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DISTRIBUTION OF THE MEDICINAL SPECIES *AJANIA FASTIGIATA* (C.WINKL.) POLJAKOV IN KAZAKHSTAN

The study of the distribution of medicinal plants has a special weight in many preliminary analyses, places where it is possible to dominate and have a larger population to know is very important. Particularly if the resource base of the raw plant material is to be identified. Many literature sources give inaccurate habitat data, or give too large an area, which makes it very difficult to determine where the population is concentrated, i.e. the predominant population of the plant in question. The Asian genus *Ajania* includes about 43 species, depending on the authors, with a large number of representatives in China and Japan, as well as native to Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Northern India, Russia and Tajikistan. *Ajania fastigiata* (C.Winkl.) Poljakov is a promising medicinal plant, which is undemanding and does not require special conditions of growth, thereby excluding the possibility of deterioration of the population during the collection of plant raw materials. The aim of the work is to identify the exact distribution of the studied species by means of actual herbarium specimens. As a result, a map of the studied species' habitats is drawn and the concentration of habitats where the species is most common is seen. According to our data the studied species is often found in the southern part of Almaty city and goes well up to Terskey Alatau, as well as in the north-eastern part of Dzungarian Alatau.

Key words: Asteraceae, *Ajania fastigiata*, medicinal plant, ecology, habitat, herbarium.

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Қазақстанда дәрілік *Ajania fastigiata* (C. Winkl.) Poljakov түрінің таралуы

Зерттеу дәрілік өсімдіктердің таралуы қай жерде көп кездесетінін алдын-ала талдаулар да ерекше салмаққа ие, мұнда басым және популяцияларының қай жерде көп болатынын білу өте маңызды. Әсіресе, егер өсімдік шикізатының ресурстық базасын анықтау қажет болса. Көптеген әдебиеттерде тіршілік ету ортасы туралы нақты мәліметтер көрсетілмеген немесе тым үлкен аумақ берілген, бұл кейіннен жекедаралар шоғырланған жерді анықтау өте қиын, яғни зерттелетін өсімдік популяциясы басым ортаны. Азиялық *Ajania* туысы түрлі авторларға байланысты Қытай мен Жапонияда, сонымен қатар Ауғанстан, Қазақстан, Қырғызстан, Моңғолия, Солтүстік Үндістан, Ресей және Тәжікстанда өсетін 43 жуық түрі белгілі. *Ajania fastigiata* (C.Winkl.) Poljakov – бұл перспективалы дәрілік өсімдік, ол ерекше өсу жағдайларын қажет етпейді, осылайша өсімдік шикізатын жинау кезінде популяцияның нашарлау қауіпін болдырмайды. Жұмыстың мақсаты – зерттелетін түрдің гербарий үлгілері арқылы нақты таралу аймақтарын анықтау. Нәтижесінде зерттелетін түрдің өсетін жерлерінің нүктелерінің картасы жасалады және осы түр ең көп кездесетін нүктелердің концентрациясы көрінеді. Біздің деректеріміз бойынша зерттелетін түр Алматы қаласының оңтүстік бөлігінде жиі кездеседі және Теріскей Алатауына, сондай-ақ Жоңғар Алатауының солтүстік-шығыс бөлігінде жақсы бейімделген.

Түйін сөздер: Asteraceae, *Ajania fastigiata*, дәрілік өсімдік, экология, таралу аймағы, гербарий.

