Taxonomic Study for the New Record *Orobanche armena* Tzvelev (Orobanchaceae) in Iraq

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**ABSTRACT**

*Orobanche armena* Tzvelev is a new plant record within Orobanchaceae family in Iraq, from Qandil mountain (North-East of Erbil) within Rowanduz district (MRO). Identification and morphological study have been done, these illustrated by graphs. Pollens characters have been clarified like shapes, colors, sizes, surface ornamentation and numbers. In addition, some features of the leaf and stem anatomy have been examined.

**KEYWORDS:** New record

**Orobanche armena**
Orobanchaceae
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**1. INTRODUCTION**

Orobanchaceae is one of the plant families in Iraq, which includes 210 species of 15 genera over the world (Simpson, 2006). In Iraq consist of 11 species within 2 genera (Al-Rawi, 1964). Gilli (1982) mentioned 36 species of the genus in Turkey, one of them is *O. armena*. Chater and Webb (1972) stated 45 species of the genus *Orobanche* in Europe. Wien (1964) pointed out that 47 species of the genus present in Iran. Rechinger (1964) in the low lands of Iraq indicated 5 species. Whilst Al-Rawi (1964), Rida and Daoood (1982), Karim (1978) and Chakravarty (1976) mentioned 10 species in Iraq. Faris (1983) and Hameed (2016) stated 4 species in Pira Magrun mountain and Hujran Basin separately. Khalaf (1980) mentioned 3 species of the genus in Sinjar mountain. Ahmad (2013) indicated 5 species in Hawraman mountains. Whilst Fatah (2003) mentioned 1 species in Haibat Sultan mountain. Ahmed, (2010) and Darwesh (2017) did not indicate any species in Darband Gomaspan and Choman region respectively. Chakravarty (1976) stated that *O. aegyptiaca* is reported to be used in diarrhea. It is also used to cure boils produced in the throat of cattle. From the similar studies that involve new plant records in Iraq the study of Al-Musawi and Majeed (2013), Halooob (2016) and Sardar (2017). In all the available references, the study did not find any species refers to *O. armena*, therefore the studied specimens regarded as a
new plant record for the Flora of Iraq. The purpose of the current study is to confirm the presence of *O. armena* in Iraq and to study the morphological characters as well as some pollens characters, with leaf and stem anatomy.

2. MATERIALS AND METHODS

For plant specimen's collection, various scientific trips were made to the different regions of northern districts (Kurdistan region) of Iraq in 2017. Identification of the specimens has been done by using the Orobanchaceae family key in Flora of Turkey, the specimens were treated by standard herbarium techniques to become formal specimens, and preserved in Herbarium of Education College - University of Salahaddin, Erbil (ESUH). Kruss dissecting microscope has been used in the examining of the collected specimens that belong to *O. armena*. Some environmental notes have been mentioned, and a map (figure 1) was used. For the pollens, anthers fixed in FAA (Formalin-glacial acetic acid-ethyl alcohol) solution, then a single anther removed and placed in a drop of water or 50% glycerol (the latter to prevent the material from drying out) and dissected with a needle to extrude the pollens; the anther wall material removed and stained with safranin. Then, a cover slide applied. (Simpson, 2006). A mobile camera (Sumsung-A5) has been used for photographing the different plant parts and the scientific terms that used in the study have been taken from Harris and Harris (2001), Hesse et al. (2009) and Agashe and Caulton (2009). For the leaf and stem anatomy, the procedure in Al-Mashhadani (1992) has been used and the information in Metcalfe and Chalk (1950) were utilized.

3. RESULTS AND DISCUSSION

3.1. Morphological Study

*Orobanche armena* Tzvelev in Fl. URSS 23: 686 (1958); Fl. Turkey, Gilli, 7: 21 (1982).

Herbs, glandular, (28-31) cm. Stem unbranched, erect, costate, brown, (90-130)x(7.5-8.5) mm. Leaves (scales) sessile, alternate-spiral, hairs on the lower surface and margin, margin entire, apex acuminiate, base truncate, brown, lower cauline leaves narrowly oblong-cultrate or lanceolate-narrowly lanceolate, (14-16)x(3.3-4.0) mm, upper cauline leaves cultrulate, (14-17)x(3.0-3.5) mm. Inflorescence a dense simple spike, (160-190) mm, Bracts, cultrate-narrowly oblong, margin dentate, apex acuminiate, base truncate, glandular, brown, (15-20)x(4.0-5.2) mm. Flowers numerous, hermaphroditic, Calyx halves connate at base, 2-toothed, teeth narrowly ovate, glandular, brown, (21.3-25.0)x(5.5-7.0) mm, Corolla tubular-campanulate, of tube and limb, glandular-pilose, brown, tube (10-13)x(8.2-10.5) mm, limb bilabiate, lower lip 3-lobed, margin entire, apex obtuse and dentate, upper lip apex emarginate, (11.5-13.0)x(9.0-10.5) mm, Stamens 4, epipetalous, inserted above corolla base, filaments terete, densely pilose below, sparingly glandular-pilose above, brown, (6.5-9.0)x(0.4-0.6) mm, pilose hairs (0.15-0.90)x(0.04-0.06) mm, glandular-pilose hairs (0.20-0.70)x(0.03-0.06) mm, anthers narrowly oblong, brown, versatile attachment with the filaments, (2.1-2.5)x(0.8-1.2) mm. Pistil one, brown, ovary superior, narrowly ovoid-ovoid, glandular, (6.0-8.0)x(2.8-3.3) mm, style 1, terete, glandular-pilose, (2.2-3.0)x(0.4-0.6) mm, glandular-pilose hairs (0.15-0.40)x(0.03-0.05) mm, stigma 2-lobed, rough, (0.7-1.0)x(2.2-2.6) mm. Fruit simple, dry, capsule, ovoid- narrowly ovoid, brown, (8-11)x(3.2-7.0) mm. Seeds numerous, oblong, narrowly ovoid-oblong, reticulate, with small soft hairs, black, (0.35-0.50)x(0.20-0.25) mm. (Plates 1-3).

