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Diversity, Distribution, and Phytocenology of the Genus *Aegilops* L. (Poaceae) in Uzbekistan

Mamatkasimov Odilbek[1], Kurbaniyazov Bakbergen[2], Maxmudov Azizbek[1], Allamurotov Akmal[1], Mavlanov Bekzod[1], Abduraimov Ozodbek[1,*]

[1]Institute of Botany Academy of Science Republic of Uzbekistan, Uzbekistan
[2]Department of Ecology and Soil Science, Karakalpak State University named after Berdakh, Uzbekistan

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Abstract This study presents information on the diversity and phytocenology of the genus *Aegilops* L. in Uzbekistan. Our research was conducted in 2021-2024, with the results of analyzing literary sources, herbarium specimens, and data collected during field research. More than 600 herbarium specimens collected from the territory of Uzbekistan, stored in the herbarium funds of Tashkent (TASH), Moscow (MW), St. Petersburg (LE), and Almaty (AA) were analyzed for 5 species of the genus. Species diversity is presented by distribution in Uzbekistan's botanical and geographical regions. In research to date, as well as in major monographs, *A. tauschi* is not found in the flora of Uzbekistan. The fields in which the species is distributed also confirm our opinion. In the course of studies, about 20 distribution points were identified based on 3 growth points in the flora of the species as well as herbarium data. The genus *Aegilops* L. is considered to be closely related to wheat both ecologically and genetically, as they belong to the same natural polyploid series. The diploid, tetraploid, and hexaploid species of the genus *Aegilops* can be crossed with wheat, resulting in stable hybrids. Representatives of the category are of high economic importance, and natural samples are also widely used in agricultural sectors. It is representatives of the category that are resistant to various factors (drought, sudden warming or cooling of the Air, various environmental factors) that are very important for the sharply continental environmental conditions of our republic. Data on the distribution, phytocenology, and current status of the five species of the *Aegilops* L. genus are used for monitoring the species and maintaining vascular plant cadastres. Natural population areas serve as primary sources for selection and genetic research. The results obtained are recommended for future editions of the monograph “Flora of Uzbekistan”.

Keywords Diversity, Phytacenology, *Aegilops* L., *Aegilops cylindrica*, A. *crassa*, A. *tauschi*, A. *triuncialis*, A. *juvenalis*, Flora, Uzbekistan

1. Introduction

The issue of food security is becoming increasingly urgent as anthropogenic impacts on natural ecosystems intensify during the global climate change process [1]. According to reports from the United Nations Food and Agriculture Organization (FAO), global food security has become even more complicated following the COVID-19 pandemic, and today, 864 million people worldwide are facing food shortages [2]. In this context, wild ancestors of cultivated plants play a crucial role in addressing food security issues. One of the most important characteristics of these wild ancestors is their resilience to various environmental factors.

In recent years, studies such as the diversity and distribution of plants [3], the assessment of population

conditions [4], and the structure and phylogeny of plant genomes [5] have become increasingly relevant among species that include the wild ancestors of cultivated plants. Several studies have been conducted on the wild ancestors of cultivated plants in Central Asian countries [6], [7], [8], [9], [10].

The Republic of Uzbekistan is a Middle Asian country with a rich native flora. The flora of Uzbekistan includes 202 species belonging to 102 genera and 24 families, of which 2% are ornamental, 3% vitamin-producing, 4% technical, 9% medicinal, 12% honey-producing, 22% food-producing, and 48% are used as forage plants [11]. Research is being conducted on the ornamental [12], [13], [14], medicinal [15], [16], [17], food-producing [18], [19], and forage [20], [21] properties of these species. In this context, the genus *Aegilops* L. of the Poaceae family holds significant importance.

The genus *Aegilops* L. is considered to be closely related to wheat both ecologically and genetically, as they belong to the same natural polyploid series. The diploid, tetraploid, and hexaploid species of the genus *Aegilops* can be crossed with wheat, resulting in stable hybrids [22]. Many representatives of this genus possess several valuable traits. For instance, *A. tauschii* stands out for its high baking qualities and the highest flour yield (59.4–66.1%). The necessity of studying the genus *Aegilops* L. is, first of all, due to the lack of a consolidated synopsis and sufficient data on the spike-bearing plants in some botanical-geographical regions of Uzbekistan. Secondly, due to the over-exploitation and long-term use of pastures, representatives of the Poaceae family play an important role in the grass stand in these areas. In Kazakhstan, species of *Aegilops* L., *Triticum* L., and *Avena* L. are still used as pasture crops, leading to their potential extinction. The natural erosion caused by industrialization and changes in agricultural technology highlights the importance of collecting and preserving rare plant species and genetic diversity [23].

Aegilops species possessing the U genome are the most widely distributed species in the world. Considering the limitation in the genetic diversity in cultivated wheat, the use of wild relatives and other species of *Aegilops* can provide a rich and diverse gene pool of new and ideal alleles for breeders [24]. Forage of *Aegilops* species is usually considered to have enough minerals (K, Ca, Mg and P) to meet livestock needs [25]. Some *Aegilops* species participated in wheat evolution and played a major role in wheat domestication. Thus, the genus *Aegilops* represents the largest part of the secondary gene pool of wheat, and several species have been used in crop improvement programs [26].

There are approximately 25 species of the genus *Aegilops* L. worldwide [27]. The main centers of origin are cited as Southwest Asia, Central Asia, and the Mediterranean regions [26]. Two-thirds of the species originate from these regions [28]. The species of this genus are mainly widespread in Georgia, Armenia, Azerbaijan, Northern Iran [29], Cyprus, Lebanon, Israel, Syria, Iraq, Southeast Turkey, Southwest Iran, and Northwest Jordan [30].

