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Analysis of flora of the medicinal plants of the Atyrau region

Medicinal plants are important sources of biologically active substances and phytopreparations for the prevention and treatment of diseases. In Kazakhstan, the regions of the Western Kazakhstan remain poorly studied in relation to wild medicinal plants. The purpose of the present study was to analyze the species composition of medicinal plants of the flora of the Atyrau region and their ranking by life forms, ecological groups, the degree of distribution and possibility of application in medical practice. Based on the analysis of literary sources and the results of own field studies in the Atyrau region, 177 species of medicinal plants belonging to 118 genera and 46 families are identified. The largest number of species of medicinal plants is noted in *Asteraceae*, *Lamiaceae*, *Brassicaceae*, *Rosaceae*, *Chenopodiaceae*, *Fabaceae* and *Polygonaceae* families. According to the degree of distribution, 4 groups of plants are identified: i) widespread plants, but growing sporadically, not forming thickets (128 species); ii) rare and endangered plants, not to be harvested for raw materials (11 species); iii) plants, forming small thickets (23 taxa); iv) plants, forming significant thickets suitable for industrial harvesting (15 taxa). Among the medicinal plants of the Atyrau region, 6 ecological groups were identified in relation to humidification conditions: hydrophytes, hygrophytes, mesophytes, mesoxerophytes, xerosesophytes and xerophytes. 8 groups of life forms are defined. The largest number of species is concentrated in the group of perennial herbaceous plants — 105 taxa. 128 taxa are allocated for use in folk medicine, 49 species — in official medicine. 12 pharmaceutical-therapeutic groups of plants for treatment of diseases of various etiologies are identified.

Keywords: medicinal plant, Atyrau region, systematic, life forms, ecological group, spreading, pharmacological properties, using in folk and officinal medicine.

Introduction

The development of modern industries and the rapid growth of the human population in the next 30–50 years present for scientists the task of finding new renewable resources: food sources, bio fuels, medicinal preparations, cosmetics and hygiene products. These needs will undoubtedly lead to increased interest in vegetative resources, which are a renewable for production of the raw materials. The World Health Organization notes in recent decades an increase in the use of herbal preparations and an increase in the proportion of medicinal plants by the population of the earth, which has become the basis for the development of an appropriate strategy [1].

In many countries, it is recommended to create a base for active management of traditional medicine, recognition of its role, strengthening the database, and creating mechanisms for the regulation of preparations of plant and animal origin.

Biologically active compounds released from medicinal plants, as well as their individual components from ancient times, have been used by humans as medicinal, antiseptic, perfumery and protective agents (repellents, attractants and others) [2–8]. Present days, the production of components based on medicinal plants is widely developed in many countries. Thus, 65 % of the total production of phytopreparations is accounted for by developing countries, 35 % — by industrialized states [9]. Republic of Kazakhstan has rich raw material potential of wild and cultivated useful plants [10], but own phytopreparations are presented insignificantly, as well as production of medicinal raw materials.

Kazakhstan independence sets the State the task of creating and developing its own industries, including medical and pharmaceutical. Pharmaceutical enterprises in Kazakhstan provide domestic needs by no more than 5–7 %, the remaining share of medicines is imported from abroad. However, the production of medicinal products, especially of plant origin, should be based on a stable raw material base, which is possible with the use of new types of medicinal products with their complex study, sustainable use and protection [11].

The purpose of this study is to analyze the species composition of medicinal plants of the flora of the Atyrau region and their ranking by life forms, ecological groups, degree of distribution and possibility of application in medical practice.

Materials and methods

The Atyrau region is located in the extremely western part of Kazakhstan within the coordinates E 47°05'–56°45' and N 41°20'–49°15', extending from west to east to 720 km and from south to north to 880 km. In the west it borders with the Astrakhan region of the Russian Federation, in the north — with the Western-Kazakhstan region, in the northeast — with the Aktobe regions, in the southeast — with the Karakalpak autonomy, in the south — Turkmenistan, from the south-west it is washed by the Caspian Sea [12]. The territory of the region is 118.0 thousand km².

