



Taxonomic notes on *Onobrychis* sect. *Onobrychis* subsect. *Macropterae* (Fabaceae) from Iran

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Abstract

A key, descriptions and new findings are given for *Onobrychis* sect. *Onobrychis* subsect. *Macropterae*, which occurs in the area covered by the flora of northeastern Iran (Khorasan Province). *Onobrychis patula* and *O. mucronifolia* are described as new species and are illustrated. These are perennial herbs, becoming woody at base and have long wings, the standard as long as the keel, and pods densely covered with gray appressed hairs or rarely glabrous. The relationships between the new species and their closest relatives are discussed. *Onobrychis patula* represents a spreading hairy habit, while the plants of the other species have appressed hairs. *Onobrychis mucronifolia* has large leaflets distinctly mucronulate at the apex, which can thus easily be distinguished from the other species of the subsection. It differs from *O. verae* by its height, bract length, number of flowers and leaflet indumentum.

Introduction

The genus *Onobrychis* Miller belongs to the tribe Hedysareae (Fabaceae) and has nearly 170 species. It is mainly distributed in the north temperate regions, with the most important diversity centers in the eastern Mediterranean and West Asia, and is especially species rich in Iran. It includes annual or perennial, mostly caulescent herbs (rarely spiny shrubs) with an indumentum of simple hairs, or the species are glabrous (Lock & Simpson 1991, Yakovlev *et al.* 1996, Mabberley 1997). In the Flora Iranica, *O.* sect. *Onobrychis* is represented by 14 species, a few of them such as *O. vicifolia* are cultivated as fodder or for ornamental uses (Rechinger 1984). The taxonomy of the genus *Onobrychis* continues to be subject of much confusion, mainly because of the different approaches to species delimitation, resulting in varying numbers of recognized species (Boissier 1872, Širjaev 1925, Hedge 1970, Rechinger 1984, Ball 1978, Duman & Vural 1990, Aktoklu 2001). The flora of Iran is rich in *Onobrychis* species with 80 species of which 40 are endemic (Rechinger 1984, Ranjbar *et al.* 2004, 2006, 2007a, 2007b, 2008, 2009b, Ranjbar 2009a).

In order to solve the problems regarding the morphological heterogeneity of the section and the doubtful specimens, a detailed morphological study has been conducted on the species attributed to *O.* subsect. *Macropterae* Hand.-Mazz. and other related groups by the first author. Field study is much needed to determine the range of character variation within taxa, as we conducted in the framework of the present paper. Particular attention has been paid to indumentum, leaflet size and shape, peduncle length, corolla size and colour, proportions of standards of petals to wings and keels, pod size and shape, as well as the degree of dentation on crest and disc of pods.

In this paper two new species are described from Iran. They are compared with their closest relatives. The material of the new species was collected during recent botanical collections by the staffs of the herbarium of the Ferdowsi University in Mashhad (FUMH).

Material and methods

After examination of the literature as well as herbarium specimens and plants in the field, a preliminary list of characters that had been or might be useful in delimiting *Onobrychis* taxa was developed. The utility of these characters to distinguish species was assessed by examining about 100 herbarium specimens from across the range of the genus in northeastern Iran as well as from the plants grown in the field.

Taxonomic and distributional remarks on *Onobrychis* subsect. *Macropterae*

Members of *O.* subsect. *Macropterae* have important characters such as wings (3–5 mm) equal to calyx, pod with flattened crest and semi-ovate to semiglobular shape (4–6 × 5–9 mm), with 3–8 teeth on crest, disc often without teeth or bristle. But some species of *Onobrychis* have wings longer than calyx, often distributed only in the northeastern and northwestern Alborz mountain with a large disjunction in Iran. In Turkey, the majority of these species belong to *O.* subsect. *Macropterae*. However, the wings (5.5–12.5 mm) and keel (8–12) longer than calyx (5–7 mm) are diagnostic characters for distinguishing subsect. *Macropterae*.

