The territory of Aktobe region is located in the steppe and desert zones. According to the latest physiographic zoning, it is located within 7 physiographic regions (South Ural, Priuralsk-Turgai, North Caspian, Turgai Central Kazakhstan, South Caspian, Aral-Syrdarya and Mangyshlak-Ustyurt-Krasnovodsk) [2].

Aktobe region is of a particular interest in the botanical and geographical relation as one of the most significant industrial areas of Kazakhstan. Unique steppe communities, Cretaceous massifs, relict forest and marsh tracts in need of protection of flora have been preserved in the region [3]. Strengthening the anthropogenic factor on the environment of the region requires the intensification of work on the preservation of biodiversity and the creation of a system of monitoring the plant world, in particular, inventory and preservation of populations of useful plants of the flora.

Materials and research methods

The work was carried out on the basis of more than 30-years-old materials collected by the route method, the analysis of herbarium collections in Kazakhstan, as well as the generalization of literature data of the region. There are valuable species as part of any flora. These species have economic use and are promising for use in natural conditions and when introduced into culture.

The allocation of groups of useful plants was carried out by us according to their economic significance on the basis of works devoted to these issues [4–11].

Research results and discussion

Based on the available information on the beneficial properties of the flora species of the region, we identified several groups: forage, herbs, food, meadow, technical, ornamental, poisonous.

As a result of the analysis, 876 species with the properties used by humans have been identified, which is 59.4 % of the total number of species of the region's flora [12].

The largest numbers of species are such groups as: medicinal plants — 593 species (40.2 %). Forage plants are represented by 428 species or 29 % of the total number of species of the region's flora. The group of ornamental plants consists of 253 species of the flora of the region, or 17.2 % of the total number of species. The group of industrial plants includes 208 species (14.1 %).

The group of meadow plants is 238 species, food plants — 141 species, poisonous plants — 114 species. Many species have a complex utility value. Below there is a characteristic of plants by categories of utility.

Forage plants. All forage grasses are divided into 4 economic and botanical groups: cereals, legumes, sedge and forbs.

The largest number of forage plants in the flora of Aktobe region is contained in the *Poaceae* family — 90 species or 21 % of the total number of species, forage plants and the *Fabaceae* family — 76 species or 17 %.

In Aktobe region the most abundant species are *Agropyron cristatum, Bromopsis inermis, Eremopyrum orientale, Festuca valesiaca, Phleum phleoides, Poa pratensis,* etc. *Agropyron cristatum* and *Secale sylvestre* may be of interest for breeding.

High-grade fodder plants of the *Poaceae* family are *Alopecurus pratensis, Festuca pratensis, Elytrigia repens,* etc. The sedge group includes plants from the family *Cyperaceae and Juncaceae (Carex diandra, Carex riparia, Carex vulpina and Juncus compressus).*

The most valuable source of the protein component of forage plants is the species of the *Fabaceae* family. In the flowering phase, they contain about 18.4 % of protein, and up to 31.3 % in seeds [5]. In quantitative terms, the following genera dominate in this family: *Astragalus* (29 species), *Trifolium* (8 species), *Lathyrus* (8 species), *Medicago* (6 species).

Trifolium pratense, Trifolium repens, Trifolium hybridum, Medicago falcata, Lathyrus pratensis, Melilotus albus, Melilotus dentatus, Melilotus officinalis are the most valuable feeds.

In the northwest area (Kargaly region) there are large populations of *Melilotus officinalis*, which, in our opinion, are of particular interest for the breeding of forage plants. Also, the genus *Medicago* is of particular interest.

The rational use of natural resources is primarily based on the identification and regulation of stocks of economically beneficial plants. Despite the species diversity of resources, their base in the region remains poorly understood and requires further resource uses.

Herbs. In the flora of Aktobe region, 593 herbs are registered, 114 of which are used in official medicine [13, 14].

The largest number of herbs grows in forest pegs and floodplain forests: *Betula pendula, Alnus glutinosa, Comarum palustre, Agrimonia asiatica, Crataegus korolkowii, Fragaria vesca, Fragaria viridis, Rosa canina, Althaea officinalis, Athyrium filix-femina, Tussilago farfara and Dryopteris filixmas*.

