



Floral visitors of endemic *Centaurea lycaonica* (Asteraceae) from Türkiye

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1. Introduction

Reproduction plays an essential role in the life cycles of plants. Sexual reproduction of many crops and the majority of wild plants is dependent on animal pollination through insects, birds, bats and others, with insects playing the major role. Among the insect pollinators, solitary and social bees provide most pollination in both managed and natural ecosystems. In part due to the massive scale and homogeneity of modern agriculture, the majority of crops requiring pollination are dependent on managed pollinators, and especially on managed honeybees. Cooperation and harmony between flowers and insects are very important for the success of pollination in insect-pollinated plants (Abrol, 2012). With approximately 650 species worldwide, *Centaurea* stands as the largest genus within the subtribe Centaureinae in the world (Mabberley, 2008). Türkiye is a major center of diversity for this genus (Wagenitz, 1986), and recent research has documented 247 taxa within the country (İlçim and Demir, 2023; Uysal et al., 2024). Notably, 145 of these taxa are endemic to Türkiye, reflecting an endemism rate of 58.7%. *Centaurea lycaonica* Boiss. & Heldr. is an endemic plant that grows in a rock formation between Konya and Beyşehir within the *Phalolepis* (Cass.) DC. section and on another rock formation between Konya and Seydişehir. The distance between the two known distribution areas is only 20 km. The first small population (with a small number of individuals) is known as the type locality in the Turkish flora (Beyşehir Province) and is located 50 km west of Konya. The second population is located around İnlice village, approximately 55 km southwest of Konya. This natural population is larger in area and has more individuals on a large rock and rocky slopes (Çitak and Dural, 2021). The plant is perennial, about 35 cm tall, leaves are pinnatifid, capitula are single, involucre is ovoid, 10-11×5-6 mm, appendages are dark brown, flower color varies from rose to purple, achenes are about 5 mm long, oblanceolate, light brown to straw colored (Çitak and Dural, 2021). The plant's threat category has been determined as CR (Critically Endangered). Literature has revealed that studies on the pollination biology of the genus *Centaurea*, a large and important species in Turkey, are quite scarce (Atasagun, 2019; Eroğlu, 2025). This study, conducted on the endemic taxon *C. lycaonica*, a threatened species within the genus with only two populations according to current data, aims to provide information about the species' pollinators.

2. Materials and Methods

2.1. Plant Materials

Specimens of *Centaurea lycaonica* were chosen from the İnlice Village in Konya, Türkiye. The flower and fruit samples to be studied were carefully selected, labeled and their flowers photographed, and collected for testing at various stages of development throughout June and July 2025. (accession numbers B.Çitak-434, 37.44 48.6 N, 32.04 20.8 E). The study areas have a warm and temperate climate; The average annual temperature, sunshine duration, rainy day and rainfall amount are 20.2 °C (max: 26.7 °C, min: 12.7 °C), 9.8 hours, 6.78 days and 25.7 mm, respectively (<https://www.mgm.gov.tr/veridegerlendirme/il-ve-ilceler-istatistik.aspx?k=A&m=KONYA>).

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3. Results

3.1. Insect Species that Visit Flowers and Their Behaviors

5 insects' taxa (*Halictus scabiosae*, *Adscita scitites*, Coleoptera, Diptera) have been observed to visit the *C. lycaonica* for various purposes. *Halictus scabiosae* is the most frequent visitors of the plant (Figure 1).

3.2. The role of *H. scabiosae* in Pollination

H. scabiosae comes in contact with the tubulate flowers to collect nectar upon landing on the Corolla (Figure 2). The other visitors of *C. lycaonica* are arrive the flowers for multiple purposes.

3.3. Pollination activity

The visits of *H. scabiosae*, the only pollinator of *C. lycaonica*, vary depending on temperature, wind and the amount of sucrose in the nectar (not calculated).

3.3.1. Temperature: *H. scabiosae* makes the most frequent visits during the morning hours at 22°C. As temperature increases, the number of visits decreases.

3.3.2. Wind: At the morning hours, when the wind speed is below 1 m/ sec, *H. scabiosae* makes the most frequent visits.

4. Discussion and Conclusion

Centaurea species attract a lot of different pollinator with respect to their origins (Monticelli et al., 2022; D'Agostino and Abeli 2025). It is noteworthy in the literature that studies on pollinators of the *Centaurea* genus are quite limited. The visitors of Hymenoptera and Diptera taxa were observed in the genus *Centaurea*. One of the pollinators of the genus were determined as *Halictus* bees that observed in *C. lycaonica*.