Key to the species of *Onobrychis* subsect. *Macropterae* Hand.-Mazz. in northeastern Iran

- 1 Plant densely covered by spreading hairs 0.3–0.7 mm long.....*O. patula* Ranjbar, Joharchi & Karamian
- Plant loosely to densely covered by appressed hairs 0.2–0.3 mm long.....2
- 2 Pods glabrous*O. assadii* Ranjbar, Amirabadizadeh & Tolui
- Pods densely covered by appressed white hairs.....3
- 3 Leaflets with upper surface glabrous and bracts ≥ 3.2 mm long.....*O. mucronifolia* Ranjbar & Hadadi
- Leaflets with upper surface with loosely to densely appressed hairs, bracts ca. 3 mm long.....4
- 4 Plants suffrutescent; calyx 4.5–5.6 mm long; teeth subulate, as long as tube.....*O. ptychophylla* Širj. & Rech.
- Plants perennial herbs; calyx 6–7 mm long; teeth linear-subulate, two to four times as long as tube.....5
- 5 Pods with 6–7 teeth, leaflets ovate to elliptic, distinctly mucronate at the apex, standard 10.8–11 mm long.....
- *O. gontscharovii* Vass.
- Pods with 4–6 teeth, leaflets elliptic, not distinctly mucronate at the apex; standard 7.5–9 mm long *O. verae* Širj.

Onobrychis patula Ranjbar, Joharchi & Karamian, *sp. nov.* (Figs. 1 & 2)

Differt ab Onobrychide verae indumento pilis patentibus tantum consistente (nec partim pilis appressis consistente), foliis supra laxe subappresse vel patentem pilosis, subtus dense subappresse vel patentem pilosis (nec utrinque dense appresse pilosis), calyce ca. 5 (nec 6–7) mm longo, laxe appresse piloso (nec sparse appresse piloso), alis 6.6–7 (nec 7–8) mm longis, leguminibus 6–7 (nec 4–5) mm longis.

Type:—IRAN. Prov. Khorasan: Ghouchan, north Amarat, 2000 m, 15 July 1997, *Zangoosie 29706* (holotype FUMH!, isotype BASU!, photo and a fragment TARI!, W!).

Ascending-erect perennial with thick woody rootstock, up to 35 cm tall, branched at the base. Indumentum of white hairs on vegetative parts. Stipules of lower leaves connate, ovate-triangular, acute-acuminate, those of upper leaves free, papery with brownish base; 3–6 mm long and 1.8–3 mm wide, loosely covered by spreading hairs, ciliate at margins with 0.3–0.5 mm long. Upper leaves 2.5–4 cm long and lower leaves 8–11 cm long; rachis slender, straight or curved-ascending, loosely covered by spreading hairs, ciliate hairs at margins with hairs 0.3–0.7 mm long, upper petiole up to ca. 1 cm long, lower petiole up to 5 cm long. Upper leaflets in 3–5 pairs, lower leaflets in 4–7 pairs, elliptic to oblong-elliptic, rounded to cuneate at base, obtuse or slightly mucronate at the apex, 5–8 × 2.5–3.5 mm, upper surface loosely covered by subappressed or spreading hairs 0.3–0.4 mm long, lower surface densely covered by subappressed or spreading hairs 0.3–0.5 mm long. Inflorescence 3–4 cm long, oblong before anthesis, 38–40-flowered, elongating in fruit to 12–16 cm long. Bracts papery, 2.2–2.8 mm long and 0.6–0.8 mm wide, linear-lanceolate, acuminate, loosely

