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A New Distribution Area of the Endangered Endemic *Linum vuralianum* (Linaceae) in Türkiye

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Abstract

Linum vuralianum Yılmaz & Kaynak (Linaceae) is an endemic species described in 2008, known from only two localities (Emet-Kütahya and Pelitözü-Bilecik) in Türkiye. According to the distribution area and population data, the threat category of the IUCN has been recommended as "EN" by the authors of the species. It has been determined that the species has a new distribution area in Çamlıca Mountain, Soma-Manisa with this study. It has been determined that *Linum vuralianum* is distributed in open forest places at about 1000 m altitude on the north-western view of Çamlıca Mountain. According to the observations made during the field study, it was concluded that the threat category of the species should be protected in the same way.

Keywords: Distribution, Endemic, *Linum vuralianum,* Manisa, Türkiye

1. Introduction

Linum is a large genus containing about 200 species worldwide belonging to the family Linaceae. The genus *Linum* is distributed in the Mediterranean basin, the southwest and north of America, and the temperate and subtropical regions of Asia [1]. The main distribution area of the genus *Linum* is the North American continent, the Balkan Peninsula and Anatolia [2, 3].

The first revision of *Linum* species in Türkiye and the East Aegean Islands was made by Davis who recognised 49 taxa [4]. Since then with the new taxa identified, added as a new record to the flora and with new combination the *Linum* taxa in Türkiye has been reached to 55, 26 of which are endemic [4-14].

The fact that 75 species in the Mediterranean basin represent the genus *Linum* [15] that the number of taxa in Anatolia has reached 55 with the newly added species and that the endemism rate (47%) is high [14] indicates that Anatolia may be one of the gene centres of this genus.

With many taxonomic studies conducted in our country in recent years, new data have begun to be obtained regarding the situation of endemic and rare taxa in nature [16-25].

In studies conducted on species whose new distribution areas have been identified, their descriptions are renewed, maps showing the distribution areas of taxa are updated, and existing danger categories are re-evaluated according to the new observations obtained.

With this study, it has been revealed that the endemic *Linum vuralianum* Yılmaz & Kaynak, known from only two localities in Türkiye, has a new distribution area [9].

2. Materials and Methods

It has been collected *Linum* samples while conducting fieldwork in Çamlıca Mountain in June 2024 (39°03'55.64"N 27°33'38.46"E).

The specimens were checked against the Flora of Turkey [4], taxonomical investigations of *Linum* species in Türkiye [26-30] and the latest identified new *Linum* taxa.

As a result of the examinations, it was understood that the collected species was *Linum vuralianum* Yılmaz & Kaynak, an endemic species that was identified in 2008 and is known only from two localities (Kütahya-Emet and Bilecik-Pelitözü) in Türkiye.

The description of the species is given based on measurements made on samples collected from its new distribution area. Then, photographs of the species taken during field studies and a map showing the current distribution have been added.

The assessment regarding the IUCN threat category was made by taking into consideration the number of individuals in the new distribution area of *L. vuralianum* and its situation in its natural environment during field studies [31].

3. Results

3.1. Description

Plants annual or biennial (Figure 1). Flowering stems erect, 15–66 cm, with scabrid ridges and persistent basal rosettes. Rosette leaves dense, spathulate, petiolate, 15–30 x 6–10 mm. Lower cauline leaves narrowly oblanceolate-spathulate, acute 15–60 x 6–13 mm, Uppermost cauline leaves narrowly oblanceolate or linear, acute, 17–55 x 2.5–10 mm, one- (to three-) nerved, with stipular glands at base.

Figure 1. Habit of *Linum vuralianum.*

Inflorescence many flowered. Flowers heterostylous. Sepals lanceolate or narrowly ovate, acuminate, 10–12 x 2–2.5 mm, keeled, with narrow membranous glandular ciliate margins. Petals yellow, obovate, 17–26 x 5–8 mm, acute or obtuse (Figure 2). Filament equal, 5–11 mm, united at base into a short tube, 1 mm; anthers, oblong, 3 mm; staminode, 1 mm. Styles in short-styled flowers c. 4 mm in long-styled flowers c. 7 mm and united in the middle, stigma linear. Capsule spherical, 3–5 mm, seeds oblong, 3–3.5 x 1.5–2 mm, brown.

Figure 2. *Linum vuralianum* in population of Çamlıca Mountain (Soma/Manisa).

3.2. Flowering, Habitat and Distribution

It grows in the open places forest of *Pinus nigra* at an altitude of 700–1050 m, on the north-western view of Çamlıca Mountain.

Flowering is in June. It is distributed in a limited area at Çamlıca Mountain approximately a total number of 200 individuals but the population density is in good condition.

3.3. Conservation status

According to the distribution area and population data (two different localities, a distribution area of 5000 km^2 and about a total of 300 individuals in two populations), the threat category of the IUCN has been recommended as "EN" (criterion B1a) by the authors of the species [9].

It has been determined that the species has a new distribution area in Çamlıca Mountain, Manisa-Soma district with this study (Figure 3). Although the distribution area of the taxon has expanded with the discovery of a new distribution area for *L. vuralianum*, the number of individuals in the population and when the previous data are evaluated together, it was concluded that the threat category of the species should be protected in the same way.