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Распространение лекарственного вида *Ajania fastigiata* (C. Winkl.) Poljakov в Казахстане

Изучение распространения лекарственных растений имеет особый вес во многих предварительных анализах, мест где может преобладать и иметь большую популяцию знать очень важно. В особенности если необходимо выявить ресурсную базу растительного сырья. Во многих литературах указываются не точные данные по месту обитания или же дается слишком большая территория, что впоследствии очень сложно определить, где сконцентрирована скопление особей, то есть преимущественно преобладают популяции изучаемого растения. Азиатский род *Ajania* включает около 43 видов, в зависимости от авторов, с большим количеством представителей в Китае и Японии, а также произрастающих в Афганистане, Казахстане, Кыргызстане, Монголии, Северной Индии, России и Таджикистане. *Ajania fastigiata* (C.Winkl.) Poljakov является перспективным лекарственным растением, который не прихотлив и не требует особых условия произрастания тем самым, исключая возможность ухудшения популяции при сборе растительного сырья. Целью работы является выявления точных ареалов распространения изучаемого вида посредством фактических гербарных образцов. В итоге составлена карта точек мест произрастания изучаемого вида, и видна концентрация точек, где больше всего встречается данный вид. По нашим данным изучаемый вид часто встречается в южной части города Алматы и хорошо идет до Терской Алатау, а также в Северо-Восточной части Джунгарского Алатау.

Ключевые слова: Asteraceae, *Ajania fastigiata*, лекарственное растение, экология, ареал, гербарий.

Introduction

The genus *Ajania* Poljakov is a perennial herbaceous plant, usually grayish, without shortened vegetative shoots, with erect or often ascending and branched, well-developed, densely lobed stems. Leaves are ordinary with dissected laminae covered with appressed bipartite, sometimes with an admixture of simple, hairs.

The Asian genus *Ajania* includes about 43 species, depending on the authors [1; 2; 3; 4], with a large number of representatives in China and Japan, as well as growing in Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Northern India, Russia and Tajikistan. This genus was separated from *Artemisia* by Polyakov [5]. And it is indicated that *Ajania* originated from ancestral taxa closely related to *Dendranthema*, and that the adaptation of *Ajania* to Central Asian steppes and deserts led to high similarity with representatives of *Artemisia* inhabiting these areas. To explain the similarities among the three genera, Bremer and Humphries [1; 6; 7; 8] suggested that the independent lineages descended from the same dendranthema of a single ancestor. Three species were excluded from *Ajania* to form a separate new genus *Phaeostigma* by A.A. Muldashev [9]. Two species of *Ajania* and one species of *Phaeostigma* were recently studied from the palynological point of view (for *Ajania fastigiata*

and *A. fruticulosa*; for *Phaeostigma salicifolium*) [10; 11].

Because of its complex taxonomic history with numerous species movements between the two major groups of *Artemisiinae*, *Ajania* and individual genera are a particularly interesting group to study. Species of the genus *Ajania* cover most of the entire distribution range in Central Asia, with *Ajania* in China (from northwestern to northeastern and southwestern parts), Korea, Japan, and the Far East [12; 13; 14; 15; 16].

Despite a number of cladistic studies based on morphological and molecular information, there remain quite a few taxa whose systematic position in the subtribe *Artemisiinae* is unclear [1; 10; 17; 18; 19; 20; 21; 22; 23].

The genus includes 30-40 species [1; 2; 3; 4; 5] with an eastern Palearctic range. In Kazakhstan there are 3 species with 1 endemic: *A. korovinii* Kovaleusk. (Kurgiz Alatau).

According to the genus monograph by A.A. Muldashev, “the emergence of at least most species of the genus occurred at the end of the Neogene”. However, it is possible that the formation of the genus occurred earlier, at the beginning of the Neogene [24].

Ajania fastigiata – perennial herbaceous plant. It grows on fine-grained and rubbly, stony slopes, in thickets of small bushes, on steep slopes, in grassy-

grassy-grassy, grassy-typchak steppes from high foothills to the middle belt of mountains. Flowering is from July to August, depending on the place and climate of growth, sometimes in September, fruiting comes to the months of August and September, sometimes even in early October [25; 26].

The purpose of this research work is to identify the exact range of *Ajania fastigiata* (C.Winkl.) Poljak species and its ecological habitat to certain environmental conditions. Data analysis will help to develop a route for further studies of the resource base of the population of the studied species in the future.