covered by spreading hairs, at margins with ciliate hairs 0.3–0.5 mm long. Pedicel 1–1.5 mm long. Bracteoles narrowly linear to subulate, minutely hairy. Calyx greenish-brown, ca. 5 mm long, loosely covered by appressed hairs; teeth 2.3–3 mm long, narrowly linear or subulate. Corolla pale pink-violet or brownish to yellowish when dry. Standard 9–9.2 × 5.5–6 mm, ovate-elliptic, emarginate at the apex, abruptly cuneately narrowed at the base. Wings 6.6–7 mm long; blades narrowly oblong, rounded at the apex, 5.5–6 ca. 2 mm; auricle 1–1.2 mm; claw 1.8–2 mm long. Keel 9–9.2 mm long; blades obliquely obovate, with curved lower edge and nearly straight upper edge, obtuse to subacute at the apex, 6.5–7 × 3–3.2 mm; auricle indistinct; claw 2–2.3 mm long. Staminal tube truncate at the mouth. Ovary sessile, semiorbicular. Pods sessile, semiorbicular, erect to ascending, 6–7 mm long and 5.5–6 mm wide, loosely covered by appressed hairs 0.2–0.3 mm long, without prickles on disc, crest 5–6-toothed, serrate; teeth 1–1.8 mm long and 1–1.5 mm wide.

Etymology:—The specific epithet “patula means “spreading and is chosen due to the diagnostic feature of spreading hairs covering the plant.

Specimens examined:—Known only from type material.

Taxonomic and distribution remarks:—*Onobrychis patula* is a narrowly endemic species known only from the dry-steppe zone of the mountainous regions near south Kopetdagh in Khorasan Province (Fig. 3). This new species shows remarkable similarity to *O. verae* in the shape of the petals and shape of the pods (Table 1). Both species are distributed in northeastern Iran. *Onobrychis patula* can be recognized by rachises, peduncles and leaflets densely covered by spreading hairs, although the upper surface of the leaflets can be loosely hairy sometimes. The length of calyx, wings and pods can be used for definite distinction of the species.

TABLE 1. Diagnostic morphological characters of *Onobrychis verae*, *O. patula* and *O. mucronifolia*.

	<i>Onobrychis verae</i>	<i>Onobrychis patula</i>	<i>Onobrychis mucronifolia</i>
Plant height (cm)	up to 40	up to 35	up to 60
Stem indumentum	gray appressed hairs, 0.3–0.5 mm long	greenish gray densely spreading hairs, 0.3–0.7 mm long	greenish olive loosely appressed hairs, 0.3–0.5 mm long
Stipule	membranous	papery with brownish stripes	membranous
Leaflet pairs in lower leaves	5–6	3–7	4–5
Leaflet length (mm)	5–10	5–8	12–25
Leaflet indumentum	finely gray appressed hairy, 0.3–0.5 mm long	upper surface loosely subappressed to slightly spreading hairy, lower surface densely subappressed to slightly spreading hairy, 0.3–0.5 mm long	upper surface glabrous, lower surface sparsely appressed hairy, 0.3–0.6 mm long
Bract length (mm)	2–3	2.2–2.8	3.2–4.8
Calyx indumentum	sparsely short appressed hairy	loosely short appressed hairy	sparsely to loosely short appressed hairy
Calyx length (mm)	6–7	ca. 5	6.8–7
Standard length (mm)	8–9	9–9.2	10.3–10.4
Wing length (mm)	7–8	6.6–7	7.8–8
Pod length (mm)	4–5	6–7	?
Number of pod teeth	3–5	5.5–6	?



FIGURE 1. *Onobrychis patula* (from holotype). **A.** habit. **B.** calyx. **C.** standard. **D.** keel. **E.** wings. **F.** androecium. **G.** gynoecium. **H.** pods. Scale **A** = 2 cm, **B ? H** = 1 cm.



FIGURE 2. *Onobrychis patula* (from holotype). **A.** variations in pods. **B.** stem and rachis indumentums (black arrow). **C.** stipule (black arrow). Scale in A–C based on mm.