We would like to point out that this study on the pollinators of the genus contributes to the field specifically for *C. lycaonica*, but more detailed data should be obtained by making more observations.

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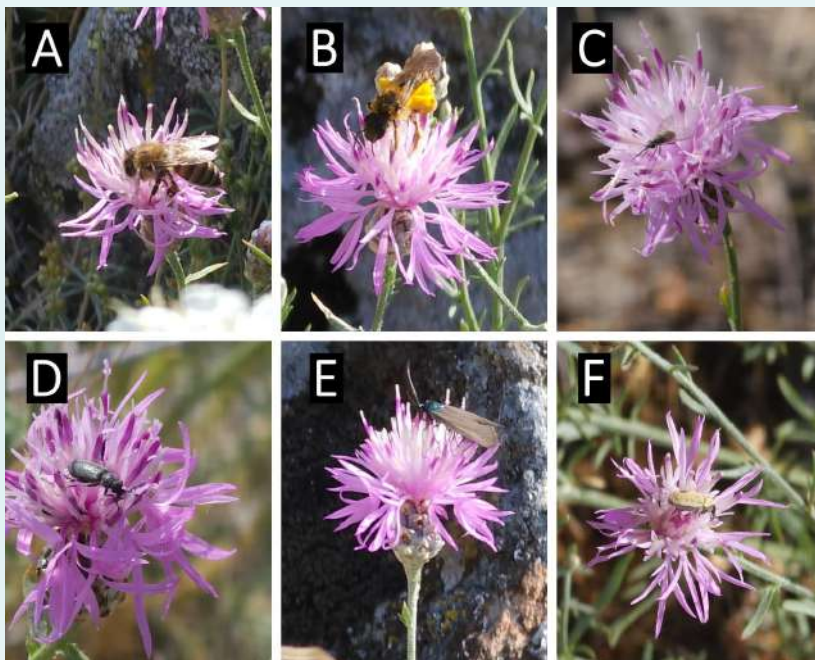


Figure 1. The photographs of insects which visit *C. lycaonica*. A-B. Hymenoptera (*Halictus scabiosae*) C. Diptera D. Coleoptera E. Lepidoptera (*Adscita scitites*) F. Coleoptera

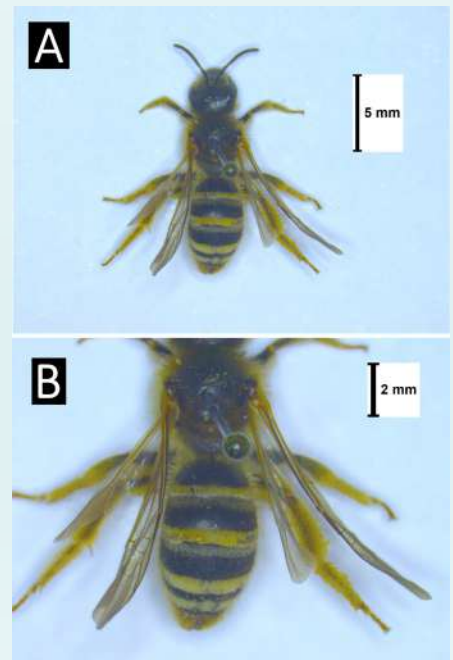


Figure 2. The light microscope photographs of *H. scabiosae*.

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Most species of the genus *Centaurea* are pollinated by insects, especially bees, which are the main pollinators and nectar carriers of plants. *Centaurea lycaonica* is an endemic plant used in folk medicine that distributes in the rocky formation found between Konya-Seydişehir and on another rocky formation found between Konya-Beyşehir within the Phalolepis (Cass.) DC. section. The present study aimed to observe and determine the pollinators of *C. lycaonica*. The flowers of species is complicated because of both sterile and fertile flowers united in the same receptacle. The flowers have nectaries that attract the visitors. During the observations *Apis mellifera* bees are the most effective floral visitors for *C. lycaonica* are determined. The opening and closing hours of flowers in *C. lycaonica* were noted. This study provide the structure and functions of sexual units order pattern of pollen dispersal and admission of *C. lycaonica* which is rare and endemic plant species.