Materials and Methods

The object of the study is a species of the genus *Ajania* from the family Asteraceae – *Ajania fastigiata* (C.Winkl.) Poljak.

To identify points of actual growth of the studied species, available herbarium specimens were reviewed: Herbarium Fund of the Institute of Bot-

any and Phytointroduction, Herbarium index AA; Herbarium Fund of the Lomonosov Moscow State University (MW), V.L. Komarov Botanical Institute of the Russian Academy of Sciences (LE), Institute of Botany of the Academy of Sciences of the Republic of Uzbekistan (TASH). V.L. Komarov Botanical Institute of the Russian Academy of Sciences (LE), Institute of Botany of the Academy of Sciences of the Republic of Uzbekistan (TASH). QGIS 3.28 program was used for data mapping.

Results and Discussion

According to the examined herbarium specimens the data of labels related to the territory of Kazakhstan were written out, besides, the map of actual places of growth of the investigated species was made (Table 1; Figure 1).

All marked actual points are visually represented in a map (Figure 1), which is almost similar to the data set out in classical botanical literature:

Table 1 – Information from herbarium specimens AA, MW, LE, TASH

№	Collection location (label data)	Collectors	Date of collection
Dzungarian Alatau			
1	Dzungarian Alatau, near Topolevka village	Lipsky V.	14.07.1909
2	Meadow-steppe area on the slope of a rocky escarpment in the Chulak tract	Pavlov N.V.	16.07.1928
3	Dzungarian Alatau Ridge. The area between Sarkand and Kopal villages. Sarkand and Kopal, valley between Dzheldy-Karagai and Suok-tau mountains, on a ravine slope	Shipchinskiy N.V.	02.08.1928
4	Kazakhstan, northern slope of Dzungarian Alatau, Shrub thickets in Ananyevaya gorge, near Sarkand, 1000 m	Gubanov I.A.	13.07.1967
5	Dzungarian Alatau, near Topolevka village	Kukenov M.K.	23.08.1969
6	Dzungarian Alatau, valley of the Maly Baskan River, right bank in the middle part of the valley	Sdobodobinina A., Kluikov E.	21.06.1974
7	Dzungarian Alatau, left bank of the Koksus River, Ulkenkotyrkoy nepo ridge. Semenovskoye settlement.	Kamelinskikh L., Gusev M.	30.07.1975
8	Headwaters of the Karatala River. South of the forest cordon at the confluence of the Chizhi River with the Kara River. Meadow slopes near the key. Height 1100 m.	Danilov M.P., Shormanova A.A., Kurmantayeva A.A., Bilibayeva B.K.	18.06.2015
9	Lepsinsky district Steppe slope near the road at the pass between Lepsinsky and Topolevsky settlements	Danilov M.P., Shormanova A.A., Bilibayeva B.K., Kenesbai A.H.	19.06.2019
Trans-Ili – Kungei Alatau			
1	Right bank of the Turgeni River, uroch. Karach. Grassy slope	Karelin G., Kirilov J.	1841
2	Foothills of Zailiyskiy Alatau, northern loess slope of «Verigina» mountain	Sokalsky N. D.	22.07.1907
3	Dzhalanash gorge near the village. 2000 m. Along the southern steppe stony slopes	Geld A.I.	02.07.1933