The number of species in Central Asian countries is nearly similar, with 5 species recorded in Kazakhstan [31], [32], 4 species in Kyrgyzstan [33], and 3 species in Tajikistan [34]. The initial information on the distribution of the genus in Uzbekistan's flora was provided in the first edition of the monograph Flora of Uzbekistan [35]. Over the past 70-80 years, no targeted studies have been conducted on the distribution, species diversity, or phytocenology of this genus.

Taking into account the economic and agricultural significance of the genus representatives, it is important to evaluate and critically review the diversity, distribution, GIS mapping, and role in phytocenosis of *Aegilops* species in the flora of Uzbekistan. During the research, the distribution of *Aegilops* L. species in the flora of Uzbekistan was confirmed based on more than 500 herbarium specimens stored at the National Herbarium of Uzbekistan (TASH), as well as herbarium collections in Moscow (MW), St. Petersburg (LE), and Almaty (AA). This was corroborated by literature data from previous studies, geobotanical records, and the results of our fieldwork, confirming the presence of five species of the genus in Uzbekistan: *Aegilops cylindrica*, *A. crassa*, *A. tauschii*, *A. triuncialis*, and *A. juvenalis*.

2. Materials and Methods

Our research was conducted from 2021 to 2024 across various botanical-geographical regions of Uzbekistan and the collections of the National Herbarium of Uzbekistan (TASH). More than 1.5 million plant specimens are stored here. This herbarium is the largest herbarium Foundation in Central Asia.

The materials collected during field research were compared with the specimens stored in the TASH, MW, LE, and AA collections, and the distribution of the species in Uzbekistan was re-evaluated. Floristic and geobotanical methods were used in the field studies. To describe the coenopopulations of each species, generally accepted methods [36], [37] were applied. The geographical coordinates of the plant growth points were determined using Google Earth Pro 2023 and Sas Planet 2023 software.

Maps indicating the growth points of the species were created using ArcGIS 10.6 software. Correlation analysis of species was based on Pearson (R) indicators of the low program.

Uzbekistan's botanical-geographical regions were expressed using a scheme developed by K. Sh. Tojibaev [38] and others. The nomenclature section of the checklist includes the accepted species names according to the Conspectus Florae Asiae Mediae [39], [40] and The Plant

List database [41] along with synonyms, references to protologues, and type designations. The citation of authorship follows the Authors of Plant Names [42], Plants of the World Online [43] and the International Plant Names Index [44].

3. Results and Discussion

3.1. Diversity of the Genus *Aegilops* L.

During the research, an analysis was initially carried out on the specimens stored in the National Herbarium of Uzbekistan (TASH). It was found that the herbarium collection contains a total of 682 specimens representing 6 species of the genus, of which 548 specimens were collected from Uzbekistan, while the remaining specimens were collected from other Central Asian countries. Additional specimens collected during the research period (2021-2024) were added to this collection. According to POWO, *Aegilops squarrosa* L. is currently considered a synonym of *Aegilops triuncialis* L. (Table 1).

During the research, herbarium specimens of *Aegilops* L. species from international databases (GBIF, Virtual Herbarium) were also analyzed, and it was found that over 100 specimens collected from Uzbekistan had been included in international databases (Table 2). During the research, the earliest collected specimen of each species stored in the TASH herbarium was studied. It was observed that the earliest specimen of *Aegilops cylindrica* was collected in 1908 (herbarium no. 359), *Aegilops crassa* in 1914 (herbarium no. 504), *Aegilops triuncialis* in 1914 (herbarium no. 351), and *Aegilops juvenalis* in 1927 (herbarium no.541) (Figure 1).

The distribution of the species worldwide and in the flora of Uzbekistan was analyzed based on collected herbarium specimens, literature data, and the results of field research.

***Aegilops cylindrica* Host.** Host in Gram. Aust. 2: 6 (1802) Nevskiy in Flora of USSR 2: 671 (1934) Drobov in Flora of Uzbek 1:295 (1941) Nikiforov in Opred. Rast. Sred. Azii 1: 183 (1968) Tzvel. in Zlaki SSSR 157 (1976)

Botanical Description. Annual with slender spikes. Plants 20–40 (80) cm tall. Spikes 5–7 (10) cm long (excluding awns), with 5–7 (9) spikelets. Glumes 8–9 mm long. Uppermost spikelet with 3–4 small awns arising from glumes and lemmas. Outer glume 2 – toothed at base of awn. Spike falling entire or mostly disarticulating into cylindrical spikelets.

Ecology. It grows at altitudes from 650 to 2100 meters above sea level on shallow rocky, gravelly, and soft gray soils.

Distribution. Central Asia, Afghanistan, Iran, Iraq, Turkey, South Europe, and Northwest Europe [29], [26].

Distribution in Uzbekistan. Kurama, Chatkal, North Turkestan, Hissar, Zeravsshan, Kuhitang, Baysun, Nuratau, Babatag ridges (Figure 1).

Aegilops crassa Boiss ex Hohen. Diagn. Pl. Or., cep. 1,7: 129 (1846) Neviskiy in Flora of USSR 2: 671 (1934) Drobov in Flora of Uzbek 1:295 (1941) Nikiforov in Opred.Rast. Sred. Azii 1: 183 (1968) Tzvel. in Zlaki SSSR (1976)

Botanical Description. Annual with a long slender spike. Plants 30–50 cm tall. Spikes 6–9 cm long, adpressed velutinous, disarticulating. Glumes 8–10 x 4–5 mm, subtruncate. Lemmas 2-toothed, those of upper spikelets are often broadly awned. The uppermost spikelet is narrower than the lateral one. *Ecology.* It grows at altitudes from 600 to 1600 meters above sea level on shallow rocky and soft gray soils.