Somewhat fewer species are found in meadows and marshes: *Inula helenium, Hypericum perforatum, Oxycoccus palustris, Sanguisorba officinalis, Cynoglossum officinale, Plantago maxima, Bidens tripartita*, etc.

Herb characteristic of steppe formations includes *Pulsatilla patens, Dianthus versicolor, Euphorbia subcordata, Carduus crispus*, etc. Among medicinal plants there are many weedy species: *Capsella bursa-pastoris*, *Xanthium strumarium, Taraxacum officinal, Urtica dioica, Berteroa incana*.

Therapeutic herbs can be used for the prevention and treatment of a number of diseases. *Helichrysum arenarium, Tanacetum vulgare, Artemisia absinthium, Achillea millefolium* can be used for raw materials. Besides, the territory of Aktobe region is perspective for resource management studies.

Food plants. Food plants occupy one of the first places among other foods, being an important source of proteins, carbohydrates, fats, vitamins.

The greatest value among the species in this group are fruit and berry, vegetable and spicy aromatic wild species. Fruit and berry include: *Rubus saxatilis, Rubus caesius, Padus avium, Rosa canina, Rosa laxa, Rosa*

majalis, Fragaria vesca, Fragaria viridis, Viburnum opulus, Crataegus korolkowii, Prunus spinosa, Ibrahmus, and *Idrasus, Ibrahmus, Ibrahmus sanguinea, Crataegus korolkowii, Prunus virosis, Viburnum opulus, Crataegus sanguinea, Crataegus korolkowii Padus avium, Rubus idaeus, Rosa acicularis*.

A number of herbaceous plants are used as vegetable species: *Allium angulosum, Allium caesium, Urtica dioica, Taraxacum officinal, Cichorium intybus, Sanguisorba officinalis, Rumex acetosa, Rumex confertus, Rumex pseudonatronatus, Stemera confertus, Steumera confertus, Rumex crispus, Rumex pertudonatronatus and Steamer confluentus.*

The aromatic plants include *Mentha piperita, Carum carvi, Daucus carota, Thymus marschallianus, Filipendula ulmaria, Humulus,* etc. Only a small fraction of plants of this group is used by locals.

Meadow plants. This group is represented by 238 flora plants, most of which belong to the family *Rosaceae* and *Fabaceae*: *Cerasus fruticosa, Comarum palustre, Cotoneaster melanocarpus, Padus avium, Chamaecytisus ruthenicus, Melilotus albus, Melilotus dentatus, Melampyrum cristatum, Salix hastata*.

In the broad sense, honey plants include plants that produce not only nectar, but also pollen or perga for bees. Usually honey plants are divided into three groups in terms of flowering: spring; summer; late summer and autumn.

Spring honey plants: species of *Betula, Ulmus, Salix, Taraxacum, Viburnum, Populus, Padus, Amygdalus* and other genera.

Running honey plants: *Chamerion angustifolium, Echium vulgare, Filipendula ulmaria, Medicago falcata, Melilotus albus, Melilotus officinalis, Rubus idaeus, Vicia cracca, Vicia tenuifolia, Trifolium hybridum, Trifolium medium, Trifolium pratense, Trifolium repens, Rosa majalis.*

Late summer and autumn honey plants: *Achillea millefolium, Berteroa incana, Origanum vulgare, Bidens tripartita, Odontites vulgaris.*

Technical plants. This is a group of plants, parts of which are used as raw materials for various industries.

In our flora, they include 208 plant species (14.1 %). They can be divided into the following subgroups: dyeing, essential oil, spinning, tanning and others.

Dyeing art is one of the oldest art. As soon as a person learned to make fabrics, make leather, make yarn, roll felt, and weave carpets, it became necessary to dye them. The ability to dye fabrics and make leather depended on the development of civilization, which was determined by historical time and natural conditions [15].

Dyeing plants of our flora include: *Betula pendula, Betula pubescens, Atraphaxis frutescens, Rumex confertus, Chelidonium majus, Isatis tinctoria, Genista tinctoria, Impatiens nolitangere*.