According to the geological structure, surface structure and soil-botanical conditions, the territory of the region is quite clearly divided into the following large geo-morphological areas: the Caspian lowland, the Ural plateau and the Ustyurt plateau. The climate is sharply continental, arid type. Summer is hot and durable; winter is moderately frosty and short.

The objects of the study are wild natural populations of medicinal plants of the flora of the Atyrau region. The identification of the species composition of medicinal plants is carried out according to literary data [16–20], analysis of herbarium material and materials of previous field surveys on various floristic areas (Caspian, Embinsky, Bukeyev). The names of the plants are given in accordance with the reference book of S.K. Czerepanov [21].

All separated species are ranked according to the following indicators: 1) by systematic groups [22]; 2) by life forms [23]; 3) by ecological groups [24]; 4) by degree of spreading; 5) by pharmaceutical-therapeutic action [25–28] and 6) using in official and folk medicine [10].

Results and discussion

As the results of the analysis of literary data and own field surveys, 177 species of medicinal plants from 118 genera and 46 families were identified in the Atyrau region (Table 1).

Table 1

Taxonomic composition of the medicinal plants of the Atyrau region's flora

Family	Genus	Species	Family	Genus	Species
<i>Equisetaceae</i>	1	3	<i>Salicaceae</i>	2	4
<i>Cupressaceae</i>	1	1	<i>Betulaceae</i>	1	2
<i>Ephedraceae</i>	1	1	<i>Cannabaceae</i>	1	1
<i>Alismataceae</i>	1	1	<i>Urticaceae</i>	1	1
<i>Poaceae</i>	1	1	<i>Polygonaceae</i>	4	5
<i>Araceae</i>	1	1	<i>Chenopodiaceae</i>	3	7
<i>Lemnaceae</i>	1	1	<i>Amaranthaceae</i>	1	2
<i>Liliaceae</i>	2	3	<i>Portulacaceae</i>	1	1
<i>Asparagaceae</i>	1	1	<i>Caryophyllaceae</i>	1	1
<i>Iridaceae</i>	1	1	<i>Nymphaeaceae</i>	1	1
<i>Ranunculaceae</i>	3	3	<i>Peganaceae</i>	1	1
<i>Papaveraceae</i>	1	1	<i>Nitrariaceae</i>	1	2
<i>Fumariaceae</i>	1	1	<i>Polygalaceae</i>	1	1
<i>Brassicaceae</i>	10	11	<i>Rhamnaceae</i>	2	2
<i>Rosaceae</i>	9	10	<i>Malvaceae</i>	3	3
<i>Fabaceae</i>	6	8	<i>Hypericaceae</i>	1	1
<i>Linaceae</i>	1	1	<i>Elaeagnaceae</i>	1	1
<i>Apiaceae</i>	4	4	<i>Onagraceae</i>	2	2
<i>Limoniaceae</i>	2	3	<i>Orobanchaceae</i>	1	1
<i>Gentianaceae</i>	1	1	<i>Plantaginaceae</i>	1	6
<i>Boraginaceae</i>	3	3	<i>Dipsacaceae</i>	2	3
<i>Lamiaceae</i>	13	19	<i>Asteraceae</i>	16	42
<i>Solanaceae</i>	2	4	<i>Scrophulariaceae</i>	3	4
			Total: 46	118	177

The largest number of species of medicinal plants is noted in *Asteraceae*, *Lamiaceae*, *Brassicaceae*, *Rosaceae*, *Chenopodiaceae*, *Fabaceae* and *Polygonaceae* families. These 6 leading families contain 57 genera or 48.3 % of the total number of genera, as well as, 97 species or 54.7 % of the total number of medicinal plant species.