Distribution. Central Asia, Afghanistan, Iran, Iraq, Middle East, Turkey, Caucasus [26], [28], [29].

Distribution in Uzbekistan. Chatkal, Kurama, North Turkestan, Hissar, Zeravsshan, Kuhitang, Baysun, Nuratau, Babatag, Eastern Alay ridges, In the basins of Zarafshan and Topalang rivers, In the Relic Mountains (Figure 2).

***Aegilops tauschii* Coss.** Not. Quelq. Pl. Crit. Rar. Nouv. 2: 69 (1849) Tzvel. in Zlaki SSSR 157 (1976).

Botanical Description. Annual with slender spikes. Plants 30 – 40 cm tall. Spikes 5–7 cm long (excluding awns), with 9–11 spikelets. Lateral spikelets are barrel-shaped, usually disarticulating. Uppermost spikelet with unowned glumes. Lower lemmas bearing slender awn up to 3–4 cm long.

Ecology. It grows at altitudes from 400 to 1800 meters above sea level on shallow rocky and gravelly soils [45], [46].

Distribution. Central Asia, Afghanistan, North – Central China, Iran, Iraq, Middle East, Turkey, Pakistan, Krym, North Caucasus, West Himalaya [26], [29], [47], [48], [49], [50].

Distribution in Uzbekistan. Chatkal, Eastern Alay, Nuratau, North Turkestan, Zeravshan, Western Hissar ridges (Figure 3).

Table 1. Catalog of herbarium specimens in TASH fund

№	Species	Total number of herbarium specimens	The number of herbarium specimens collected from the territory of Uzbekistan	The number of herbariums we typed (2021-2024)
1	*Aegilops cylindrica* Host.	121	102	35
2	*Aegilops crassa* Boiss.	102	87	21
3	*Aegilops tauschii* Coss.	-	-	18
4	**Aegilops triuncialis* L. *Aegilops squarrosa* L.	253 200	212 145	57 -
5	*Aegilops juvenalis* (Thell.) Eig	4	2	6
6	*Aegilops kotschyi* Boiss.	2	-	-

Note: *these species were studied as separate species until 2006 when they were merged as synonyms (https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:384648-1)

Table 2. Catalog of herbarium specimens in international databases

№	Species	GBIF	Vertual herbarium	MW
1	*Aegilops cylindrica* Host.	9	3	2
2	*Aegilops crassa* Boiss.	42	1	4
3	*Aegilops tauschii* Coss.	3	-	-
4	*Aegilops triuncialis* L.	13	3	6
5	*Aegilops juvenalis* (Thell.) Eig	35	-	5

