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Research Article

Geranium robertianum L. (Geraniaceae): A new record for the flora of Iraq.

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Abstract: Plant specimens were collected during a fieldtrips near Derbandikhan city (Sulaimani province) in Spring 2016, is added to the other 10 species of this genus previously reported from Iraq. Gross morphology of all plant parts was investigated comparatively, description and detailed figures are given. The geographical distribution is mapped. Previous checklists and studies were checked, to confirm and prove that this species is a new record for the flora of Iraq. A comprehensive study of literatures, herbaria and preceding checklists has been conducted.

Keywords: Plant Taxonomy**,** Geraniaceae, *Geranium*, New record, Iraq (Kurdistan Region).

Introduction

Geraniaceae is a cosmopolitan family in their distribution in temperate or warm temperate and subtropical of the northern and southern hemisphere (Lawrence, 1951). *Geranium* L. (Cranes Bill) genus belongs to the tribe Geranieae of the family Geraniaceae (Boissier, 1867) and comprises about 350 species distributed in temperate and tropical alpine regions in the world (Lawrence, 1951 and Aedo *et al.,* 2005). Knuth (1912) published his monograph on *Geranium*, recognized 260 species, and over 423 are currently accepted, Reich (1890) proposes the first classification for the entire genus, which he divided into 10 sections. Knuth (1903) recognized 12 sections and later, in his monograph (Knuth, 1912) distinguished 30 of them. Subsequently, Knuth (1931) added 2 more. Knuth from 1912-1933 scheme 328 sections for the genus have been questioned by numerous authors (Warberg 1938a, 1938b, Tokarski 1972); *Geranium* is divided into the subgenera *Geranium*, *Erodioidea* and *Robertium* (Aedo *et al.,* 1998); Considering only type of fruit discharge, Yeo (1984, 1990) divided subg. *Geranium* into 3 sections, section *Geranium* is a widespread group, absent only in tropical lowlands.

According to the floras and previous taxonomic studies this genus is represented by 10 species in Iraq (Salih, 2009), 38 species in Turkey (Davis *et al*., 1982) and 47 species in Iran (Rechinger, 1964). 14 spp. in Syria, Palestine and Sinai (Post, 1932) and 7 spp. in Egypt (Tackholm, 1974). Locally In Iraq there are previous works and checklists each indicated to the numbers and distribution of the *Geranium* species as Handel Mazzetti (1910) 1 species, Nabelek (1923) 2 spp, Guest (1933) m 4 spp., Zohary (1946) 6 spp, Blacklock (1948) 7 spp., Al-Rawi (1964) check listed 9 spp., Rechinger in flora of lowland Iraq (1964) noted to 4 spp., Rechinger in flora Iranica (1972) listed 10 species distributed in Iraq, Chacravarty (1976) 9 spp., Khalaf (1980) recorded 7 spp. distributed on Sinjar mountains, Faris (1983) recorded 5 spp. distributed on Peramagroon mountains and recently Salih (2009) determined 10 spp. in Iraq.

Materials and Methods

Specimens of *Geranium robertianum* were collected during the spring of 2016 in Derbandikhan city (Sulaimani province-Northeast Iraq) MSU district close to Derbandikhan Lake (Altitude: 495m, 35°6'39"N 45°40'59"E). Materials which depended as data for this study are herbarial specimens of Iraqi major herbaria {Baghdad, National herbarium of Iraq (BAG), Baghdad-university herbarium, college of Science (BUH), Arbil-University of Salahaddin, College of Science (AUH) and Baghdad- College of Agriculture (BAH)}, field trips, studies and checklists aforementioned and some Floras such as: Flora of Lowland of

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Iraq Rechinger (1964); Flora Iranica Rechinger (1964); Flora of Turkey Davis *et al.,* (1982). Geographical distribution was made by aid of prepared maps (fig. 1), the species was photographed in their natural habitats (fig. 2, 3). Microcharacters were measured with aid of a compound microscope (Siezz) and dissecting microscope (Olympus). Pollen grains were prepared for light microscopy (LM) by using the standard method described by Erdtman (1969), pollens were investigated by Seizz microscope, under E40x, E100x with 10x eyepiece and photographed (fig. 4) by digital camera (SONY, 3x, 13.6 Megapixels).

