**Erysimum amasianum** Hausskn. & Bornm. (Brassicaceae) as a New Record for Flora of Iraq

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**ABSTRACT**

*Erysimum amasianum* Hausskn. & Bornm. regards as a new plant species for the Flora of Iraq within Brassicaceae family, found in Safin mountain (north-east of Erbil) in Rowanduz district (MRO). The characteristics of *E. amasianum* are the followings: Biennial plants; 2-fid hairy; leaves entire (or dentate, pinnatifid in some basal leaves), linear-oblancoate (cultrate in lower cauline leaves, linear in upper cauline leaves); pedicel thickened, fruit a siliqua, terete, rigid, erect-spreading. The identification of the species was proved by applying the keys in the available references, morphological description was fixed. Pollen grains characters have been studied like shape, color, size, surface ornamentation and number. In addition, the features of the stem anatomy such as epidermis, cortex, vascular bundles and the pith have been examined.

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**1. INTRODUCTION**

Brassicaceae (Cruciferae) is one of the families mentioned in the Flora of Iraq which have 3250 species around the world and distributed on 365 genera (Simpson, 2006). In Iraq, Al-Rawi (1964) stated that the family comprise 199 species distributed on 74 genera. In the Flora of U.S.S.R., Shishkin (1949) indicated 52 species of the genus *Erysimum* (Tourn.) L., in Saudi Arabia, Migahid (1978) did not remark any species of the genus, while Post (1932) declared 11 species in Syria, Palestine and Sinai. Chamberlain and Raven (1972) in Turkey stated 33 species of the genus implicating *E. amasianum*. In Iran, Raven (19-) indicated that 40 species of the genus present, also in Iran, Ghahreman and Attar (1999) mentioned 26 species. In the Flora of low land Iraq, Rechinger (1964) declared 3 species, while Guest (1933) did not mention any species of the genus in Iraq, Zohary (1946) stated 10 species of the genus in Iraq and Blakelock (1948) pointed to 3 species of the genus in Iraq, but Al-Rawi (1964) mentioned 13 species and Ridda and Daoed (1982) with Townsend and Guest (1980) indicated 12 species. Faris (1983) mentioned 3 species in Piramagrun mountain, each of Fatah (2003), Darwesh (2017) and Khalaf (1980) mentioned 2 species in Haibat Sultan, Choman and Sinjar respectively, Ahmed (2010) did not state any species of the genus *Erysimum* in Gomaspan, whilst Hameed (2016) mentioned 1 species in Hujran Basin. Ahmad (2013) indicated 6 species in Hawraman mountains. Chakravarty (1976) stated that the seeds of the species *E. repandum* L. which present in Iraq when
soaked in water, become coated with a transparent mucilage matter. They are given in fever. They are also applied in the form of a poultice to relieve pain in the stomach. It is reported that the plant is employed in Spain as an antiscorbutic. It is also reported useful for sheep grazing.

The current study confirmed the presence of *E. amasianum* in Iraq depending on the recent collections, as well as morphological characters, pollen grains and stem anatomy, to add more information for aiding the identity of the species covered by the present study.

2. MATERIALS AND METHODS

Plant specimens have been collected within field trips in the different regions of northern districts of Iraq in 2017. By helping the keys of Flora of Iraq, Flora of Turkey and Flora Iranica, the specimens have been identified, then kept in herbarium of Education College, University of Salahaddin-Erbil, (ESUH). For the pollen grains, anthers fixed in FAA, a single anther removed and positioned in a drop of water or 50% glycerol (the latter to prevent the material from drying out). The anther dissected with a scalpel to extrude the grains. The anther wall material was removed, a drop of safranin was added on the grains, then a cover-slip was slide on top of the pollens. (Simpson, 2006). A Sony camera used for photographing the parts of plants and the scientific terms have been taken from *Agashe and Caulton* (2009) and *Harris* (2001) and *Metcalfe and Chalk* (1950). For the stem anatomy, the procedure in Al-Mashhadiani (1992) has been used and the information in *Metcalfe and Chalk* (1950) was applied.

3. RESULTS AND DISCUSSION

3.1. Morphological Study

*E. amasianum* Hausskn. & Bornm. In Mitt. Thur. Bot. Ver. 20: 2 (1904-5); Fl. Turkey, Cullen, 1: 474 (1965).