№	Collection location (label data)	Collectors	Date of collection
4	The stalls behind the Botanical Gardens, amongst the wormwood.	Rubtsov N.I.	10.07.1934
5	Dzhalanash river valley in the vicinity of Dzhalanash settlement. Dry slopes of foothills	Geld A.I.	22.08.1934
6	Faithful	Solodovnikova V.S.	22.08.1936
7	Ridge. Turaigyr Ridge, southern slope	Solodovnikova V.S.	31.08.1936
8	Kaskelen Gorge, eastern herbaceous slope	Dmitrieva A.A.	24.08.1937
9	Floodplain of the Tau-Chilik r. near the village. Kutyrge, on sand	Polyakov P.P.	15.09.1940
10	Ushch. Kulsai, steppe eastern slope	Polyakov P.P.	11.07.1941
11	On the right bank plateau from the Sarybulak River valley, mountain steppe	Rubtsov N.I.	29.07.1947
12	On the slope of loess foothills near Turgeni village, among wormwood-grass steppe	Myrzakulov P.M.	26.08.1947
13	Middle course of the Kurmekty River. south-eastern steppe slope. Height 2100 m.	Goloskokov V.P.	13.08.1952
14	Slopes to the Poganka River behind the B. garden	Roldugin I.I.	20.06.1953
15	Chet-Merke Gorge	Myrzakulov P.M.	15.08.1967
16	Right bank of the Turgen River. Dry grassy slope	Myrzakulov P.M.	18.08.1967
17	Zailiyskiy Alatau, Aksai, est. of Sataldy r. Sataldy; southern slope	Myrzakulov P.M.	30.08.1967
18	Alma-Ata oblast. Chiliksky district, near Kuram r.	Myrzakulov P.M.	03.09.1967
19	Ushelie of the Kurmekty River. Eastern slope. H-2000 m.	Stepanova E.F.	07.09.1973
20	Almaty region, Zailiyskiy Alatau, Assyu valley bottom, upper boundary of spruce trees	Sobolev L.	22.07.1974
21	North slope of the Zailiyskiy Alatau ridge. Zailiyskiy Alatau ridge, Kaskelen ear. Kaskelen, rose garden on the slope of northern exposure	Klyuikov E.	14.08.1979
22	Alma-Ata vicinity. Stalls in the area of MIA approach, meadow on NW slope	Krasnoborov I.M.	02.09.1988
23	Almaty region, about 250 km northeast of Almaty, Near Rudnichny settlement, Valley of the right bank of the Koksuy River. Hill slope, on stony substrate	Sukhorukov A.	19.08.2008
Ketmen-Terskey Alatau			
1	Tien-Shan, Ketmen Ridge, Mount Teternik, southern rubbly slopes, 1230 m	Rubtsov N.	12.09.1912
2	Terskey Alatau ridge, ul. Kurkapak, stony slopes	Mikhailova V.P.	20.08.1937
3	Ketmen Ridge, Kumirchi tract	Polyakov P.P.	13.07.1938
4	Ketmen Mountains	Koshechkina G.	July 1948
5	Ketmen Ridge, Narynkolsay Nook. Narynkolsai	Arystangaliev S.A.	19.08.1962
6	Shol-Adyr Mountains, steppe south slope	Arystangaliev S.A.	08.08.1963
7	Terskey Alatau Ridge, 1 km north-west of the Kurykakpak River, stony slopes	Arystangaliev S.A.	12.06.1964
8	Terskey Alatau. Headwaters of the Big Kokpak River	Lushpa O.W.	18.07.1968
9	Ketmen Ridge, Karagaily Gorge	Kukenov M.K.	23.08.1969
10	Tien-Shan. Ketmen ridge. Mount Teternik, southern rubbly slopes, 1230 m.	Mikheeva N.N.	16.09.1973
11	Western end of Ketmen-Tau, Tuyuk-Su Gorge, steppe slope	Danilov M.P.	07.08.1978
Kyrgyz Alatau			
1	Kirghiz Ridge, Ushch.r. Suyundyk-Sai, eastern rocky slope, altitude 2000 m.	Lipshits S.Yu.	05.08.1928

№	Collection location (label data)	Collectors	Date of collection
2	Ushch. Aspara near Char, southern rocky slope	Rubtsov N.I.	12.09.1946
Western Tien Shan			
1	Talas Alatau, Aksai River valley (eastern boundary of the Reserve). In the belt of junipers	Danilov M.P.	19.08.1962