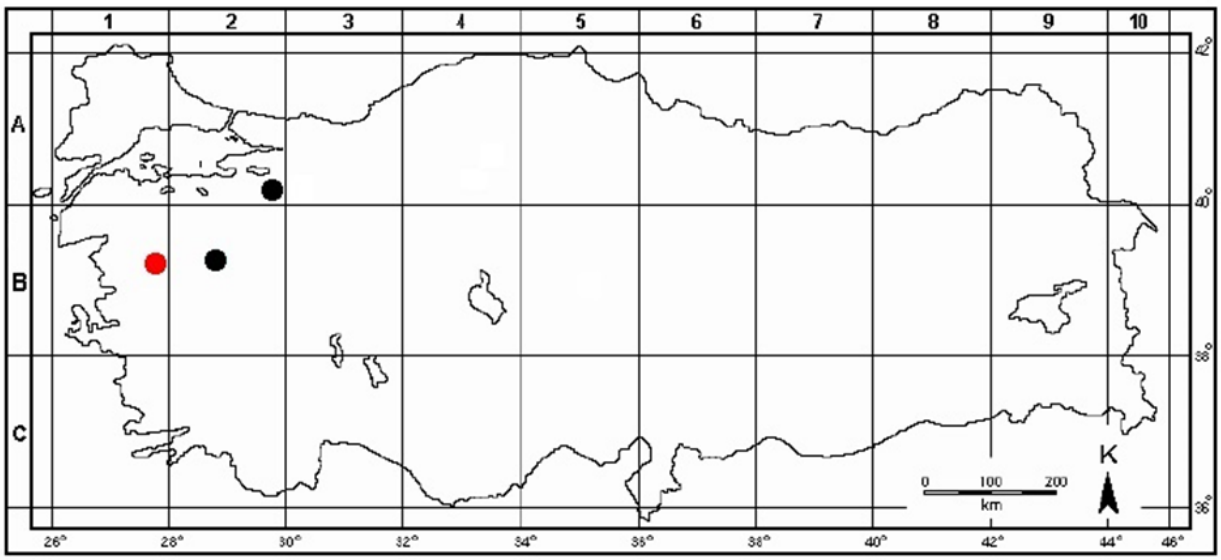

Figure 3. Current distribution map of *Linum vuralianum* (●); New distribution area (Manisa-Soma), (●); Other known distribution areas (Kütahya-Emet and Bilecik-Yenişehir, respectively).

4. Discussion

Linum is represented by five sections in Türkiye. *L. vuralianum* is an annual or biennial taxon in the *Linum* section Syllinum [32]. The others, except one (*Linum nodiflorum* L.), are perennials.

Linum section *Syllinum* is characterized by having keeled or striated stems (keels smooth or papillose hairy), leaves usually having stipules at the base, and petals being yellow or rarely white and fused at the base.

Some taxa such as *L. vuralianum*, carry rosette leaves at the base of their flowering stems. The flowers are mostly heterostylous. Sepals are distinctly veined, keeled, membranous and glabrous. Sepals are longer than capsules.

Section *Syllinum*, is rich in terms of the number of endemic taxa for Türkiye, together with the newly added taxa (17 out of 22 taxa are endemic) [6, 8, 14, 26]. Almost all of the endemic taxa are narrowly distributed, endangered or vulnerable species [26].

Therefore, it is very pleasing to find a new distribution area for any species that is endangered and has localized distribution areas.

When we compare morphological measurements of characters in different populations, it can be said that there are slightly larger individuals in the Manisa population (Table 1.).

According to morphological measurements, the fact that individuals in the Çamlıca population are slightly larger is probably due to environmental factors.

Considering the common parameters such as the lack of long distances between their distribution areas, their closeness in terms of latitude, and their presence at

similar elevations, it is thought that the determining factor may be soil. The accuracy of this inference will of course be possible by comparing soil samples taken from the distribution areas of different populations.

Table 1. Comparison of morphological measurements of characters in different populations.

Linum vuralianum	**Kütahya and Bilecik** Populations (Yılmaz & Kaynak 2008)	**Manisa** Population (In this study)
Plant height	15–60 cm	15–**66** cm
Basal leaves	15–30 × 6–10 mm	15–**45** × 6–**14** mm
Lower cauline leaves	20–45 × 3–6 mm	15–**70** × 6–**13** mm
Uppermost cauline leaves	15–35 × 2–6 mm	17–**55** × 2.5–**10** mm
Sepals	7–10 × 2–2.5 mm	7–**12** × 2–2.5 mm
Petals	18–22 × 8–11 mm	17–**26** × 5–8 mm
Capsule	3–5 mm	**4**–5 mm
Seeds	2.5– 3 × 1–1.5 mm	3–**3.5** × 1.5–**2** mm

5. Conclusion

The discovery of a new distribution area of the endangered endemic species is a pleasant event. When looking at studies on the flora of any province in Türkiye, it is exciting how many new areas there are to be discovered. It is clear that in the long term, a large information pool will be formed where the complete flora of Türkiye and the distribution of taxa are supported by more data.

Studies on the newly discovered distribution areas of taxa are quite necessary and valuable from this perspective.

Ethics

There are no ethical issues after the publication of this manuscript.

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