

Diphelypaea boissieri (Reuter) Nicolson with a new Host and Distribution

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Abstract: *Diphelypaea boissieri* (Reuter) Nicolson a new recorded species for Iraq is described here for the first time. The species is collected from Mountain of Peramagron at alt. about 1931m in Sulaimanya District (MSU). It is parasitize on *Cousinia haussknechti* (Compositae) which is a new host for this species. History of the species in Iraq, characterization, diagnostic features pollen and seed morphology, habitat, distribution and illustrations based on Iraqi materials were provided.

Keywords: Orobanchaceae, Diphelypaea, Phelypaea, Orobanche, Parasitic plant, Iraq

1. Introduction

Nabelek 1935 mentioned Phelypaeacoccinea to occur in Amadya district north Iraq. He collected the species from Mar Jakub above Simel N. Mosul, Al-Rawi 1964 in his checklist, listed *Orobanche coccinea* without mentioning where he collected the species but he referred to Zohary 1946, the flora of Iraq and its phytogeographical subdivision. Chacravarty 1976 mentioned the species *O. coccinea* among ten species of Orobanche listed to occur in Iraq based on the checklist of Al-Rawi 1964. Schiman-Czeika in Rechinger 1964 mentioned *Anopolon coccineum* as a new combination based on *Orobanche coccinea* M.B., saying that the type In Hebrides Caucasi, M.B. is in LE and seen by him, He also said that the species is occur in Iraq in Kurdistan M. Pir Omar Gudrun 1700-2000m Husskn.

Novopokrovskij & Tzvelev 1958 and Gilli in Davis 1982 mentioned the genus Phelypaea (included Anopolon) with 2 species *Phelypaeacoccinea* and *P. tournefortii*. The later author treated *Diphelypaea coccinea* (Bieb.) Nicolson 1975 and *Diphelypaea boissieri* (Reuter) Nicolson 1975 as synonyms to *Phelypaeacoccinea* (Bieb) Poiret. Nicolson 1975 proposed a new name Diphelypaea for Phelypaea L. 1758 non Phelypaea Browone 1756. He also proposed three new combinations *Diphelypaea boissieri* (Reut.) Nicolson based on *Anoplanganthus biebersteinii* var. Boissieri Reuter., *Diphelypaea coccinea* (Bieb.) Nicolson based on *Orobanche coccinea* Bieb. and *Diphelypaea tournefortii* (Desf.) Nicolson based on *Phelypaea tournefortii* Desf. According to Nicolson 1975 it is clear that the generic name Anopolon Reichenbach 1828 is superfluous and illegitimate under article 63 since it included the type, *Orobanche uniflora* L. of the earlier generic name Aphyllon Mitch. 1769 which ought to have been adopted. Gilli in Davis 1982 treated *Diphelypaea boissieri* (Reut.) Nicolson as a synonym to *Phelypaeacoccinea* (Bieb.) Poiret.

Salih 2002 in his MSc thesis on the Orobanchaceae in Kurdistan Region of Iraq mentioned the presence of *Phelypaeacoccinea* in MSU, Sulaimanya District, on Pira-Magron Mountain. Cullen 2010 described *Phelypaeaboissieri* and provided a good illustration with a key to separate *P. boissieri* from the other 2 species *P. coccinea* and *P. tournefortii*. Matus *et al.* 2016 published a

database and digested herbarium collection of F. Nabelek Iter Turcico-Persicum 1909-1910.

2. Material and Methods

Materials were collected from the Kurdistan Mountains Region on Pira-Magron Mountain in Sulaimanya District for several times in spring during the years 2014-2017 while we collecting materials for a PhD study on the taxonomy of Orobanchaceae in Iraq. Herbarium specimens were mounted and deposited in the Herbarium of the university of Basrah (BSRA). Observations, taxonomical diagnosis, host attachment for the species were recorded in the field and photographed. For nomenclature we followed Nicolson 1975.

Species identification were based on the keys in Cullen 2010 and other regional floras and papers such as Beck 1930, Novopokrovskij and Tzvelev 1958, Rechinger 1964, Nicolson 1975, Gilli in Davis 1982 and Tzvelev 1915. All Iraq herbaria (BAG, BUH, SUI) were visited and their specimens of Orobanchaceae were examined, compared and reidentified.