On the basis of the flora conception, the identified species of medicinal plants are ranked by the degree of prevalence in natural populations. So, all medicinal plants in the territory of the Atyrau region are separated on 4 groups:

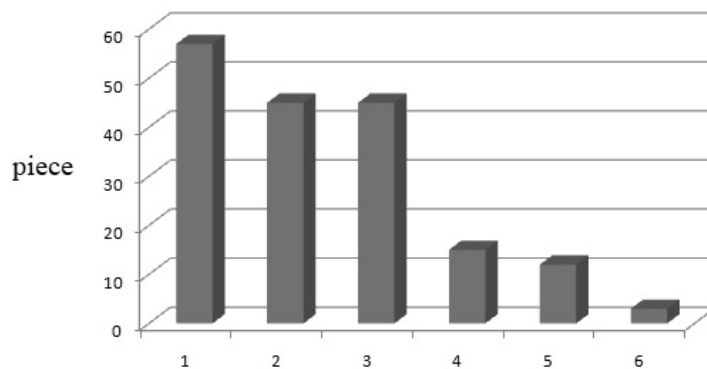
i) Widespread, but growing sporadically, not forming thickets (128 species). Among them are species such as: *Alisma plantago-aquatica*, *Asparagus officinalis*, *Populus tremula*, *Polygonum aviculare*, *Gypsophila paniculata*, *Thalictrum collinum*, *Thlaspi arvensis* and others;

ii) Rare and endangered species, that cannot be harvested for raw materials (11 species), including *Juniperus sabina*, *Acorus calamus*, *Nuphar luteum*, *Pulsatilla patens*, *Fritillaria meleagroides*, *F.ruthenica*, *Adonis vernalis*, *Amygdalus nana* and others;

iii) Species, forming small thickets (23 species): *Sanguisorba officinalis*, *Ephedra distachya*, *Iris tenuifolia*, *Syrenia sessiliflora*, *Helichrysum arenarium*, *Rubus caesius*, *Melilotus officinalis*, *Peganum harmala*, *Polygala comosa* and others;

iv) Species with significant thickets, suitable for industrial harvesting (15 species). They are: *Limonium gmelinii*, *Rheum tataricum*, *Althaea officinalis*, *Anabasis salsa*, *Artemisia terrae-albae*, *Salvia stepposa*, *Scabiosa isetensis*, *Achillea nobilis* and others.

Medicinal plants are ranked according to life forms and ecological groups. In the Atyrau region, medicinal plants belong to 6 ecological groups in relation to humidification conditions: hydrophytes, hygrophytes, mesophytes, meso-xerophytes, xero-xerophytes and xerophytes (Fig. 1).

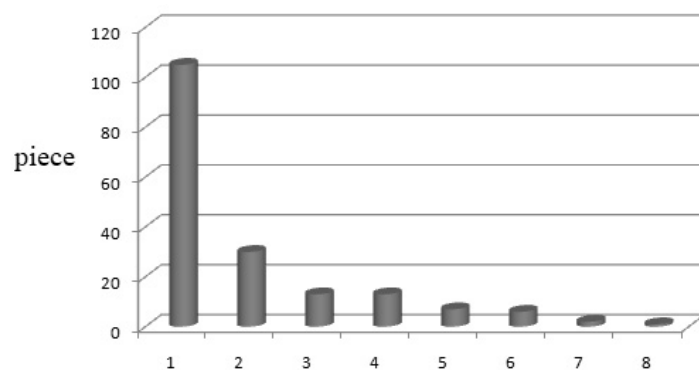


1 — xerophytes; 2 — mesophytes; 3 — meso-xerophytes; 4 — hygrophytes; 5 — xero-mesophytes; 6 — hydrophytes

Figure 1. Distribution of medicinal plants of the flora of the Atyrau region by ecological groups

The largest number of species was noted among the xerophyte group — 57 taxa. The group of mesophytes and meso-xerophytes is occupied the 2nd position (by 45 taxa). In third place are hygrophytes (15 species), in fourth — xeromesophytes with 12 taxa. The last place is occupied by a group of hydrophytes with 3 species.

There are 8 types of life forms among medicinal plants (Fig. 2).



1 — herbaceous perennials; 2 — herbaceous annuals; 3 — herbaceous biennials; 4 — shrubs; 5 — trees; 6 — semi-shrubs; 7 — low shrubs; 8 — low semi-shrubs

Figure 2. Distribution of medicinal plants of flora of Atyrau region by life forms

The largest number of species is concentrated in the group of perennial herbaceous plants — 105 taxa, in second place — herbaceous annual plants — 30 species, in third — herbaceous biennial plants and shrubs (by 13 species), in fourth — trees (7 species), in fifth — semi-shrubs (6 species). The last positions are occupied by a group of low shrubs (2 species) and low semi-shrubs (1 taxon).

