

Analysis of the distribution of species belonging to the genus *Aegilops* L. In botanical-geographical regions and ecological zones of Uzbekistan

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Abstract: This article presents analyzes of the results of research on the distribution of *Aegilops crassa* Boiss. ex Hohen., *Aegilops cylindrica* Host, *Aegilops juvenalis* (Thell.) Eig, *Aegilops kotschy* Boiss., *Aegilops tauschii* Coss., *Aegilops triuncialis* L. species, which are representatives of the *Aegilops* L. genus distributed in Uzbekistan, by botanical-geographic regions and ecoregions.

Keywords: Ecoregion, *Aegilops* L. endemic, altitude range, botanical-geographic region.

Introduction:

The wheatgrass or grass family (Poaceae) plays a leading role in the flora of Uzbekistan. Species belonging to many genera of this family are of great importance in agriculture and livestock farming. *Aegilops* L. – commonly known as Qasmaldoq or Yettibo'g'im – is one of the genera in the Poaceae family. This genus includes 23 species of annual herbaceous plants [1]. *Aegilops* L. species are mainly distributed in Europe, Asia, and Africa. In Uzbekistan, a

total of 6 species have been identified: *Aegilops crassa* Boiss. ex Hohen., *Aegilops cylindrica* Host, *Aegilops juvenalis* (Thell.) Eig, *Aegilops kotschy* Boiss., *Aegilops tauschii* Coss., and *Aegilops triuncialis* L. [1]. Among these, two herbarium specimens of *Aegilops kotschy* Boiss., collected in 1991 from the territory of Uzbekistan, are preserved in the National Herbarium of Uzbekistan (TASH) [4]. However, no herbarium samples of this species have been collected from the territory of

the Republic in recent years.

Aegilops crassa Boiss. ex Hohen. – broad Qasmaldoq, *Aegilops cylindrica* Host – cylindrical Qasmaldoq, *Aegilops triuncialis* L. – awned Qasmaldoq, and *Aegilops juvenalis* (Thell.) Eig – juvenile Qasmaldoq have been recorded growing in agricultural fields, plains, foothills, pastures, and mountainous areas of the Republic at elevations ranging from 500 to 1550 meters above sea level [3].

Today, due to the rapid development of science and technology and the negative impact of anthropogenic factors on nature, serious ecological changes are occurring on our planet. In our Republic as well, the varying degrees of salinity in irrigated lands make it important to study the ecology of nutritious forage plants [2].

Ecological zones are among the key factors influencing the distribution of species. Therefore, the aim of our research is to analyze the growth and distribution of populations of species belonging to the genus *Aegilops* L., which includes forage plants, across the ecological zones and botanical-geographical regions of Uzbekistan.

METHODS

Georeferenced data were collected from 811 herbarium specimens of *Aegilops* L. preserved at the National Herbarium of Uzbekistan (TASH). In addition,

data were obtained from online databases including MW (Moscow University Herbarium), Plantarium, Plants of the World Online, iNaturalist, and the Global Biodiversity Information Facility (GBIF).

To determine the distribution of species across Central Asia, ArcGIS 10.8 software was used to extract terrestrial ecological and botanical-geographical zones of Uzbekistan from the global terrestrial ecoregions map. Statistical analysis of these data was carried out using Microsoft Excel. This made it possible to analyze the distribution of species in the unique geographical conditions of Central Asia.

Furthermore, to gain a broader understanding of the distribution range of the species, the concept of "ecoregions" of Central Asia was employed. These ecoregions, which consider specific botanical characteristics and geographical factors, provide a classification system that enables a more detailed analysis of the distribution patterns of the species across Central Asian countries, particularly in Uzbekistan.

This methodology allowed for the integration of both primary field research data and publicly available biodiversity information, ensuring a reliable analysis of the distribution of *Aegilops* L. species within the studied region.