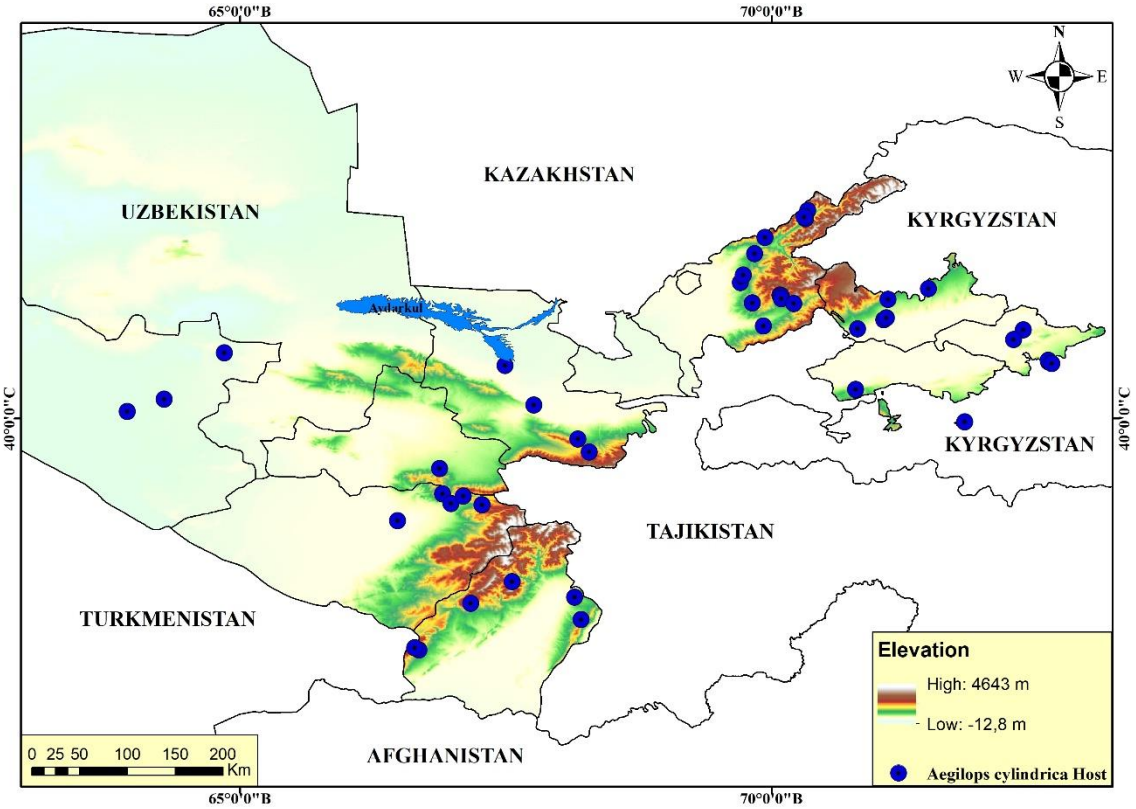

Figure 1. Distribution of *Aegilops cylindrica* Host. in Uzbekistan

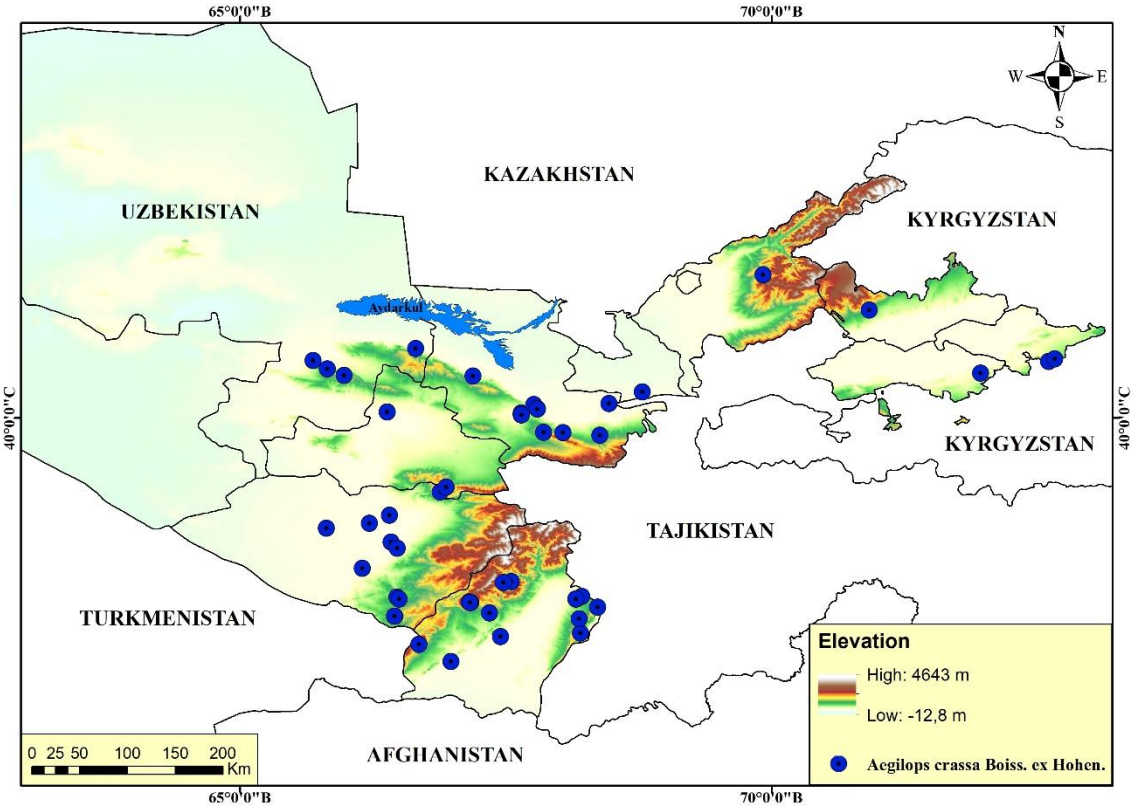

Figure 2. Distribution of *Aegilops crassa* Boiss ex Hohen. in Uzbekistan

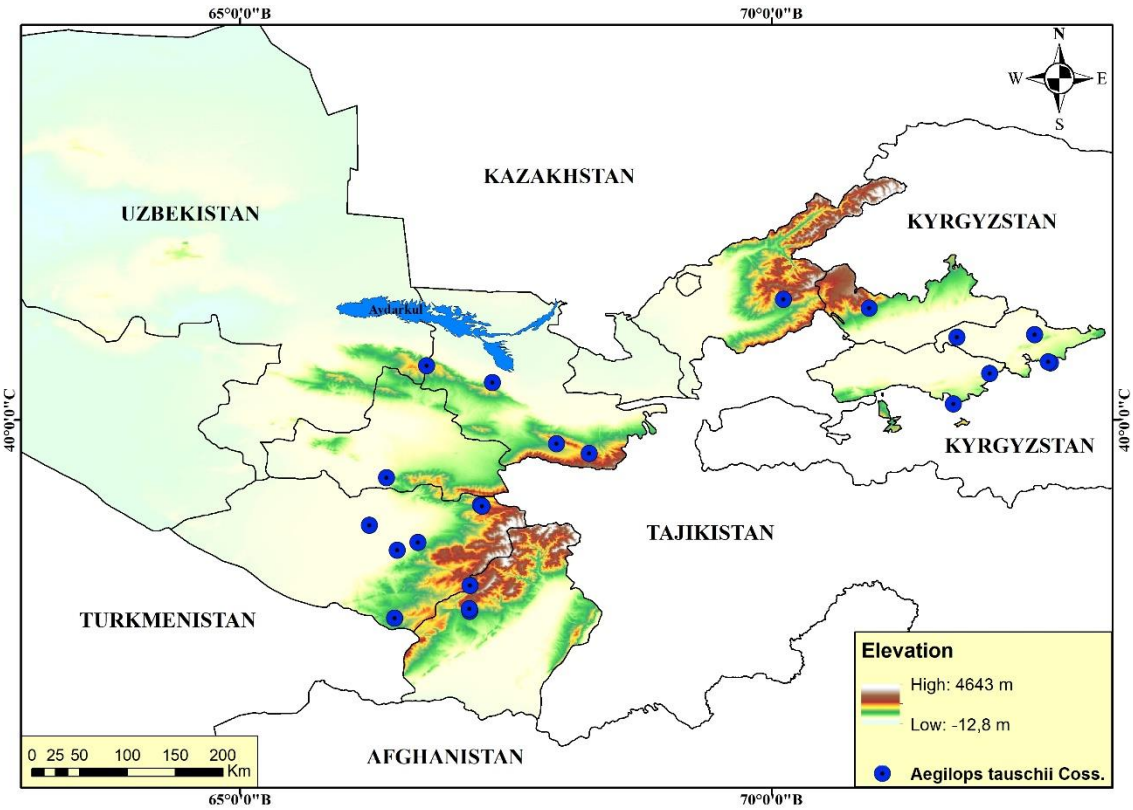

Figure 3. Distribution of *Aegilops tauschi* Coss. in Uzbekistan

***Aegilops triuncialis* L.** Sp. Pl. 1: 1051 (1753) Neviskiy in Flora USSSR 2: 672 (1934) Drobov in flora Uzbek 1:295 (1941) Nikiforov in Opred. Rast. Sred. Azii 1: 184 (1968). Tzvel. in Zlaki SSSR 158 (1976).

Botanical Description. Multitillered annual with subcylindrical spikes. Plants 20–30 cm tall (excluding spikes). Spike 2.5–6 cm long (excluding awns), with 3–5 fertile and (2) 3 rudimentary spikelets. Spikes break off as a unit. Glumes of lateral spikelets with 2–3 awns, 1.5–6 cm long. Central awn of apical glumes 5–8 cm long, lateral awns 1–3 cm.

Ecology. It grows in the foothills, along road edges, and in rocky, gravelly slopes in the hills and plains at altitudes ranging from 400 to 2000 meters above sea level.

Distribution. Central Asia, Afghanistan, Iran, Iraq, Middle East, Turkey, Pakistan, Krym, North Caucasus, Southern Europe [26], [29], [50].

Distribution in Uzbekistan. Hissar, Kuhitang, Zeravsshan, Chatkal, Ugam, Kurama, Baysun, Nuratau, Babatag ridges and Topalang, Sangzor, Shakhimardan rivers and in the residual mountains (Figure 4).

Aegilops juvenalis (Thell.) Eig Fedde, Repert. Beid LV (1929) Neviskiy in Flora USSSR 2: 672 (1934) Nikiforov in Opred. Rast. Sred. Azii 1: 184 (1968). Tzvel. in Zlaki SSSR 158 (1976).

Botanical Description. Annual with medium-long spikes. Plants 10–35 cm tall (excluding spikes). Spikes 3–7 cm long (excluding awns), with 3–6 spikelets, cylindrical to slightly moniliform. Glumes adpressed velutinous, lateral glumes with 2 widely spaced awns. Spikelets are cylindrical to urceolate, 8–13 mm long.

Ecology. It grows in fine stony, gravelly, and soft gray soils in areas at elevations ranging from 400 to 1800 meters above sea level.