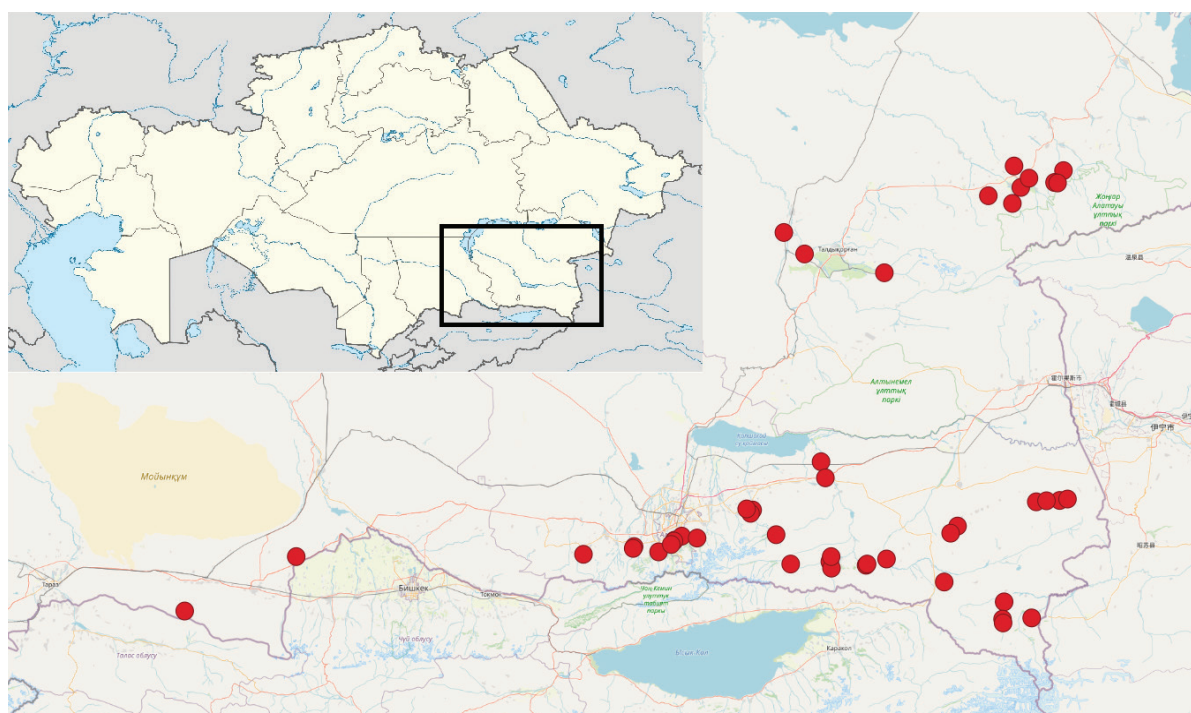


Figure 1 – Map of *Ajania fastigiata* distribution points in Kazakhstan according to actual QGIS herbarium specimens

Flora of Kazakhstan (1966) – Floristic regions: 18. Balkhash-Alakol, 23. Tarbagatai, 24. Dzungarian Alatau, 25. Trans-Ili – Kungei Alatau, 25a. Ketmen-Terskey Alatau, 27. Kirgiz Alatau, 29. Western Tien Shan [18].

Central Asia Plant Identifier (1993) – Dzungarian Alatau, Tien Shan (Chu-Ili mountains, Ketmen-tau, Trans-Ili, Kungei, Terskey, Kirgiz, Talas Alatau, Ichkeletau, mountains in the middle reaches of the Naryn River), Pamir-Alai [17].