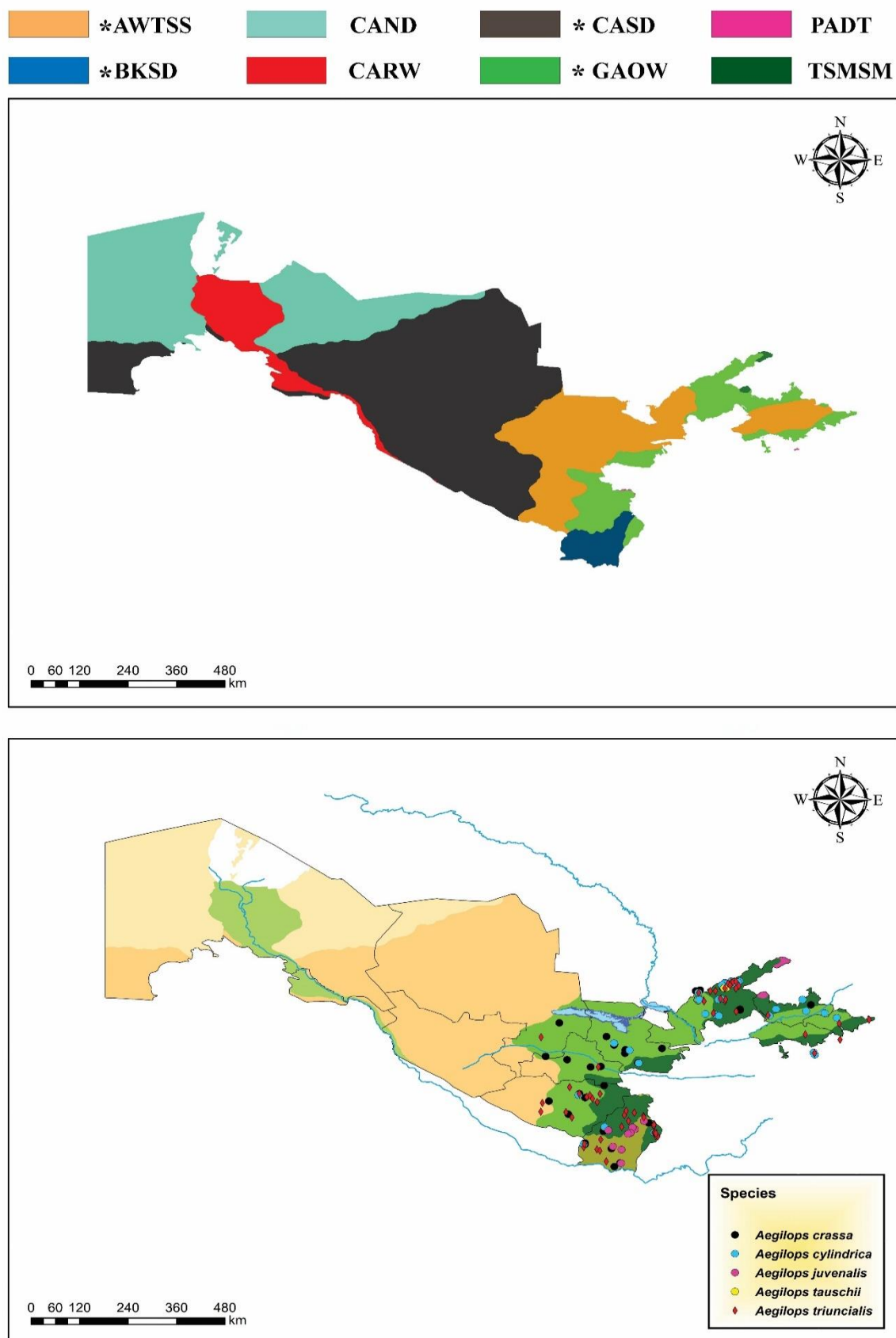


Figure 1. Ecoregions of Uzbekistan; a star symbol indicates the presence of at least one species within the respective ecoregion. This map provides information about the occurrence of *Aegilops* L. species in these ecoregions.

RESULTS

Ecoregion-Based Analysis

During the study, based on georeferenced data from 157 specimens belonging to 5 species of the *Aegilops* L. genus distributed in the territory of Uzbekistan, a distribution map of *Aegilops* L. species was developed using the ecoregions of Uzbekistan, selected from 37 Central Asian ecoregions (Figure 1).

