

A New Record of *Paracaryum shepardii* Post & Beauv. (Boraginaceae) in
Iraq

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Abstract

Paracaryum shepardii Post & Beauv. is a new record to Boraginaceae in Iraq, found in Hasarost mountain (north-east of Erbil) within Rowanduz district (MRO). The collected plant specimens differ from the three-other species that already present in Iraq, where *P. shepardii* differs from *P. rugulosum* (DC.) Boiss., *P. sintenisii* Hausskn. ex Bornm. and *P. strictum* (C. Koch.) Boiss in that the wings of the nutlets are flat and not covering the disc, while in the other three species the wings are strongly incurved and partly covering the discs, as well as some other characters. Identification and morphological study was done, these clarified by photographs. In addition, some characters of the pollen grains such as shapes, colors, sizes, sculptures and numbers, together with stomatal complex characters of the leaf have been studied.

Key words: New record, *Paracaryum shepardii*, Boraginaceae, Rowanduz district, Iraq.

تسجيل جديد للنوع *Paracaryum shepardii* Post & Beauv. من العائلة لسان الثور

(Boraginaceae) في العراق

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الخلاصة

Paracaryum shepardii Post & Beauv هو تسجيل جديد الى العائلة Boraginaceae في العراق، توجد عيناته في جبل حصاروست (شمال شرق اربيل) ضمن مقاطعة رواندوز (MRO). العينات التي جمعت تختلف عن الانواع الثلاثة الموجودة في العراق، حيث يختلف النوع *P. shepardii* عن الانواع *P. sintenisii* و *P. rugulosum* (DC.) Boiss. و *P. strictum* (C. Koch.) Boiss Nab. و Hauskn. ex Bornm. في كون اجنحة البنيديقات مسطحة ولا تغطي القرص، بينما في الانواع الاخرى تكون الاجنحة منحنية بقوة وجزئيا تغطي الاقراص. تمت عملية التشخيص والدراسة المظهرية للنوع ووضحت بالصور. اضافة الى ذلك، تمت دراسة بعض صفات حبوب اللقاح مثل اشكالها والوانها واحجامها وتضاريس اسطحها واعدادها وكذلك صفات المعقد الثغري للاوراق.

الكلمات المفتاحية: تسجيل جديد، *Paracaryum shepardii* ، Boraginaceae ، مقاطعة رواندوز ، العراق

Introduction

As a family, Boraginaceae contains 2435 species throughout the world that belong to 117 genera [1]. In Iraq, there are 92 species distributed on 26 genera [2]. In Turkey, there are 27 species of the genus including *P. shepardii* [3]. One study did not mention the genus *Paracaryum* in Europe [4]. In Iran, 15 species of the genus are present [5], while in other study [6] 17 species were recorded. In U.S.S.R., 9 species were recorded [7]. In Saudi Arabia, one species which is *P. intermedium* (Forssk.) Lipsky was recorded [8], while no species of the genus were recorded in Syria, Palestine and Sinai [9]. In Iraq, two previous studies [10, 11] did not record any species of the genus, but in three other studied [12-14] only one species was recorded in each study which were *P. sintenisii*, *P. strictum* and *P. rugulosum*, respectively. Two studies [2 and 15] recorded 2 species in Iraq which were *P. sintenisii* and *P. strictum*. Khalaf [16] mentioned one species of the genus in Sinjar mountain which is *P. sintenisii*. Other

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previous studies [17-22] did not record any species of *Paracaryum* in PiraMagrun, Haibat Sultan, Hawraman, Gomaspan, Hujran and Choman, respectively. The authors of some studies [23-28] conducted similar works to the present study that involves new plant records in Iraq. The present study aimed to confirm the presence of *P. shepardii* in Iraq and to study the morphological characters of the species, as a new record for the Iraqi Flora. In addition, some pollen grains and stomatal complex characters were investigated.