The dominant number of species belongs to group used in folk medicine (128 taxa); 49 species are used in official medicine. Analysis of application of identified species in medicine on the basis of pharmaceutical-therapeutic action is carried out. 12 groups are separated (Table 2).

Table 2

Distribution of medicinal plants of the flora of the Atyrau region by pharmaceutical-therapeutic properties

№	Pharmaceutical-therapeutic group	Number of species, piece	% from total number of species
1	For the treatment of the gastrointestinal tract	92	51.9
2	For the treatment of diseases of the oral cavity	29	16.4
3	For the treatment of kidneys and urinary tract	52	29.3
4	For the treatment of diseases of the respiratory system	70	39.6
5	Used as antipyretic and anti-inflammatory agents	73	41.2
6	For the treatment of the cardiovascular and nervous system	56	31.6
7	As anti-parasite agents	29	16.4
8	For the treatment of gynaecological diseases	21	11.9
9	As antidiabetic agents	15	8.5
10	Wound healing and painkillers	29	16.4
11	For the treatment of skin diseases	28	15.8
12	Having other properties	131	74.0

The largest number of species has other types of activity — 131 taxa (or 74.0 %). Among the identified pharmaceutical therapeutic properties, the maximum number of species can be used to treat diseases of the gastrointestinal tract — 92 species (or 51.9 %). 73 species (or 41.2 %), can be used as antipyretic and anti-inflammatory agents. A smaller number of species (70 taxa) can be used to treat respiratory diseases. A significant number of species (56 taxa or 31.6 %) are used in official and folk medicine for the treatment of diseases of the cardiovascular and nervous system. 52 species (or 29.3 %), are used for the treatment of kidneys and urinary tract.

Conclusion

i) On the territory of the Atyrau region (the Western Kazakhstan), 177 species of medicinal plants belonging to 118 genera and 46 families were found. The largest number of medicinal plant species is noted in *Asteraceae*, *Lamiaceae*, *Brassicaceae*, *Rosaceae*, *Chenopodiaceae*, *Fabaceae* and *Polygonaceae* families, which include 48.3 % of the total number of genera and 54.7 % of the total number of species.

ii) The identified species of medicinal plants are ranked by the degree of spreading, which made it possible to distinguish 4 categories: a) The group of widespread, but growing sporadically, not forming thickets includes 128 species; b) The group of rare and endangered species that cannot be harvested for raw materials (11 species); c) Species forming small thickets amounted (23 taxa); d) Species that form significant thickets suitable for industrial harvesting (15 taxa).

iii) Among the medicinal plants of the Atyrau region, 6 ecological groups are identified in relation to humidification conditions: hydrophytes, hygrophytes, mesophytes, meso-xerophytes, xero-mesophytes and xerophytes. The largest number of species is noted to the xerophyte group (57 taxa).

iv) 8 groups of life forms are defined. The largest number of species is concentrated in the group of perennial herbaceous plants — 105 taxa, the last positions are occupied by a group of low shrubs (2 species) and low semi-shrubs (1 taxon).

v) The dominated number of species belongs to the wild species used in folk medicine — 128 taxa; 49 species are used in official medicine. 12 pharmaceutical-therapeutic groups of plants for treatment of diseases of various etiologies are identified.

Thus, on the territory of the Atyrau region, a significant species composition of medicinal plants is discovered, covering almost the entire spectrum of pharmaceutical and therapeutic activity, which indicates a high prospect of their practical use.