Our research shows that all 5 *Aegilops* L. species were found in the Gissaro-Alai open woodlands (GAOW) ecoregion. In the Badkhyz and Karabil semi-desert (BKSD), 4 species were recorded; in the Alai-Western Tian Shan steppe (AWTSS), 3 species; in the Pamir alpine desert and tundra (PADT), 2 species; and in the

Central Asian southern desert (CASD), 1 species was identified.

However, no sufficient data were available from other ecoregions such as the Tian Shan montane steppe and meadows (TSMSM), the Central Asian northern desert (CAND), and the Central Asian riparian woodlands (CARW).

By studying the species distribution on the ecoregion-based map, it was determined that *Aegilops* L. species grow at various altitudinal ranges within four different ecoregions of Uzbekistan. Among them, *Aegilops triuncialis* L. – the awned Qasmaldaq – was found to be the most widespread species (Figure 2).

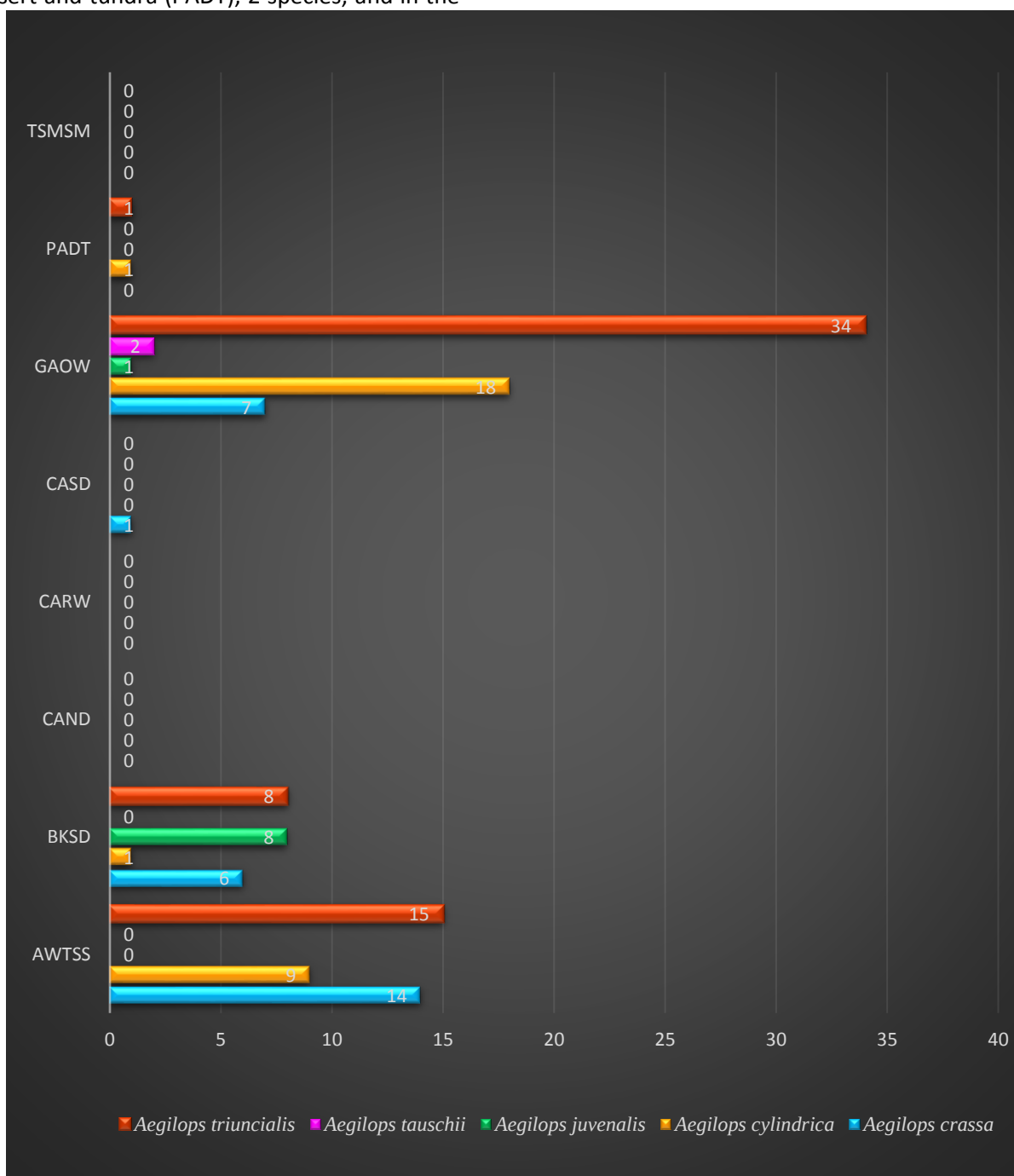


Figure 2. Distribution of *Aegilops* L. species across each ecoregion.

Analysis by Botanical-Geographical Regions

The territory of the Republic of Uzbekistan was divided into botanical-geographical regions by Tadjibaev K.Sh. and others (2016) [7]. Uzbekistan's botanical-geographical regions are categorized into two

provinces: the Mountainous Central Asia Province and the Turan Province. Each province is further subdivided into 8 districts (Figure 3).