Materials and Methods

Several field trips were made to the different regions of northern districts of Iraq: Amadiya district (MAM), Rowanduz district (MRO), Sulaimaniya district (MSU), Kirkuk district (FKI) and Arbil district (FAR) during spring and summer seasons of the year 2016 for plant specimens collection. The identification of the specimens have been done by using some keys especially in Flora of Turkey, then the specimens were treated herbarially to become formal specimens, and placed in the Herbarium of Education College - University of Salahaddin, Erbil (ESUH). Fixation of some ecological notes were cleared and the map (Figure 1) was placed. For the pollen grains, anthers fixed in FAA, then a single anther removed and placed in a drop of water or 50% glycerol (to prevent the material from drying out), and dissected with a scalpel to extrude the pollen grains; the anther wall material removed and a cover slip applied. Then, the pollens stained with safranin [29]. A Sony camera has been used for photographing the different plant parts and the scientific terms that used in the study have been taken from previous studies [30-32]. For the study of stomatal complex, the procedure used previously [33] has been followed and the information mentioned in some other studies [34-37] have been utilized.

Results

P. shepardii Post & Beauv. in Dinsmore, PI. Postianae et Dinsmorianae 1:8 (1932); Fl. Turkey, Mill, 6: 294 (1978).

P. shepardii is perennial herb, densely woolly-tomentose, arachnoid on younger branches and leaves, height (35-45) cm. Stems erect, green or green-yellow, (21-24)x(2.0-2.5) cm. Leaves simple, alternate-spiral; basal leaves elliptic or narrowly elliptic, margin entire, apex obtuse with small mucro, base truncate, green-yellow, (22-32)x(3.5-5.0) mm, petiole (20-28)x(1.0-1.3)

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mm; lower cauline leaves narrowly elliptic or linear, margin entire, apex obtuse or acute, base attenuate, subamplexicaul, green, (50-58)x(5.0-6.5) mm; upper cauline leaves cultrate or narrowly lanceolate, margin entire, apex acute, base truncate, green, (10-35)x(2-4) mm. Inflorescence helicoid cyme, ebracteate, peduncle teret, green, (20-40) mm. Flowers actinomorphic, (2.5-5.5)x(3.0-4.0) mm, pedicel teret, green, (2.3-5.0)x(0.3-0.5) mm. Calyx gamosepalous, 5-lobed \pm to base, narrowly lanceolate-cultrate or lanceolate, margin entire, apex acuminate, base obtuse, green, (2.4-5.0)x(0.5-1.0) mm. Corolla violet, glabrous, with tube and limb, tube (1.3-3.0)x(1.0-1.5) mm; limb 5-lobed, (1-2)x(2.3-2.7) mm, lobes semi-circular, margin undulate, apex obtuse, lobes width (0.7-1.2) mm; throat of 5, violet, trapeziform, antipetalous scales (appendages), (0.30-0.35)x(0.50-0.55) mm (broader than long, where base of anther situated below scale base), apex emarginate, papillose. Stamens 5, epipetalous, altering with corolla lobes, inserted on the upper half of corolla tube; filaments filiform, yellow, (0.3-0.6)x(0.10-0.15) mm, anthers oblong, dorsifixed attachment with the filaments, dark yellow, (1.0-1.5)x(0.5-0.8) mm. Pistil one, ovary superior, 4-locular, pyramidal, yellow, (0.25-0.35)x(0.60-0.80) mm; style gynobasic, included, filiform, yellow, (0.35-0.60)x(0.10-0.12) mm; stigma entire, capitate or globoid, yellow, (0.10-0.14)x(0.10-0.13) mm. Fruit 4 nutlets, borne on a pyramidal gynobase, with erect incurved beak, differentiated into disc and margin; margin prolonged into a spreading wing, (6.5-11.0)x(7.0-10.0) mm, yellow; fruit stalk (4-8)x(0.4-0.6) mm; nutlets sub-orbicular-orbicular, glochidiate-echinulate; disc rhombic, glochidiate-echinulate, (3.5-4.5)x(2.5-3.2) mm; wing flat, denticulate with numerous glochids, width (1.5-3.0) mm; beak (3.5-6.0)x(0.40-0.55) mm from lower part, x(0.15-0.20) mm from upper part. Seed single, apical pendulous, broadly ovoid or rotund-broadly ovoid, yellow-brown, (2.7-4.2)x(2.0-2.6) mm. (Plates 1-2). Pollens yellow, single, 5-colporate, prolate in equatorial view, spheroid in polar view, very small, equatorial axis (4-5) μ m, polar axis (6-7) μ m, numerous. (Plate 3). Stomatal complex anomocytic, in both surfaces, more in adaxial, stoma elliptic, (7-9) μ m; guard cell kidney like, (15-17)x(3.0-4.5) μ m. (Plate 4).