Type: [Turkey A9 Kars] Armenia turcica, ad declivia faucis Kajyzman-Darasu (nr Kajizman) prope fl. Arax (Aras), 18 vi 1886, V. Massalsky (holo. LE).

Studied samples

MRO: ESUH/ Qandil mountain (North-East of Erbil) within Rowanduz district, 2350 m, 6.8.2017, A. Sardar and S. Al-Dabagh, 7598.
Habitat
The plant was found as parasitic individuals on *Astragalus* sp., in the rocky clay soils; altitude: 2350 m; flowering: August.
(figure 1).

3.2. Palynological Study
Pollens yellow, single, tricolpate, spheroidal in both equatorial and polar view, small size according to Erdtman (1971), axis (15-20) µm, tuberculate surface ornamentation, numerous. (Plate 4).

3.3. Anatomical Study
In the leaf, the epidermis is covered by the cuticle layer which is not equal in its thickness from region to region, (2.50-3.750) µm; The epidermal cells shape in the cross sections were oblong, circular, quadrate, irregular, different sizes, straight or oblique radial walls, straight or convex external and internal walls, (12.5-30.0) µm. the mesophyll of dense homogenous cells, oblong, circular, semi-circular, irregular, with different sizes, little intercellular spaces, (200-250) µm, vascular bundles (8-11), one is the midrib, semi-circular in shape, (87.5-100.0) µm.

A cross section of the middle of a flowering stem has been taken to be the material of the stem anatomy. The epidermis was a single continuous layer of elongate, circular, semi-circular or irregular cells, having different sizes, straight or convex walls; the thickness of the epidermis depends on the differences in the cell sizes, (10-20) µm. The cuticle layer was (2.5-7.5) µm.

The cortex consists of numerous layers of parenchymal tissue, the cells of different shapes and sizes, oblong, circular, semi-circular or irregular, (900-1000) µm. The vascular tissue as a ring, of xylem and phloem, xylem represented by vessels, phloem more developed than xylem, a number of vascular bundles present in the cortex, different in sizes, represented by vessels, (125-225) µm. The pith consists of parenchymal cells, polygonal, different sizes, (4-8 faces), with intercellular space, (2500-2700) µm. (Plate 5).

The current work studied the new plant record *O. armena* from Orobanchaceae family in Iraq, and included some aspects like the morphological characters, pollen grains, leaf with stem anatomy and the environment. Within the literature review about the genus *Orobanche* in Iraq, involving the plant specimens of National Herbarium of Iraq (BAG), College of Science Herbarium, University of Salahaddin-Erbil, Iraq (ARB) and College of Education Herbarium, University of Salahaddin-Erbil, Iraq (ESUH), the study did not find any specimens belong to *O. armena*, therefore the study regarded the studied plant specimens as a new record for the Flora of Iraq from Qandil mountain.

*O. armena* has some characters differ from the related species which is *O. kurdica* Boiss. & Hausskn. that present in Iraq where *O. armena* has smaller corolla and connated halves of calyx at the base (Gilli, 1982), as well as, the other characters.
Fig (1): A map of Iraq shows the location of *O. armena* •
Plate (1): *O. armena* with different plant parts

- Photographs of *O. armena*
  - Cauline leaves
  - Inflorescence
  - Bract

*Photographs of* *O. armena*
Plate (2): Reproductive parts of *O. armena*
Plate (3): Reproductive parts of *O. armena*

Plate (4): Pollens of *O. armena* X100
Plate (5): C.S. of the leaf and stem of *O. armena*: ue: upper epidermis; m: mesophyll; vb: vascular bundle; vc: vascular cylinder; le: lower epidermis; p: pith; co: cortex; ep: epidermis; cvb: cortical vascular bundle; ph: phloem; x: xylem

4. CONCLUSIONS

The present study verified the presence of the species *O. armena* from Orobanchaceae family as a new record for the Flora of Iraq which collected from Qandil mountain (North-East of Erbil), in addition, morphological, palynological and anatomical studies have been conducted for the species under study.
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