3. Results and Discussion

Diphelypaea boissieri (Reuter) Nicolson, Taxon 24:654, 1975. *Anoplanganthus Brebesteinii* var. *boissieri* Reuter in Candolle (1847, 11:42). *Orobanche coccinea* (M.B.) Poir. in Al-Rawi in Dep. Agr. Iraq. Tech. Bull. 12: 148 (1964). *Anopolon coccineum* (M.B.) Riedl et Schiman-Czeika, in fl. Iranica 5:2 (1964). *Phelypaeacoccinea* (Bieb.) Poiret, in Salih 2002, A systematic study on the family Orobanchaceae in Duhok, Arbil and Sulaimani Governorates. Kurdistan Region-Iraq (unpublished).

4. Description

Perennial root parasitic herb to 50cm tall, Stem erect, simple, hollow, cylindrical, 7-10mm thick, reddish brown, minutely pubescent with glandular hairs, often with 1-2, rarely more scales-leaves. Inflorescence terminal, solitary, spectacular. Calyx gamosepalous more or less zygomorphic, 20-32mm long, five equal lobes, weakly 2-lipped, with similar indumentum to that on the stem and scale-leaves.

Corolla distinctly zygomorphic, 4-6cm long, often wider than long, with five lobes, lobes often orbicular or broadly obovate, widely spreading and distinctly overlapping, lobes bright scarlet with two dense black patches; corolla tube cup-shaped, bright red inside, pale orange-yellow outside. Stamens 4, epipetalous on the corolla tubes inserted 4-7mm above corolla tube, filaments 12-17mm long, broad, slightly pubescent near the apex; Anther ovate, 4-5mm long, white-yellowish, with patches of long white hairs, conspicuously mucronate. Style single, 11-17.5mm long, stout, red, arched-erect, glabrous. Stigma, bright scarlet, thick disk, perpendicular on top of the style. Capsule 10-15mm long, 5-7mm wide, ovateoblong, brown. Parasitize on the root of *Cousinia haussknechti* (Compositae). (Figure 1).

5. Pollen and Seed Morphology by SEM Examination

Pollen grains medium, spheroidal, 25.5-27.5 μ m, inaperturate, verrucate, intine thinner than exine. Seed ovoid, or pear-shaped, 0.45-0.7 x 0.24-0.39mm perforate, dark brown-black, cell shape often pentagonal or sometimes rounded.

Taxonomically the pollen morphology of *Diphelypaea boissieri* is similar to that in the *D. coccinea* and *D. tournefortii* and to species of Orobanche, therefore there is no significant importance for the palynological characters in the taxonomy of *Diphelypaea*, this is in agreement with Zare *et al.*, 2013. The same to the seed surface configuration of *D. boissieri*, our SEM results showed no significant importance for seed ornamentation to distinguish the species from its closely related species *D. coccinea* and *D. tournefortii*. However it may have some significant importance on generic level as mentioned by Zera and Ali 2016. (Figure 2).

In the National Herbarium of Iraq BAG we found no materials for what so called *Orobanche coccinea* as mentioned by Al-Rawi 1964 in his wild plants of Iraq with their distribution. It seems that Al-Rawi himself did not collect or deposited any specimens for the mentioned species in Iraq, but he referred to Z:Z (Nab), which means that he cited what mentioned by Zohary 1964 based on Nabelek 1935. We examined 2 specimens collected from Pira-Magrun mountain (MSU) with the numbers 41195 and 41196 deposited in BUH and found that the 2 specimens were in fact *Diphelypaea boissieri* and not *D. coccinea*. Salih 2002 in his MSc thesis on the Orobanchaceae in Kurdistan misidentified the same specimens (41195) together with other collections from the same place (Pira-Magrun) and date as *Phelypaeacoccinea*.

During our trips in 2014-2017 to the mountain of Pir Omar Gudrun, Pira-Magrun in Sulaimanya in Kurdistan Iraq which

also mentioned by Schiman-Czeika 1964 as a place of distribution in Iraq for *Anopolon coccineum* (M.B.) Riedl et Schiman-Czeika We found that the only Orobanchaceae species grown there was *Diphelypaea boissieri* and not *A. coccineum*. Our surveys to the districts MAM, MRO, MSU and other mountains regions in Kurdistan revealed that only *D. boissieri* occurs in Iraq. Nabelek collection from Simel above Mosul as *Phelypaeacoccinea* (1909-1910) I, more similar to *D. boissieri* than to *D. coccinea*, though its diagnostics are not so clear on the herbarium sheet.