Type: [Turkey C6 Hatay] Amanus, viii 1903, *Shepard* 212 (holo. G, iso. BE1). S. Anatolia (Amanus). C6 Hatay: d. Iskenderun, Akkaya, 1600 m, Akman 281!

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Studied specimens

MRO: ESUH/ Hasarost mountain (north-east of Erbil), 1700 m, 10.8.2016, A. Sardar and R. Khdir, 7481.

Environment and Presence

Present as individuals within the area, on the rocky soils; altitude: 1700 m; flowering: July-August. Found in Hasarost mountain within Rowanduz district (MRO). (figure 1).



Plate 1: Photograph of *P. shepardii*

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Figure 1: A map of Iraq shows the regions and districts according to [38 and 39] • *P. shepardii*

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Basal leaves



Lower cauline leaves



Upper cauline leaf



Inflorescence



Flower



Opened corolla showing scales & stamens

0.9 mm

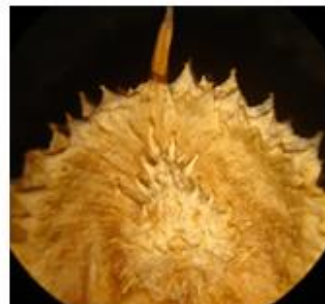


Pistil

0.2 mm



Fruit



Fruit showing nutlet appendages

3 mm



Seed

0.9 mm

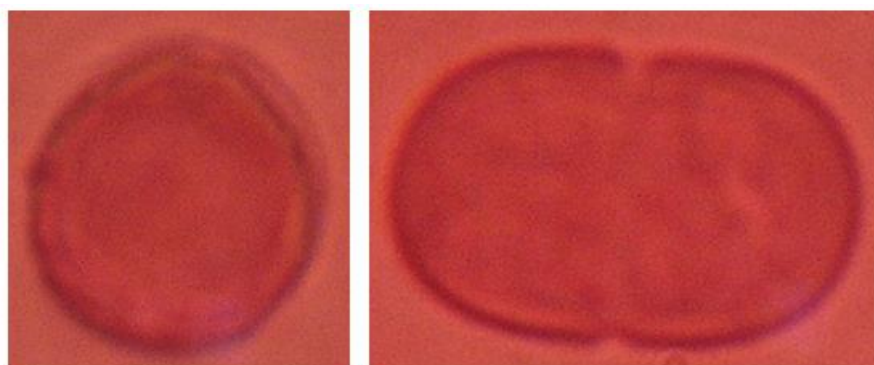
2 mm

Plate 2: Plant parts of *P. shepardii*



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Polar view

Equatorial view

Plate 3: Pollen grain of *P. shepardii* x100

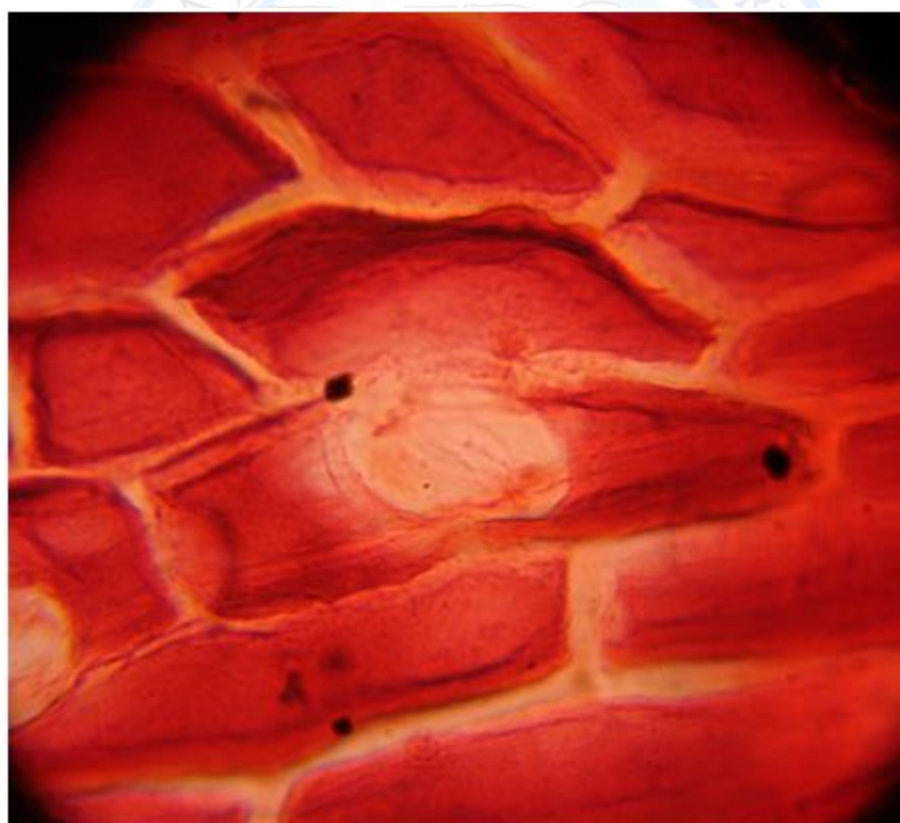


Plate 4: Stomatal complex of *P. shepardii* x100

Discussion

The present study dealt with the plant *Paracaryum shepardii* as a new record for Boraginaceae in Iraq. The work involved limited aspects such as the morphological characters and the environment with the presence of the species. According to literature review about the genus *Paracaryum*, especially the information in previously published studies [2, 15] and involving the