Distribution. Iran, Iraq, Kazakhstan, Lebanon-Syria, Turkey, Turkmenistan, Uzbekistan, Azerbaijan [26], [29], [52].

Distribution in Uzbekistan. Kurama, Baysun, Kuhitang, Babatag ridges (Figure 5).

During the research, the distribution of the collected herbarium specimens in the botanical-geographical regions of Uzbekistan was analyzed by species. The results of the analyses indicated that the highest distribution was observed in the Kurama, Tashkent, and Chorkesar botanical-geographical regions of the Western Tien-Shan area. The lowest distribution was noted in the Karshi-Karnabchol and Kyzylkum residual mountains (Table 3). This situation can be directly linked to the annual precipitation levels in these regions. Specifically, the annual precipitation in the Western Tien-Shan area is around 250–400 mm, while in the Qarshi-Karnabchol and Kyzylkum residual mountains, it is about 100–1500 mm.

The collected data on the distribution of the species across botanical-geographical regions was analyzed using the UPGMA method in a cluster analysis. According to the results of the analysis, the species distribution was divided into four clusters. Cluster analyses indicate that there is not a significant difference in the distribution of the species. The distribution of *A. juvenalis* is found in the Arashan, Kurama, and Tashkent areas of the Western Tien-Shan, as well as in the Baysun, Kuhitang, and Shurkhon-Sherabad regions of the Western Hissar. The next species, *A. tauschi*, is distributed in the Western Tien-Shan, Western Hissar, Nurota, and Central Fergana districts. The distributions of *A. crassa* and *A. cylindrica* are closely related, which can be explained by the proximity of their geographic ranges. Cluster analyses also reveal that *A. triuncialis* stands out distinctly from the others. This species has a broader distribution area in our republic and is widely used in the restoration of pastures in Central Asia.

Cluster analyses suggest that representatives of the order do not occur as dominates or subdominates in the plant community. They have a one-year life form and develop very quickly in good conditions.