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С.С. Сағындықова, А.А. Иманбаева, М.Ю. Ишмуратова, Г.Г. Гасанова

Атырау облысының флорасынан дәрілік өсімдіктерді талдау

Дәрілік өсімдіктер аурудың алдын алу және емдеу үшін биологиялық белсенді заттар мен фитопрепараттардың маңызды көзі болып табылады. Қазақстанда Батыс Қазақстанның өңірлері жабайы дәрілік өсімдіктерге қатысты аз зерттелген. Осы зерттеудің мақсаты — Атырау облысы флорасының дәрілік өсімдіктерінің түрлік құрамына талдау жүргізу және оларды тіршілік формалары, экологиялық топтары, таралу дәрежесі және медициналық практикада қолдану мүмкіндігі бойынша саралау. Әдеби дереккөздерді талдау және жеке далалық зерттеулердің нәтижелері бойынша Атырау облысының аумағында 118 туысқа және 46 тұқымдасқа жататын дәрілік өсімдіктердің 177 түрінің өсетіні анықталды. Дәрілік өсімдіктердің ең көп саны *Asteraceae*, *Lamiaceae*, *Brassicaceae*, *Rosaceae*, *Chenopodiaceae*, *Fabaceae* және *Polygonaceae* тұқымдастарынан тұрады. Таралу дәрежесі бойынша өсімдіктер 4 топқа бөлінді: 1) кең таралған, бірақ сирек өсетін, көпалар түзбейтін (128 түр); 2) сирек кездесетін және жойылып бара жатқан, шикізатқа дайындалуға жатпайтын (11 түр); 3) шағын көпалар құрайтын (23 таксон); 4) өнеркәсіптік дайындауға жарамды едәуір көпалар құрайтын (15 таксон). Атырау облысының дәрілік өсімдіктерінің арасында ылғалдану жағдайларына қатысты 6 экологиялық топ бөлінді: гидрофиттер, гигрофиттер, мезофиттер, мезоксерофиттер, ксеросезофиттер және ксерофиттер. Өмір сүру формаларының 8 тобы анықталды. Түрлердің ең көп саны көпжылдық шөптесін өсімдіктер тобында шоғырланған — 105 таксон. Халықтық медицинада қолдану бойынша 128 таксон, ресми медицинада — 49 түрі бөлінді. Әр түрлі этиологияның ауруларын емдеу үшін өсімдіктердің 12 фармако-терапиялық топтары бөлінді.

Кілт сөздер: дәрілік өсімдік, Атырау облысы, жіктеу, тіршілік формалары, экологиялық топ, таралуы, фармакологиялық қасиеттері, халықтық және ресми медицинада қолданылуы.

М.С. Сағындықова, А.А. Иманбаева, М.Ю. Ишмуратова, Г.Г. Гасанова

Анализ флоры лекарственных растений Атырауской области

Лекарственные растения являются важными источниками биологически активных веществ и фитопрепаратов для профилактики и лечения заболеваний. В Казахстане регионы Западного Казахстана остаются мало изученными в отношении дикорастущих лекарственных растений. Цель настоящего исследования — провести анализ видового состава лекарственных растений флоры Атырауской области и их ранжирование по жизненным формам, экологическим группам, степени распространения и возможности применения в медицинской практике. По итогам анализа литературных источников и результатов собственных полевых исследований на территории Атырауской области выявлено произрастание 177 видов лекарственных растений, относящихся к 118 родам и 46 семействам. Наибольшее число видов лекарственных растений отмечено в семействах *Asteraceae*, *Lamiaceae*, *Brassicaceae*, *Rosaceae*, *Chenopodiaceae*, *Fabaceae* и *Polygonaceae*. По степени распространения выделены 4 группы растений: 1) широко распространенные, но растущие спорадично, не образующие зарослей (128 видов); 2) редкие и исчезающие, не подлежащие заготовке на сырье (11 видов); 3) образующие небольшие заросли (23 таксона); 4) образующие значительные заросли, пригодные для промышленной заготовки (15 таксонов). Среди лекарственных растений Атырауской области выделено 6 экологических групп по отношению к условиям увлажнения: гидрофиты, гигрофиты, мезофиты, мезоксерофиты, ксеросезофиты и ксерофиты. Определены 8 групп жизненных форм. Наибольшее число видов сосредоточено в группе многолетних травянистых растений — 105 таксонов. По использованию в народной медицине были выделены 128 таксонов, в официальной медицине — 49 видов. Обозначены 12 фармако-терапевтических групп растений для лечения заболеваний различной этиологии.

Ключевые слова: лекарственное растение, Атырауская область, систематика, жизненные формы, экологическая группа, распространение, фармакологические свойства, применение в народной и официальной медицине.

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