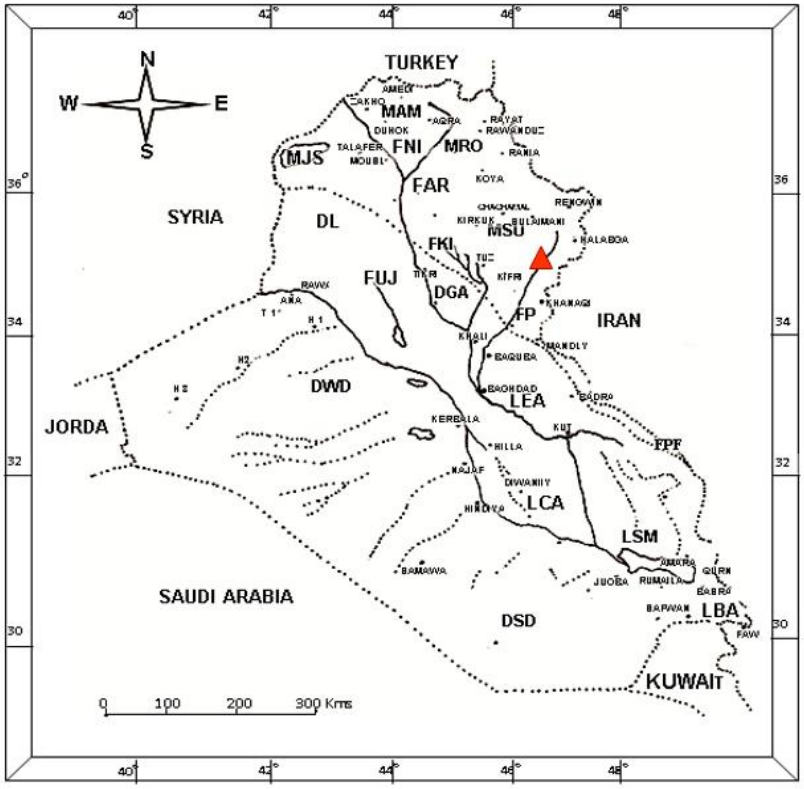


Figure 1. Distribution map of the *Geranium robertianum* (▲) with physiographic regions and districts of Iraq.

Physiographic regions and districts of Iraq.

	F – UPPER PLAINS AND FOOTHILLS REGION
M – MOUNTAIN REGION	FUJ- Upper Jaziera District
MAM – Amadiya District	FNI- Nieneveh District
MRO – Rowanduz District	FAR- Arbil District
MSU – Sulaimani District	FKI- Kirkuk District
MJS – Jabal Singar District	FPF- Persian District
D – LOWER PLATEAU REGION	L – LOWER MESOPOTAMIAN REGIO
DLJ – Lower Jaziera District	LEA- Eastern Alluvial Plain District
DGA- Ghurfa – Adhaim District	LCA- Central Alluvial Plain District
DWD – Western Desert District	LSM- Southern Marsh District
DSD- Southern Desert District	LBA- Basra Estuarine District

Results and Discussion

***Geranium robertianum* L.**, Sp. Pl. 681 (1753). Edgew. & Hook. F. in Hook. F., Fl. Brit. Ind. 1:432.1884; Knuth, l.c. 64; Collett, l.c.; Blatter, l.c.; Boiss., Fl. Or. 1:883.1867; Schischkin, l.c. 35; Schonbeck-Temesy in Rech. F., Fl. Iran. 69:37.1970; Ghafoor, l.c. 44.

Synonym:. *Geranium eriophorum* H. Lév.

Distribution: N. America, Canary Islands, C. & S. Europe, Turkey, Iran, Caucasus, Siberia, Himalayas. Japan, Kazakhstan, Korea, Kyrgyzstan, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; Africa, W Asia, Europe.

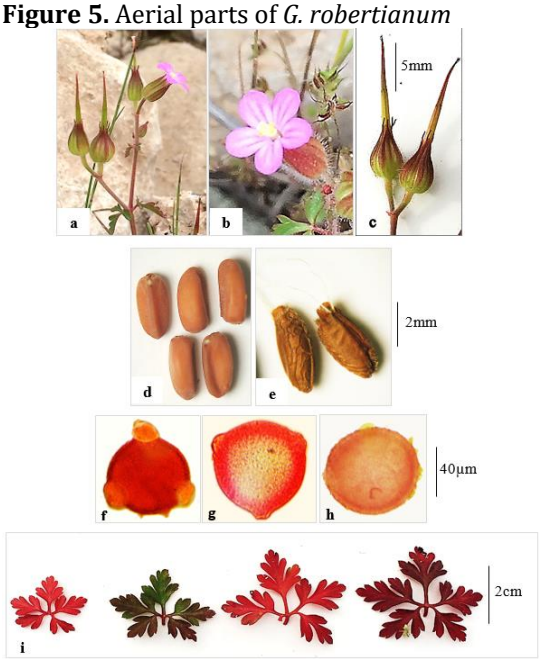
Type: Described from N. Europe, Herb. Cliff. (BM); H.G. LINN. 858/70.