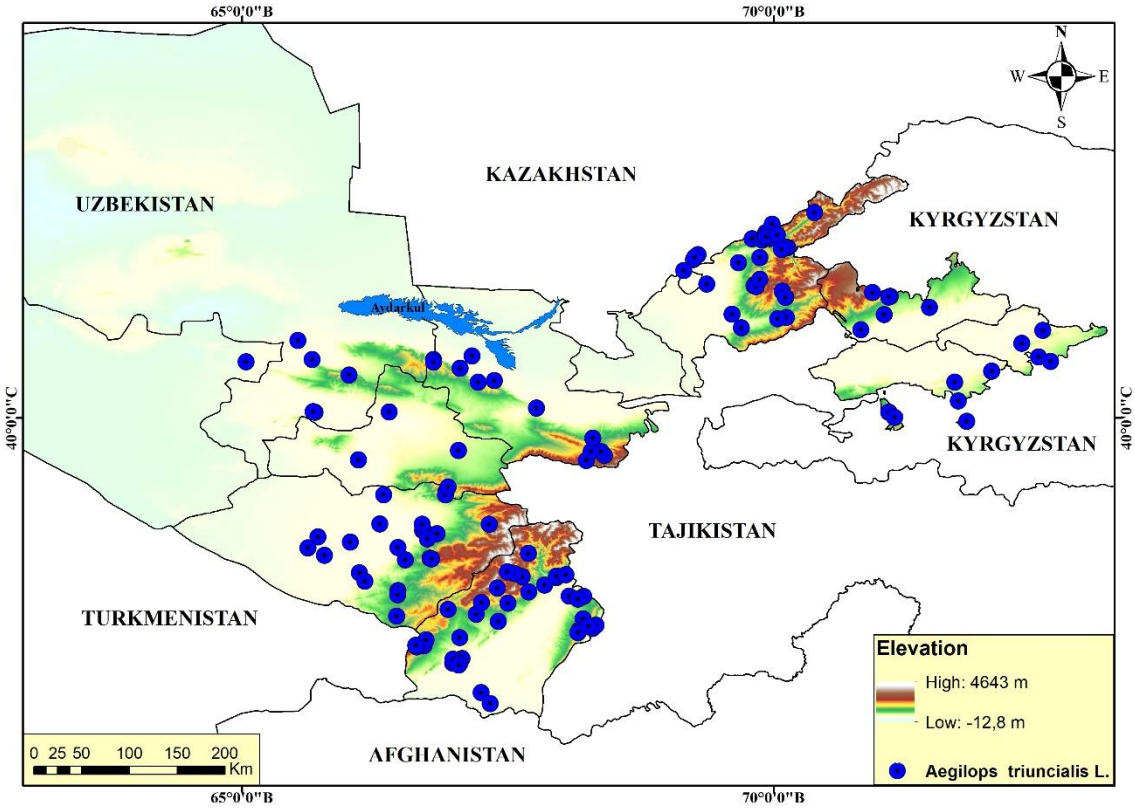

Figure 4. Distribution of *Aegilops triuncialis* L. in Uzbekistan

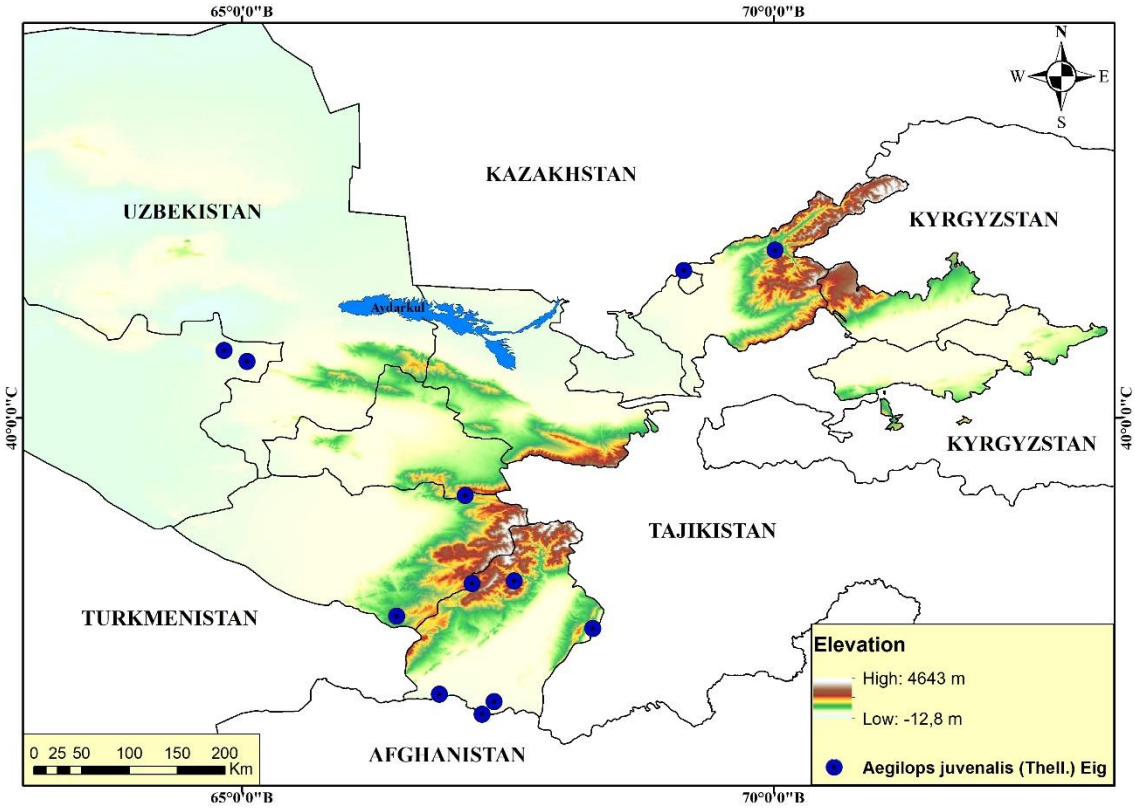

Figure 5. Distribution of *Aegilops juvenalis* (Thell.) Eig in Uzbekistan

Table 3. Distribution of *Aegilops* species in the botanical–geographical regions of Uzbekistan