Biennial, herb, height (18-41) cm, stem erect, branched, costate, winged, white, 2-fid hairs, green, (7.5-34)x(1.0-1.5) cm. Leaves simple, sessile, exstipulate, alternate-spiral, margin entire (or dentate, pinnatifid in some basal leaves), apex acute, base truncate, densely 2-fid hairs; basal leaves narrowly oblanceolate, linear, green, (5.5-42.0)x(0.3-0.8) mm; lower cauline leaves cultrate, green, (45-60)x(0.7-1.4) mm; upper cauline leaves linear, green, (40-56)x(0.6-1.3) mm. Inflorescence simple raceme, ebracteate, 2-fid hairs, flowers actinomorphic, 4-merous, pedicle thickened, 2-fid hairs, green, (2.2-3.0)x(0.4-0.7) mm. Calyx of 4 sepals, saccate, free, in two decussate pairs, lateral ones lanceolate-narrowly lanceolate, upper and lower ones cultrate, margin entire, apex obtuse or acuminate, base obtuse, 2-fid hairs on the lower surface, green, (6.7-7.7)x(1.1-1.8) mm. Corolla of 4 petals, alternating with the sepals, obovate, margin entire, apex undulate, base truncate, 2-fid hairs on the lower surface (on the midrib of the petal limb), yellow, petal limb (3.5-4.5)x(2.8-3.2) mm, petal claw (7.0-7.6)x(0.3-0.4) mm. Stamens 6, tetradynamous, in two whorls, the outer of 2 shorter and the inner of 4 longer stamens: filaments filiform, yellow, longest (5.7-6.8)x(0.25-0.30) mm, shortest (4.0-5.2)x(0.15-0.20) mm; anthers narrowly oblong-cylindraceous, yellow, basifixated attachment with the filaments, (2-3)x(0.3-0.45) mm, two nectar glands at the base of each stamen, triangular, yellow, (0.20-0.25)x(0.15-0.20) mm. Pistil 1, ovary syncarpous, of 2 carpels, 2-locular, divided by a replum, superior, terete, 2-fid hairs, yellow, (6.5-9.0)x(0.4-0.5) mm; style single, globoid or oblong, 2-fid hairs, yellow, (0.5-1.0)x(0.4-0.8) mm; stigma bilobed, rough, yellow, (0.2-0.5)x(0.8-1.1) mm. Fruit stalk terete, thickened, 2-fid hairs, (3-5)x(0.55-0.65) mm, fruit a siliqua, dehiscing upwardly by 2 valves, terete, rigid, erect-spreading, 2-fid hairs, yellow or green-yellow, (9-30)x(0.50-0.65) mm. Seeds numerous, broadly obvovoid-very broadly obvovoid or narrowly oblong-cylindraceous, yellow-brown, (0.35-0.80)x(0.2-0.3) mm. (Plates 1-3).

Type: [Turkey A5 Amasya] Amasia, 400-600 m, Bornmuller 404 (K!). Galatia. A5 Amasya: Amasya, Mt. Kirklar, 500 m, Bornm. 2686.
Studied specimens
MRO: ESUH/Safin mountain (north-east of Erbil), 800 m, 25.4.2017, A. Sardar & S. Al-Dabagh, 7593.

Environment & Presence: Present as individuals on the rocky-clay soils; altitude: 800 m; flowering: April. (Figure 1).

3.2. Palynological Study
Pollens yellow, single, tri-colporate, prolate or spheroidal in equatorial view, spheroidal in polar view, small according to Erdtman (1971), equatorial axis (13.75-17.50) μm, polar axis (18.75-25.00) μm, reticulate surface ornamentation, few in number. (Plate 4).

3.3. Anatomical Study
The stem has been studied by a cross section of the middle of a flowering stem. The epidermis was of a single continuous layer of elongate or semi-circular cells having different sizes; each cell with two projections interact with the two adjacent cells. The thickness of the epidermis depending on the differences in the cell sizes. The external and internal walls of the epidermal cells were convex (the internal walls thickened), the radial walls were sinuous. The epidermis layer (4-13) μm, the cuticle layer is thin, (1.5-2.5) μm.

The cortex consists of parenchymal tissue (the first part collenchymal), have little intercellular spaces, the cells oblong or irregular of different sizes. The number of the cortical layers is (2-3) layers, (6-21) μm. The vascular tissue is lignified and parenchymatous, the phloem outwardly and the xylem inwardly, vessels small, sclerenchymal cells present among the vascular bundles, (70-90) μm. The pith consists of parenchymal cells, circular, semi-circular or oblong, with many intercellular spaces, (5.5-6.0) μm. The pericycle with the endodermis were unclear. (Plate 5).

The research treated with a new record of the genus Erysimum which was E. amasianum from Brassicaceae in Iraq, the study contained some aspects like the morphological characters with the environment. By reviewing the literature about the genus Erysimum in Iraq, including the 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 researcher did not find any plant belongs to E. amasianum, for this reason it regarded as a new record for the Flora of Iraq.
Fig (1): Iraq’s map showing the regions and districts depending on [Guest (1966) and FAO. (2002)]

Plate (1): Photograph of *E. amasianum*
Plate (2): *E. amasianum*: A- Leaves; B- Basal leaves; C- Inflorescence D- Pedicel with sepal bases
Plate (3): *E. amasianum*: A- Flower; B- Sepals; C- Nectar glands; D- Petals; E- Stamens & Pistil; F- Fruit stalk; G- Fruit (siliqua); H- Seeds
Plate (4): Pollen grains of *E. amasianum*: A- Equatorial view; B- Polar view; A, B=100X

Plate (5): A- C.S. of Stem of *E. amasianum*; B- Magnification view of A; A=10X, B=40X
4. CONCLUSIONS

The current study confirmed the presence of the plant *E. amasianum* from Brassicaceae family as a new record for the Flora of Iraq which collected from Safin mountain (north-east of Erbil), as well as, morphological, palynological and anatomical studies have been conducted for the plant under study.

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