Based on the morphological diagnostic characters of the specimens we collected from the mountain of Pira-Magrun = Pir Omar Gudrun in Sulaimanya it is clear that the floral characteristics are similar to that mentioned for *P. boissieri* by Cullen 2010, though he put it under *Phelypaea*, but it is easily separable from *P. coccinea* on the basis of having corolla of 5 broad lobes which distinctly overlap each other, corolla wider than long and the hairy anthers *P. tournefortii* differs from our species *D. boissieri* by having pubescent calyx and basal stem bracts. We agree with Nicolson 1975 and accept his new generic name *Diphelypaea* since *Phelypaea* is an orthographic variant of *Phelypaea* Browne as a different genus belong to Scrophlariceae, therefore his new generic name *Diphelypaea* was justified, and *Phelypaea boissieri* (Reuter) Staf. 1915 is synonym.

6. Habitat and Distribution

Diphelypaea boissieri were collected from the mountain of Pira-Magrun at alt. 5793 ft., about 1931m and lat. N35°45.713' E0.45°14.236' δ =5.47yd, from gps in MSU. It was parasitize on *Cousinia cf. haussknechti* (compositae) which is a new host for this species in the world, while *D. coccinea* parasitize on *Psephellus* or *Centaurea* in its area of distribution in Euroasia Georgia and Armenia (Piwowarczyk 2016 personal communication).

The species is very rare in Iraq and localize to a certain spot on the Pira-Magrun Mountain growing sporadically with few patches of individuals. Due to the continuous collection of the plant by the local people for its attractive flowers and some medicinal properties as they believe, the species became under threatened and needs urgent conservation. In Iran *D. boissieri* is widely spread in many places in North western Iran adjacent to the Iraq border, such as Kermanshah and Sanandaj where it is common. Its distribution expands farther to enter Turkey and may reach Macedonia and Greece. It may also occur in Atherbijan, Armenia and near to Percia and Turkey border, while *D. coccinea* distributed farther north in Armenia, Atherbaijan, Georgia and may expand to Eukrania, Crimea and Russia. While *D. tornefortii* is restricted to eastern Turkey and may reach to the border of Georgia, Armenia and N. Iraq. (Map 1).



Map 1: Distribution of Diphelypaea species.

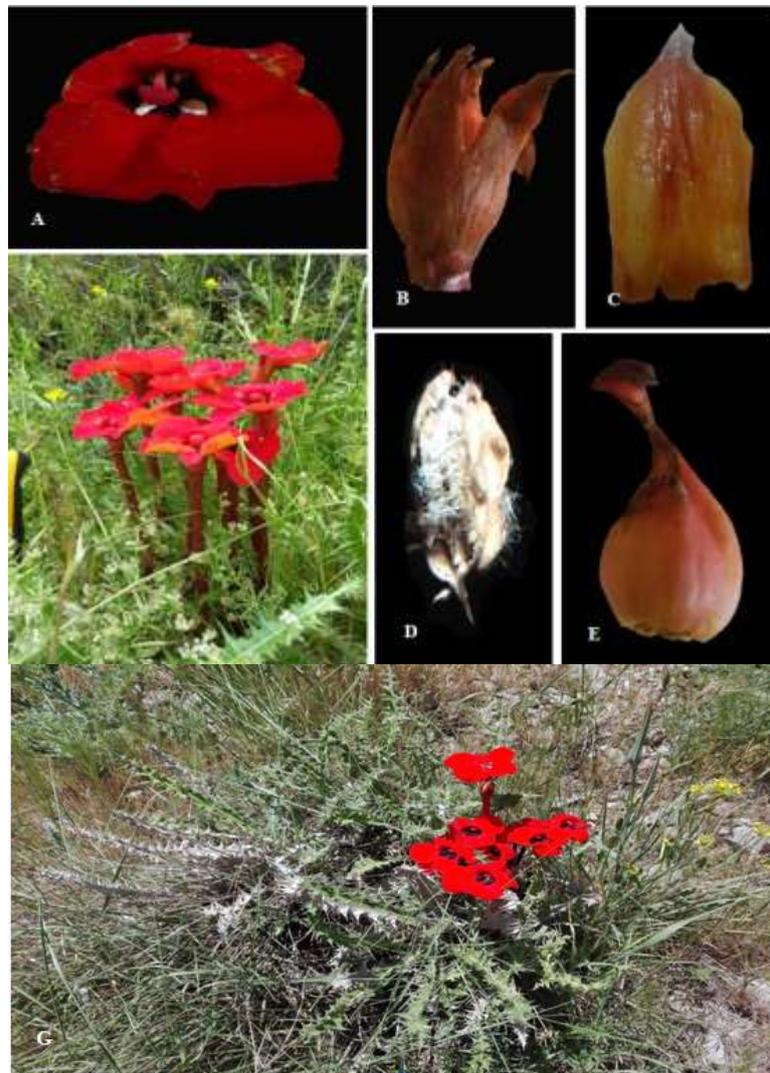


Figure 1: *Diphelypaea boissieri*: A: corolla front view, B: calyx, C: Scale, D: Anther, E: pistil
 F: Plant habit, G: Host