Botanical – geographical regions	***A. cylindrica***	***A. crassa***	***A. tauschii***	***A. triuncialis***	***A. juvenalis***
Western Tian Shan District					
Ugam – Pskem region	6	3	-	19	-
Wetren Chatkal region	5	4	2	4	-
Arashan region	-	2	-	4	2
Kurama region	6	3	3	4	2
Chorkesar region	1	2	2	2	-
Tashkent region	1	2	5	6	1
Fergana district					
South Chatkal	3	2	3	2	-
Fergana – Alay district					
Western Alay	1	-	-	3	-
Eastern Alay	1	3	4	5	-
Nuratau district					
Nuratau	4	4	2	8	-
Aktau	3	3	2	13	-
Nuratau Relic Mountains	5	3	2	12	-
Kuhistan district					
North Turkestan	5	-	3	5	-
Malguzar	2	4	2	2	-
Urgut	1	3	-	4	-
Ziadin – Zirabulak	1	2	2	5	-
Western Hissar district					
Kashkadarya	2	4	3	15	-
Tarkapchigay	3	5	-	10	-
Baysun	3	6	-	4	2
Kuhitang	3	5	-	5	3
Surkhan – Sherabad	-	3	-	4	2
Hissar-Darvaz district					
Sangardak – Tupalang	2	3	2	6	-
Panj district					
Babatag	2	4	-	9	-
Central Fergana district					
Kayrakum – Yazyavan	2	2	5	1	-
East Fergana	1	-	2	2	-
Middle Syrdarya district					
Chinaz	-	1	2	3	-
Kyzylkum district					
Kyzylkum Relic Mountains	2	3	-	4	-
Bukhara district					
Lower Zeravsshan	2	3	2	3	-
Karshi – Karnabchul	1	-	-	2	-

3.2. Phytocenology of the Genus *Aegilops* L.

During the research, a total of 16 coenopopulations were identified involving 5 species of the genus. *Aegilops* (Figure 6).

Among these, 4 coenopopulations of *Aegilops cylindrica*, 4 of *A. crassa*, 4 of *A. tauschi*, 4 of *A. triuncialis*, and 2 of *A. juvenalis* were studied (Table 4).

The phytocenotic characteristics of each studied coenopopulation were analyzed, including geographical region, geographic coordinates, elevation above sea level, plant community and dominant species, vegetation cover level, soil type, and species composition of the community (Table 4). Factors influencing the viability of the studied coenopopulations include irregular livestock grazing in these areas, road construction, geological exploration activities, the disposal of various household wastes by residents, and other similar impacts (Figure 7).

During the research, the differences between the studied coenopopulations and their viability characteristics were compared, using key indicators such as total projective cover of vegetation (%), number of species in a community, and projective cover of species (%), as shown in Table 4. According to the analysis results, the highest indicator was observed in the coenopopulation in the Tersaksoy area (CP - 5). This situation can be explained by the fact that this area is in the upper part of the mountain, where there is sufficient soil moisture and fewer anthropogenic impacts. At present, prestigious studies have been established in this direction [51], [53], [54], [55], [56], [57].