Tanning plants. By this name, plants are understood to contain special, so-called tannins in the cells, which are used in the manufacture of leather and give it a whole range of valuable technical properties, such as softness, strength, impermeability, color, etc.

In terms of their chemical composition, tannins, which are organic compounds, differ from each other in their possession of the following common features: they all dissolve in water, have astringent, tart taste, are precipitated by the action of glue, alcohol and oxidize to red or brown in air. *Rheum tataricum, Limonium gmelinii, Geranium pratense, Elaeagnus angustifolia* belong to tanning plants.

Essential oil plants are represented by such species as *Mentha longifolia, Nepeta cataria, Origanum vulgare, Chelidonium majus, Prunella vulgaris,* etc.

Spinning plants are presented: *Linum uralense, Linum corymbulosum, Linum perenne, Trachomitum lancifolium.* Other subgroups are represented by: *Humulus lupulus, Dipsacus gmelinii, Anabasis aphylla, Salix caprea, Salix alba*, etc.

Poisonous plants. Poisonous plants include: *Hyoscyamus niger, Datura stramonium, Ephedra distachya, Aconitum anthora, Conium maculatum, Hypericum perforatum, Equisetum arvense, Frangula alnus, Ranunculus flammula,* etc.

Poisonous plants are used as insecticides and ratids. Of the plant species growing in the region, these include *Cynoglossum officinale, Lepidium perfoliatum, Chelidonium majus,* etc.

Ornamental plants. The flora of the region contains in its composition a large number of species of interest for cultivation. This group is represented in our flora by 253 plant species (17.2 %). Only a small part of wild plants is used by local people in garden plots and front gardens. These include *Ulmus grabra, Betula pendula, Hesperis sibirica, Rosa majalis*, etc.

For flowering plants that are promising for use in culture are *Anemone sylvestris, Dianthus borbasii, Calystegia sepium, Pulsatilla patens, Filipendula ulmaria, Gladiolus imbricatus, Ixiolirion tataricum*, etc.

Conclusion

The rational use of natural resources is primarily based on the identification and regulation of stocks of economically beneficial plants. Despite the species diversity of resources, their base in Aktobe region requires further resource studies.

References

1 Энциклопедия «Актобе». — Актобе: Озат, 2003. — 25 с.

2 Гельдыева Г.В. Ландшафты Казахстана: учеб. пос. / Г.В. Гельдыева, Л.К. Веселова. — Алма-Ата: Ғылым, 1992. — 175 с.

3 Айпеисова С.А. Редкие исчезающие растения Актюбинской области: учеб. пос. / С.А. Айпеисова. — Актобе: Думан, 2011. — 5 с.

4 Рубцов Н.И. Дикорастущие лекарственные, технические и пищевые растения Западного Казахстана: учеб. пос. / Н.И. Рубцов. — Алматы: Полиграф-книга, 1934. — 32 с.

5 Павлов Н.В. Дикие полезные и технические растения СССР: учеб. пос. / Н.В. Павлов. — М.: Изд-во Госплана, 1942. — 642 с.

6 Кормовые растения сенокосов и пастбищ СССР: моногр.: в 3-х т. — Т. 3 / И.В. Ларин, Ш.М. Агабабян, Т.А. Работнов и др.; под общ. ред. М.Н. Касименко. — Л.: Изд-во сельскохозяйственной литературы, 1950. — 400 с.

7 Ларин И.В. Кормовые растения сенокосов и пастбищ СССР: моногр.: в 2-х т. — Т.1 / И.В. Ларин; под общ. ред. И.В. Ларина. — М.; Л.: Сельхозизд, 1957. — 879 с.

8 Кукенов М.К. Рациональное использование ресурсов лекарственных растений Казахстана / М.К. Кукенов // Изучение лекарственных растений Казахстана: материалы междунар. науч.-практ. конф. — Алма-Ата, 1988. — С. 5–12.