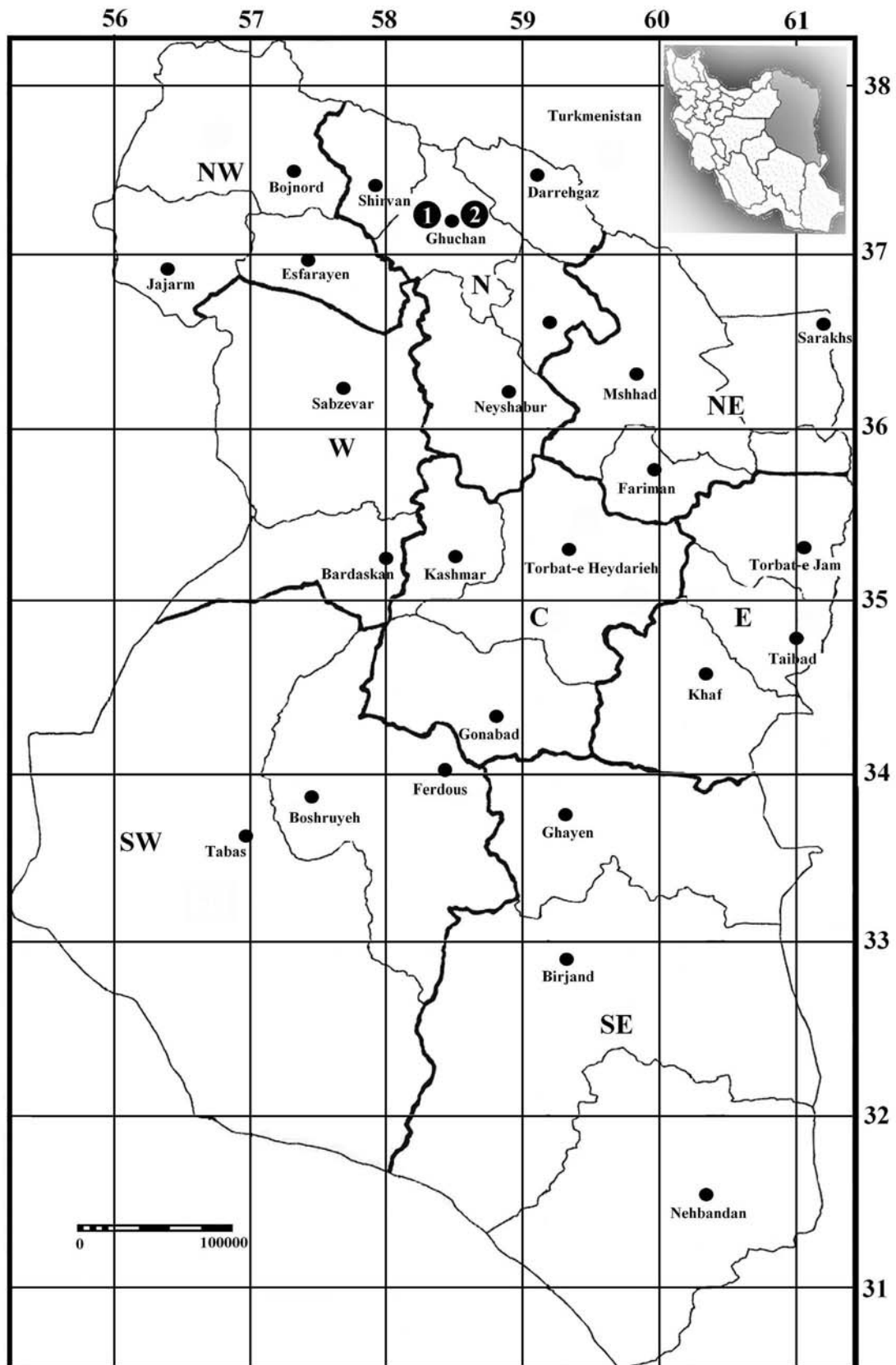


FIGURE 3. Distribution map of *O. patula* (1) and *O. mucronifolia* (2) in Iran.

Onobrychis mucronifolia Ranjbar & Hadadi, sp. nov. (Figs. 4 & 5)

Differt ab Onobrychide verae plantis 55–60 cm (nec ad 40 cm) altis; foliolis supra glabris, subtus pilis sparse appressis (nec utrimque dense pilis appressis) obtectis, foliolis 12–25 × 2.8–6 (nec 5–10 × 2–4) mm; racemis 6–8 cm longis, laxe ad dense 38–48-floribus (nec 3–5 cm longis, densiuscule ad 30-floribus); bracteis 3.2–4.8 (nec 2–3) mm longis.