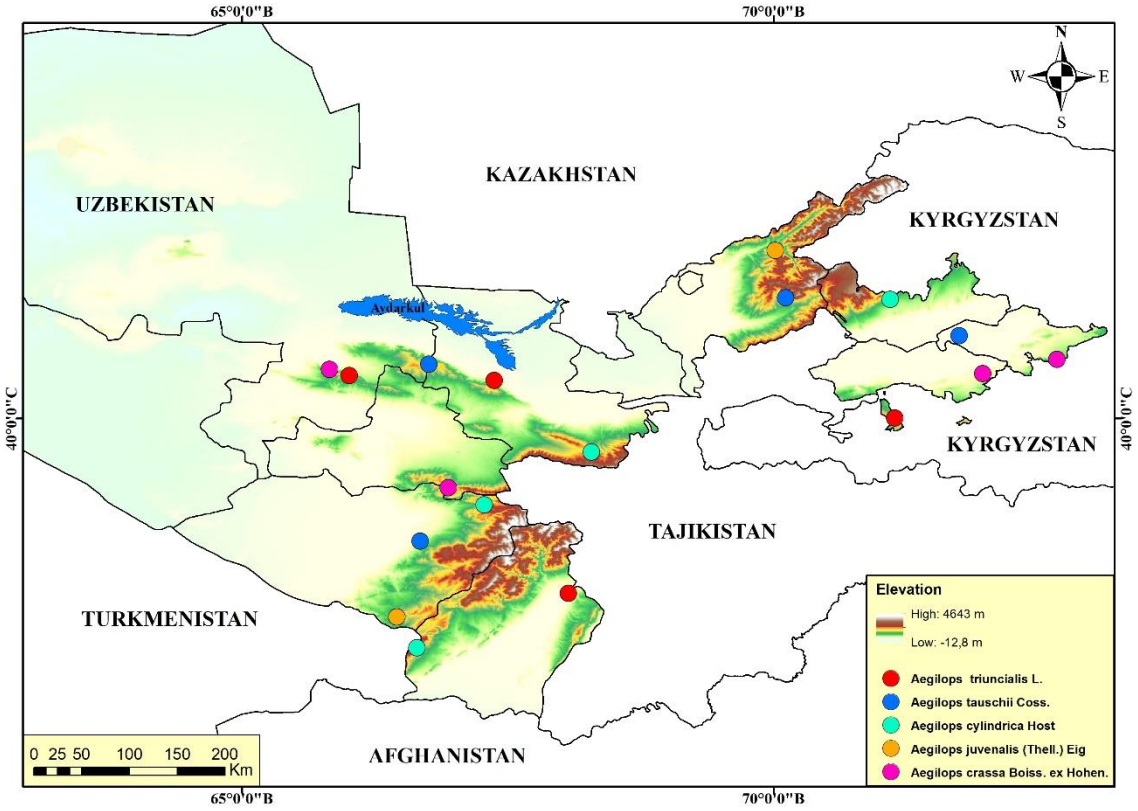

Figure 6. Locations of the studied cenopopulations

Table 4. Phytocenotic characteristics of cenopopulations

№ CP	Geographical location of coenopopulation	Geographical coordination	Altitude, m (h)	Plant community	Total projective cover of vegetation, %	Projective cover of species, %	Soil	Number of species in a plant community
***Aegilops cylindrica* Host**								
1	Surkhandarya region Kuhitang, Surhan reserve, Shalqon	E: 66,644362 N: 37,845693	1518	*Hordeum bulbosum, Poa bulbosa*	65	3	Soft grey soil	27
2	Kashkadarya region village Jovuzga	E: 67,279656 N: 39,191077	1106	*Inula grandis, Poa bulbosa*	55	4	Soft grey soil	24
3	Jizzakh region Turkestan ridge village Abay	E: 68,285803 N: 39,685241	2092	*Poa bulbosa, Hypericum scabrum*	60	3	Soft grey soil	18
4	Namangan region, village Gova	E: 71,097384 N: 41,120109	1080	*Eremurus sogdianus, Eremurus turkestanicus*	20	2	Mother rock grey soil	28
***Aegilops crassa* Boiss.**								
5	Samarkand region Urgut district village Tersaksoy	E: 66,940581 N: 39.350192	1252	*Prunus spinosissima, Prangos fedtschenkoi*	60	1	Gravelly with small stones	39
6	Navoiy region Nurota district	E: 65,823808 N:40,461638	759	*Carex pachystalis, Artemisia ferganensis*	40	1	Gravelly with small stones	27
7	Fergana region Quvasoy district village Arsiv	E: 71,970935 N: 40,422876	590	*Capparis spinosa, Alhagi pseudalhagi*	25	1	Soft grey soil	26
8	Andijan region Khojabod district village Orday	E: 72,665751 N: 40,557717	1452	*Phlomis thapsoides, Phlomoides labiosa*	30	1	Soft grey soil	28
Aegilops tauschii Coss.								
9	Andijan region Ulugnar district village Oq tom	E: 71,748085 N: 40,780112	391	*Alhagi pseudalhagi, Hordeum leporinum*	20	1	Soft grey soil	16
10	Tashkent region Angren district village Yangabod	E: 70,115585 N: 41,137028	1617	*Prunus petunnikowii, Prunus spinosissima*	60	2	Coarse rocky soil	27
11	Kashkadarya region Yakkabog` district	E: 66,674492 N: 38,847709	668	*Phlomis thapsoides, Phlomoides napuligera*	45	1	Soft grey soil	19
12	Jizzakh region Forish district	E: 66,757061 N: 40,512372	1312	*Crataegus pontica, Crataegus turkestanica*	75	1	Common grey soil	19

Table 4 continued

***Aegilops triuncialis* L.**								
13	Fergana region Sox district village Malbut	E: 71,140496 N: 40,004985	1186	*Salvia sclarea*, *Arctium umbrosum*	20	1	Coarse rocky soil	25
14	Navoi region Khatirchi district village Chuya	E: 66,009051 N: 40,405931	1115	*Artemisia scoparia*, *Cousinia microcarpa*	45	3	Coarse rocky soil	19
15	Surkhandarya region Uzun district	E: 68,069464 N: 38,358792	512	*Cynodon dactylon*, *Medicago minima*	50	2	Gravelly with small stones	15
16	Jizzakh region Forish district village Qoratosh	E: 67,373503 N: 40,360292	783	*Hordeum spontaneum*, *Amygdalus spinosisima*	45	2	Coarse rocky soil	27
***Aegilops juvenalis* (Thell.) Eig**								
17	Kashkadarya region Dekhkanabad district village Qoradakhana	E: 66,455522 N: 38,134731	1133	*Eremopyrum bonaepartis*, *Alhagi kirghisorum*	25	3	Soft grey soil	13
18	Tashkent region Bostonlick district	E: 70,018107 N: 41,581914	1227	*Juniperus seravschanica*, *Prangos pabularia*	45	1	Gravelly with small stones	23

a **b**

c **d**

e **f**

Note: *A. cylindrica* (**a);** *A. crassa* (**b, e**); *A. tauschi* (**c**); *A. triuncialis* (**d**); *A. juvenalis* **(f)**

Figure 7. Different botanical-geographical region of Uzbekistan

4. Conclusions

The species of the genus *Aegilops* L. have been utilized by humans for several centuries. In Uzbekistan, the *Aegilops* L. genus is among the countries with high species diversity in the Central Asian region. Data from existing herbarium collections, geobotanical records, and conducted studies indicate that all representatives of the *Aegilops* L. genus, which are characteristic of Central Asia, are found in our flora. This is directly related to the elevation range in our republic, which spans from -12 m to 4643 m above sea level.

According to their distribution across elevation zones, *Aegilops cylindrica* and *A. juvenalis* occur in areas at elevations ranging from 400 to 1600 meters above sea level, while *A. crassa* and *A. tauschi* are found in areas between 1600 and 1800 meters, and *A. triuncialis* is present at elevations of 2000 meters and above. The highest species diversity was observed in the botanical-geographical regions of Kurama, Tashkent, and Chorkesar in the Western Tien-Shan area. The lowest diversity was noted in the Karshi-Karnabchol and Kyzylkum residual mountains. This situation can also be directly linked to the annual precipitation levels in these regions. Specifically, the

annual precipitation in the Western Tien-Shan area is around 250–400 mm, while in the Karshi-Karnabchol and Kyzylkum residual mountains, it is approximately 800–1500 mm. An annual precipitation level of around 200–350 mm is considered optimal for species with an annual life cycle.

Data on the distribution, phytocenology, and current status of the five species of the *Aegilops* L. genus are used for monitoring the species and maintaining vascular plant cadastres. Natural population areas serve as primary sources for selection and genetic research.

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