specimens of National Herbarium of Iraq (BAG), Herbarium of the College of Science, University of Salahaddin-Erbil, Iraq (ARB) and Herbarium of the College of Education, University of Salahaddin-Erbil, Iraq (ESUH), the researcher did not find any specimens belongs to *P. shepardii*, therefore it will be regarded as a new record for the Flora of Iraq from Hasarost mountain. *P. shepardii* has some characters that differ from the related three species *P. rugulosum*, *P. sintenisii* and *P. strictum*, that present in Iraq, in that *P. shepardii* has densely woolly-tomentose hairs that arachnoid on younger branches and leaves; basal leaves elliptic or narrowly elliptic; pedicels equaling calyx; nutlets disc rhombic, glochidiate-echinulate, wings flat and not covering the disc, denticulate with numerous glochids. Pollen grains were yellow, single, 5-colporate, prolate in equatorial view, spheroid in polar view, very small and numerous [40]. Stomatal complex was anomocytic (no subsidiary cells are present, several ordinary epidermal cells enclosing the guard cells), found in both surfaces and more in adaxial. The stomatal complex study utilized information from previous published studies [34, 35].

Conclusions

The present study confirmed the presence of the plant *P. shepardii* as a new record in Iraq, therefore, it will be addition to the Iraqi plants. According to the literature review used in the study, species number of the genus *Paracaryum* become four species which are *P. shepardii*, *P. sintenisii* and *P. strictum* that found in the mountainous regions of Iraq, As well as the species *P. rugulosum* that present in the southern desert of Iraq.

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