Type:—IRAN. Prov. Khorasan: Ghouchan, southeast Oghazkhoneh, 2150 m, 24 June 1997, *Faghihnia & Zangooie*29437 (holotype FUMH!, isotype BASU!, photo and a fragment TARI!, W!).

Ascending-erect perennial with thick woody rootstock, up to 55–60 cm tall, branched at the base. Indumentum of white hairs on vegetative parts. Stipules of lower leaves connate, ovate-triangular, acute-acuminate; those of upper leaves free, membranous with brownish stripes base, 4.5–7 mm long and 2–2.8 mm wide, sparsely to loosely covered by appressed hairs, ciliate at margins with hairs 0.3–0.4 mm long. Upper leaves 2.5–4 cm long and lower leaves 2.5–6 cm; rachises slender, straight, loosely covered by appressed hairs 0.2–0.5 mm long, upper petiole up to 0.3–0.9 cm long, lower petiole up to 3.5 cm long. Upper leaflets in 2–3 pairs, lower leaflets in 4–5 pairs, linear to oblong-elliptic, rounded to cuneate at base, rounded to obtuse and clearly mucronate at the apex, 12–25 × 2.8–6 mm, upper surface glabrous, lower surface sparsely covered by appressed hairs 0.3–0.6 mm long. Inflorescence 6–8 cm long, oblong before anthesis, 38–48-flowered, elongating in fruit to 10–12 cm. Bracts papery, 3.2–4.8 mm long and 0.6–0.8 mm wide, linear-lanceolate, acuminate, loosely covered by appressed hairs, ciliate at margins with hairs 0.4–0.5 mm long. Pedicel 1.6–1.8 mm long, loosely covered by appressed hairs. Bracteoles narrowly linear to subulate, minutely hairy. Calyx greenish-brown, 6.8–7 mm long, sparsely pubescent or appressed hairy; teeth 4–4.5 mm long, narrowly linear or subulate. Corolla pink-violet or brownish to yellowish when dry. Standard 10.3–10.4 × 5.8–6.2 mm wide, ovate-elliptic, emarginate at the apex, abruptly shortly and cuneately narrowed at the base. Wings 7.8–8 mm long; blades narrowly oblong, rounded at the apex, 6.1–6.3 × 1.9–2.1 mm; auricle 0.8–0.9 mm long, claw 1.7–1.9 mm long. Keel 9.9–10 mm long; blades triangular, with curved lower edge and straight upper edge, obtuse to subacute at the apex, 6.8–7 × 3.5–3.6 mm; auricle indistinct, claw 2.8–3 mm long. Staminal tube truncate at the mouth. Ovary sessile, semiorbicular, hairy. Pods unknown.

Etymology:—The specific epithet “mucronifolia means “leaves with long sharp points, referring to the mucronate apices of the leaflets.

Specimens examined:—Known only from type material.

Taxonomic and distribution remarks:—*Onobrychis mucronifolia* is a rare endemic species known only from a locality between the Kopetdagh and Binaloud mountains near Ghouchan in northeastern Iran (Fig. 3). Although some characters of the new species (such as long wings, standard shape and hyaline stipules) are similar to *O. verae*, the different size of leaflets which are clearly mucronate at the apex, bract size and height of the plants are unique in *O. sect. Onobrychis* subsect. *Macropterae*. All these characters can confirm the isolated position of *O. mucronifolia*.

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FIGURE 4. *Onobrychis mucronifolia* (from holotype). **A.** habit. **B.** calyx. **C.** standard. **D.** keel. **E.** wings. **F.** androecium. **G.** gynoecium. Scale **A** = 2 cm, **B–G** = 1 cm.



FIGURE 5. *Onobrychis mucronifolia* (from holotype). **A.** inflorescence. **B.** inflorescences with large bracts and violet flowers. **C.** leaf and leaflets. **D.** stipules and mucronate leaflets (black arrow). Scale in **A–D** based on mm.

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