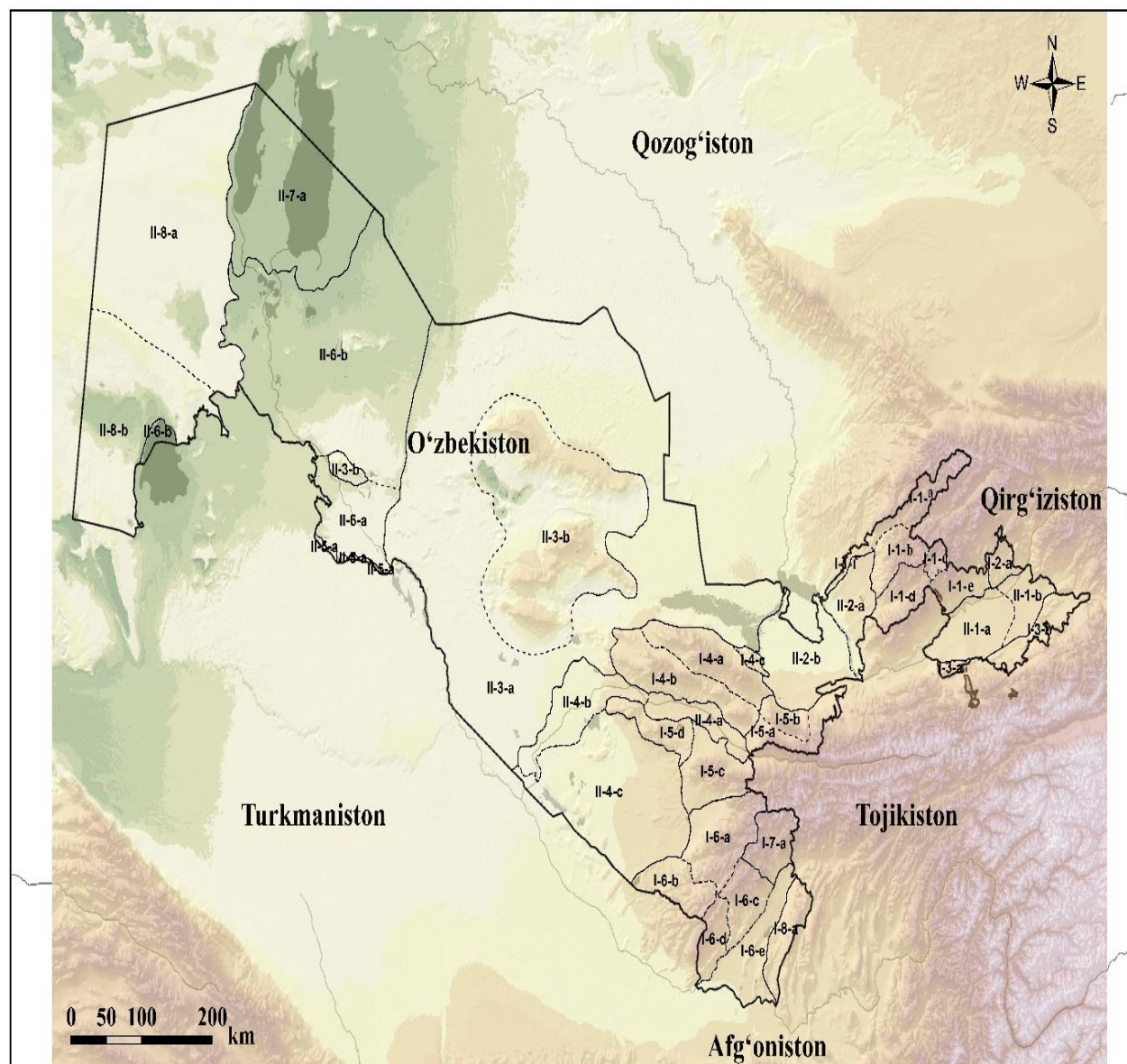


Figure 3. Botanical-geographical regions of Uzbekistan.

I. Mountainous Central Asia Province:

- I-1. Western Tien Shan District (Regions: I-1-a Ugam-Piskem, I-1-b Western Chatkal (Chimyon), I-1-c Arashan, I-1-d Kurama (Ohangaron), I-1-e Chorkesar, I-1-f Foothills of Tashkent)
- I-2. Fergana District (Region: I-2-a Southern Chatkal)
- I-3. Fergana-Alai District (Regions: I-3-a Western Alai, I-3-b Eastern Alai)
- I-4. Nurata District (Regions: I-4-a Nurata, I-4-b Oqtog', I-4-c Residual Nurata Mountains)
- I-5. Kohiston District (Regions: I-5-a Northern

Turkistan, I-5-b Molguzar, I-5-c Urgut, I-5-d Ziyovuddin-Zirabuloq)

- I-6. Western Hissar District (Regions: I-6-a Kashkadarya, I-6-b Tarqapchigay, I-6-c Boysun, I-6-d Kohiston, I-6-e Surkhan-Sherobod)
- I-7. Hissar-Darvaz District (Region: I-7-a Sangardak-Topalang)
- I-8. Panj District (Region: I-8-a Babatag)