9 Кукенов М.К. Ботаническое ресурсоведение Казахстана: учеб. пос. / М.К. Кукенов. — Алматы: Ғылым, 1999. — 160 с.

10 Ларин И.В. Луговодство и пастбищное хозяйство: учеб. пос. / И.В. Ларин, А.Ф. Иванов, П.Л. Бегучеев и др. — Л.: Агропромиздат, 1990. — 600 с.

11 Дикорастущие полезные растения России / под ред. А.Л. Буданцева, Е.Е. Лесиовской. — СПб.: Изд-во СПХФА, 2001. — 664 с.

12 Айпеисова С.А. Ақтөбе облысының жабайы өсетін пайдалы өсімдіктері / С.А. Айпеисова. — Ақтөбе, 2017. —199 б.

13 Государственная фармакопея СССР. Общая методика анализа. Лекарственное растительное сырье. — М.: Медицина, 1990. — 398 с.

14 Государственный реестр лекарственных средств. — М.: Медицина, 2000. — 1202 с.

15 Королюк Е.А. Красильные растения Алтая и сопредельных территорий / Е.А. Королюк // Химия растительного сырья: материалы междунар. науч.-практ. конф. — Алматы, 2003. — С. 101–135.

С.А. Айпеисова, Н.А. Утарбаева, Е.Т. Казкеев

Ақтөбе облысы флорасының пайдалы өсімдіктері

Мақалада Еуропа мен Азияның қиылысында орналасқан ботаникалық және географиялық орналасуымен ерекше қызығушылық тудыратын Ақтөбе облысының пайдалы өсімдіктерінің ұзақмерзімді зерттеулерінің нәтижелері келтірілген. Пайдалы өсімдіктердің 7 тобы анықталды: жемшөп, дәрілік, азықтүлік, балжинаушы, техникалық, сәндік, улы. Зерттеу нәтижелері бойынша Ақтөбе облысындағы белгілі бір қасиетке ие адамдар пайдаланатын 876 өсімдік түрлері жалпы санының 59,4 %-ын құрайтыны анықталды. Саны бойынша ең көп түрлер топтары: дәрілік өсімдіктер — 593 түр (40,2 %), жемдік өсімдіктер — 428 (29,0 %), сәндік өсімдіктер — облыстың флорасының 253 түрі, немесе түрлердің жалпы санының 17,2 %; ең азы — зиянды өсімдіктердің тобы — 114 түр екені анықталды. Көптеген түрлердің пайдалы маңыздылығы зор. Ақтөбе облысында ең көп таралғандар қатарында *Agropyron cristatum, Bromopsis inermis, Eremopyrum orientale, Festuca valesiaca, Phleum phleoides, Poa pratensis* және тағы басқа түрлер. Селекциялық мақсатта *Agropyron cristatum* және *Secale sylvestre* қызығушылық тудыруы мүмкін.

Кілт сөздер: пайдалы өсімдіктер флорасы, Ақтөбе облысы, дәрілік өсімдіктер, техникалық өсімдіктер, шикізат.

С.А. Айпеисова, Н.А. Утарбаева, Е.Т. Казкеев

Полезные растения флоры Актюбинской области

В статье приведены результаты многолетних изучений полезных растений Актюбинской области, представляющей особый интерес в ботанико-географическом отношении и расположенной на стыке Европы и Азии. Были определены 7 групп полезных растений: кормовые, лекарственные, пищевые, медоносные, технические, декоративные, ядовитые. По результатам исследований на территории региона установлено 876 видов, обладающих теми или иными свойствами, используемыми человеком, составившими 59,4 % от общего числа видов флоры Актюбинской области. Выявлено, что наибольшее количество видов представляют группы: лекарственных растений — 593 видов (40,2 %), кормовые растения — 428 (29,0 %), декоративные — 253 вида флоры региона, или 17,2 % от общего числа видов, а наименьшим группа ядовитых растений составляет 114 видов. Многие виды имеют комплексное значение по полезности. Наиболее обильны на территории Актюбинской области такие виды, как *Agropyron cristatum, Bromopsis inermis, Eremopyrum orientale, Festuca valesiaca, Phleum phleoides, Poa pratensis* и др. Интерес для селекционных работ могут представлять *Agropyron cristatum* и *Secale sylvestre*.