Phenology and Ecology: Flowering in April, rocky soils.
Altitude: 480-500m.

Figure 3. *G. robertianum* in their natural habitat

Figure 4. Herbarial specimens of *G. robertianum*

Figure 5. Aerial parts of *G. robertianum*



a, inflorescence; b, flower; c, fruits; d, seeds; e, mericarp; f, g, pollens (polar view); h, pollens (equatorial view); i, leaves

Annual herbs, tap root, 10-45cm.; stem branched (usually at base), often reddish to purple; leaves opposite, stipulate, petiolate, pedately trisect to the base, 2-5 x 2-7cm; segments 3+2 subsegments, 2-5x1-4cm, long eglandular hairs, deeply pinnatifid into obtusely obulated divisions; petiole of basal leaves 1-6.5cm long, of cauline leaves 2-18 cm, long pilose; stipules 2.5x1.3-3mm, long pilose; peduncles 2-flowered, glandular 2-9cm, short pilose and long glandular hairs; pedicles 2-116 mm, pilose with long glandular hairs; bracts 1-2 x 0.4-1mm, long and short pilose hairs. Flowers terminal, hypogynous, actinomorphic, pentamerose; sepals 5, 3-7 x 1.5-4mm, glandular hairs, awn 1-4mm; petals 5.5-13 x 2-5mm, apex obtuse, 3-nerved, limb obovate, tapering towards the base purplish pink; stamens 10, usually in 2 whorls, outer whorl opposite to petals (obdiplostemonous), inner whorl opposite with sepals, all facing to toward the gynoecium (introrse) help to self-pollination; anther 10, outline oblong, oblate and hemispherical, longitudinally dehiscence, 0.5-0.8mm; filaments linear with expanded base part and an abruptly narrowed above, glabrous, 5-0.5mm, versatile, nectaries 5, hemispheric, glabrous; pistils 1, compound, 5 syncarpous; ovary superior, 5 lobed, locules5, 1.2-1.5mm; styles 5, 2.5-4.6mm, pilose, united, adhering to the ovarian beak and the basal portion recurving elastically; stigma 5, 0.6-1.4mm, ligulate or arm shaped; fruit's beak 10-15mm long; mericarp 1-3x1-1.8mm, 2-3 prominent transversely ridged above the fewer reticulate ridge below, glabrous, brownish yellow; seeds smooth, 1.2-2.4x1-1.7mm, elliptic-oblong, brown or brownish yellow, umbo slightly projecting, black. Pollens orange to brownish yellow, 35-92µm, polar axis 55-80µm diameter (triangle), equatorial axis 48-65µm diameter (circular to ovate), pollen surface area (P. a. length x E. a. length) 72x65= 4680µm.

In accordance to the results and reviewing preceding studies, checklists and checking the herbarial specimens of the major Iraqi herbaria (aforementioned) showed that this species is a new record for the flora of Iraq, the most recent taxonomic study of the genus *Geranium* in Iraq Salih (2009) does not refer to its presence in Iraq as well as there are more than 10 published checklists of Iraqi plants with flora of Iraq from 1910 to 1980, all of these did not reported the existence of this species. During the verification of the lists and herbarial specimens (Iraqi herbaria), the researcher confirmed that this species not previously recorded in Iraq and it haven't specimens in Iraqi and non-Iraqi herbaria therefore is regarded a new for Iraq.

The species was found on the banks of Derbandikan Lake (495m altitude) in a humid environment among the rocks and directly exposed to sunlight with associated herbaceous plants as plants of family Poaceae and Asteraceae were spread high density in a limited geographical area. The results showed a similarity between the studied species and *G. purperium* with clear differences (table 1), the leaves of *G. purperium* are larger and more division than in *G. robertianum,* in general the flower are larger in *G. robertianum* and the petals are twice in length also the differences in the type and density of trichoms that covering the aerial plant parts, cytologicaly there are difference in chromosome number separates *G. robertianum* (2n=64) from *G. purperium* (2n=32) Davis *et al.,* (1982).

Table 1. Differences between *G. robertianum* and *G. purperium*

Plant parts	*G. robertianum*	*G. purperium*
Leaves size	2-5 x 2-7cm	3-7 x 5-10cm
Petals size	5.5-13 x 2-5mm	4-9 x 3-4mm
Cytology	2n=64	2n=32

Conclusion

The results of this study showed new record of the flora of Iraq, this new record species is very similar morphologically to the species *Geranium purpurium*, which leads to confusion between these two species so it requires accurate genetic studies to separate them.

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