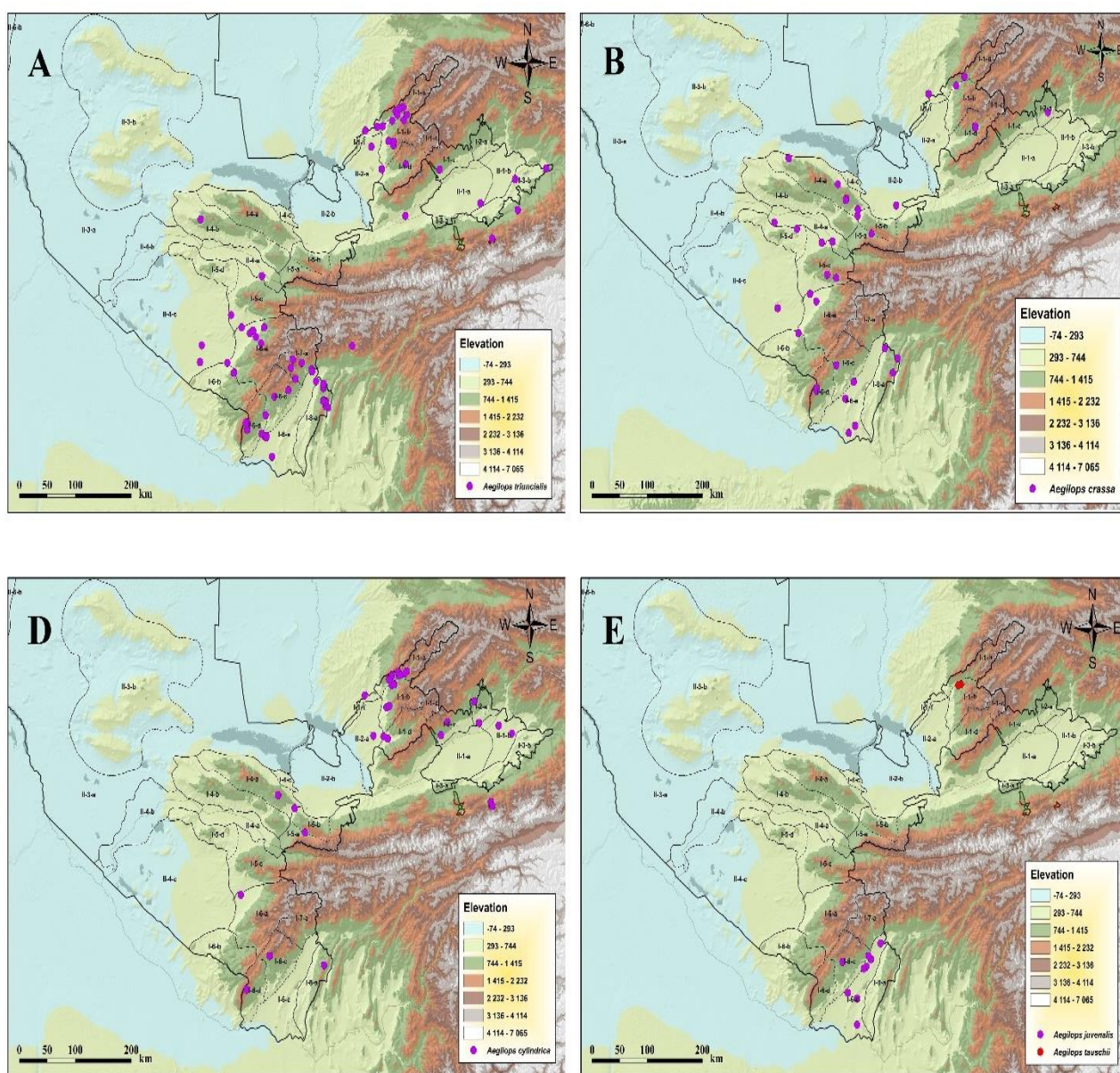
II. Turan Province:

- II-1. Central Fergana District (Regions: II-1-a Kayrakkum-Yazyavan, II-1-b Eastern Fergana)
- II-2. Middle Syrdarya District (Regions: II-2-a

Chinaz, II-2-b Mirzachul)

- II-3. Kyzylkum District (Regions: II-3-a Kyzylkum, II-3-b Residual Kyzylkum Mountains)
- II-4. Bukhara District (Regions: II-4-a Middle Zarafshan, II-4-b Lower Zarafshan, II-4-c Karshi-Karnab Desert)
- II-5. Karakum District (Region: II-5-a Northeastern Karakum)
- II-6. Southern Aral Sea District (Regions: II-6-a Khorezm, II-6-b Amu Darya Delta)
- II-7. Aral Sea District (Region: II-7-a Aral)
- II-8. Ustyurt District (Regions: II-8-a Northern Ustyurt, II-8-b Southern Ustyurt)

Herbarium records of *Aegilops* species collected from various regions indicate that *Aegilops triuncialis*, *Aegilops crassa*, and *Aegilops cylindrica* are widely distributed across both provinces. The least herbarium data were found for *Aegilops juvenalis* and *Aegilops tauschii* (Figure 4). In terms of elevation, the species were found to occur at altitudes ranging from 400 to 1500 meters above sea level, with an average distribution between 700 and 1400 meters. These species grow in various ecological environments of Uzbekistan, including desert, semi-desert, mountainous, and foothill zones.



CONCLUSION

The Poaceae family holds significant importance in the flora of Uzbekistan due to its inclusion of species that serve as nutritious food, forage, and medicinal plants. *Aegilops* L. is one such genus, comprising species that are considered valuable forage plants. The distribution

of this genus across the ecoregions and botanical-geographical regions of Central Asia demonstrates the species' adaptation to specific environmental conditions.

Today, ongoing climate change is affecting both the distribution and diversity of these species. This study

provides valuable insights into the distribution patterns of *Aegilops* species across the ecoregions of Uzbekistan. Among the studied species, *Aegilops triuncialis* was identified as the most widely distributed in the country.

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