Ключевые слова: флора, полезные растения, Актюбинская область, лекарственные растения, технические растения, сырье.

References

1 *Entsiklopediia «Aktobe» [Encyclopedia «Aktobe»]*. (2003). Aktobe: Ozat [in Russian].

2 Geldyeva, G.V. & Veselova, L.K. (1992). *Landshafty Kazakhstana [Landscapes of Kazakhstan]*. Alma-Ata: Hylym [in Russian].

3 Aipeisova, S.A. (2011). *Redkie ischezaiushchie rasteniia Aktiubinskoi oblasti [Rare endangered plants of Aktobe region]*. Aktobe: Duman [in Russian].

4 Rubtsov, N.I. (1934). *Dikorastushchie lekarstvennye, tekhnicheskie i pishchevye rasteniia Zapadnoho Kazakhstana [Wild medicinal, technical and food plants of Western Kazakhstan]*. Almaty: Polygraph-book [in Russian].

5 Pavlov, N.V. (1942). *Dikie poleznye i tekhnicheskie rasteniia SSSR [Wild useful and technical plants of the Union of Soviet Socialist Republics]*. Moscow: Izdatelstvo Gosplana [in Russian].

6 Larin, I.V., Agababian, Sh.M, & Rabotnov, T.A. et al. (1950). *Kormovye rasteniia senokosov i pastbishch SSSR [Forage plants for hayfields and pastures of the Union of Soviet Socialist Republics]*. M.N. Kasimenko (Ed.). (Vols. 1–3). Leningrad: Izdatelstvo selskokhoziaistvennoi literatury [in Russian].

7 Larin, I.V. (1957). *Kormovye rasteniia senokosov i pastbishch SSSR [Forage plants for hayfields and pastures of the Union of Soviet Socialist Republics]*. I.V. Larin (Ed.). Moscow – Leningrad: Selkhozizd [in Russian].

8 Kukenov, M.K. (1988). Ratsionalnoe ispolzovanie resursov lekarstvennykh rastenii Kazakhstana. [Rational use of resources of medicinal plants of Kazakhstan]. Proceedings from The study of medicinal plants of Kazakhstan: *Mezhdunarodnaia nauchno-prakticheskaia konferentsiia — International scientific and practical conference* (p. 5–12). Almaty [in Russian].

9 Kukenov, M.K. (1999). *Botanicheskoe resursovedenie Kazakhstana [Botanical Resource Studies of Kazakhstan]*. Almaty: Gylym [in Russian].

10 Larin, I.V., Ivanov, A.F., & Begucheyev, P.L. et al. (1990). *Luhovodstvo i pastbishchnoe khoziaistvo [Grassland and pasture farming]*. Leningrad: Agropromizdat [in Russian].

11 Budantsev, A.L., & Lesiovskaia, E.E. (Eds.). (2001). *Dikorastushchie poleznye rasteniia Rossii [Wild useful plants of Russia]*. Saint Petersburg: ID SPHFA [in Russian].

12 Aipeisova, S.A. (2017). *Aktobe oblysynyn zhabaiy osetin paidaly osimdikteri [Wild useful plants of Aktobe region]*. Aktobe: Duman [in Kazakh].

13 *Hosudarstvennaia farmakopeia SSSR. Obshchaia metodika analiza. Lekarstvennoe rastitelnoe syre [State Pharmacopoeia of the USSR. General method of analysis. Medicinal plant materials]* (1990). Moscow: Meditsina [in Russian].

14 *Hosudarstvennyi reestr lekarstvennykh sredstv [State register of medicines]* (2000). Moscow: Meditsina [in Russian].

15 Koroliuk, E.A. (2003). Krasilnye rasteniia Altaia i sopredelnykh territorii [Dyeing plants of Altai and adjacent territories]. Proceedings from Chemistry of plant materials: Mezhdunarodnaia nauchno-prakticheskaia konferentsiia — The international scientific and practical conference (p. 101–135). Almaty [in Russian].