Analyzing all data on *Ajania fastigiata* species, we give the following explanation on distribution: The studied species is found in the extreme South-Eastern part of Kazakhstan and spreads over 4 southern regions: The largest concentration of the species is in Almaty region, where it occupies the whole southern and eastern part of the region. Most of the collections were made in the territory of the

Trans-Ili Alatau Ridge. Trans-Ili Alatau. In the Ketmen and Terskey Alatau ranges there are few collections, but enough to confirm that this species is also quite common there. In Zhetysay region *Ajania fastigiata* occupies the southern part, also for Zhambyl region, and slightly affects Turkestan region from the south-eastern part. In the ridges of the Kirghiz and Western Tien-Shan the studied species is less frequent, most likely it is an extremely western part of the *Ajania fastigiata* range (Figure 2).

Regarding floristic areas of Kazakhstan, *Ajania fastigiata* exactly confirms its distribution in the mentioned areas in the Flora of Kazakhstan [18]. It is recommended to harvest *Ajania fastigiata* in the ranges of the Trans-Ili Alatau, in particular in the Karasay and Zhambyl districts, as well as in the Sarkand district, which belongs to the range of the Dzungarian Alatau.

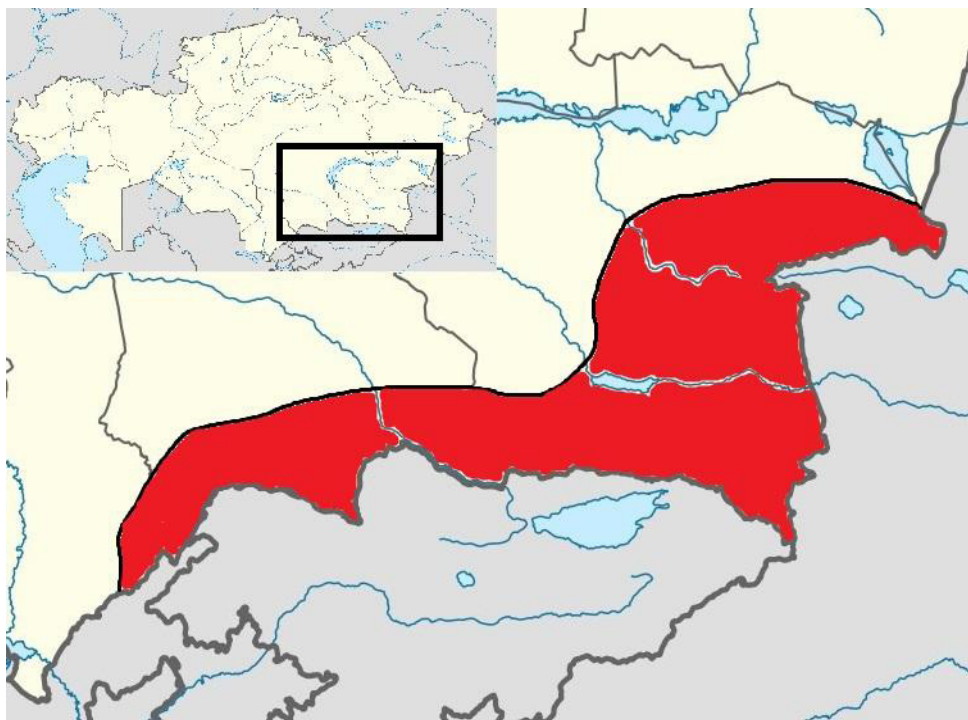


Figure 2 – Map of the actual distribution of the study species

Conclusion

Ajania fastigiata is found most of all in the South and South-Eastern part of Almaty oblast, in particular it is the territory of Trans-Ili Alatau ridge, to a greater extent this species prevails in Karasay and Zhambyl districts of Almaty region, as these districts cover dry mountain slopes. Also,

it prevails in the North-Eastern part of Dzungarian Alatau (in the Eastern part of Zhetysu region, Sarkand district). Particularly speaking about ecological habitat, *Ajania fastigiata* is found most of all on stony gray-chestnut soil, especially on dry mountain slopes, and can rise up to 2000 m above sea level, but the most optimal altitude is 1000-1200 m above sea level.

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