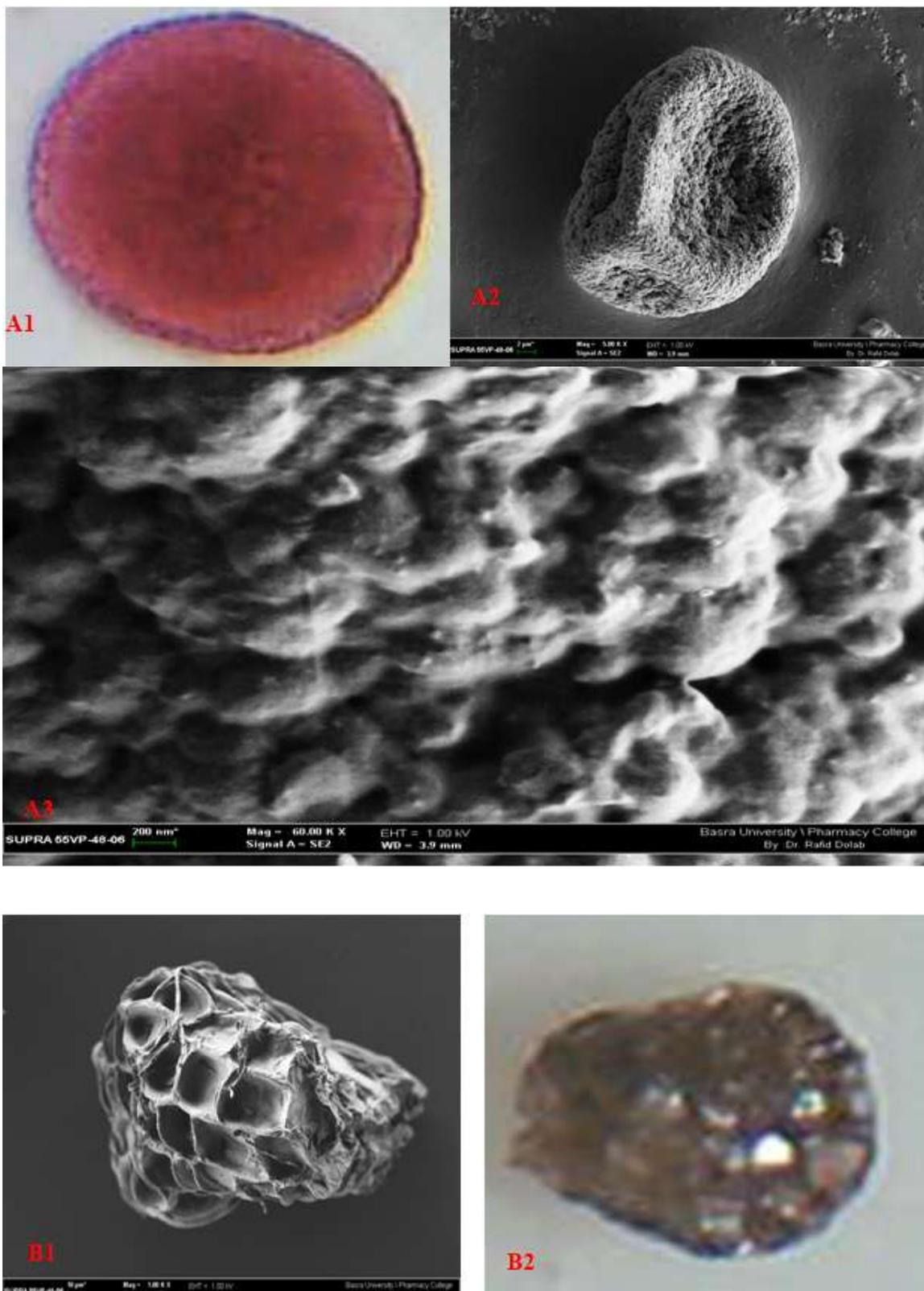


Figure 2: *Diphelypaea boissieri* (A1-3): Pollen, (B): Seed

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