



Phlomoides binaludensis (Phlomideae, Lamiioideae, Lamiaceae), a new species from northeastern Iran

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Abstract

The new species *Phlomoides binaludensis* (Phlomideae, Lamiioideae, Lamiaceae) from Binalud Mountains in the Khorasan province in NE Iran, is here described and illustrated. It belongs to *Phlomoides* section *Filipendula* and resembles *P. labiosiformis* and *P. laciniata* in general morphology, but differs primarily in corolla and calyx size, corolla color and stem indumentum. Notes on the ecology and conservation status of the new species are also given.

Introduction

The genus *Phlomoides* Moench (1794: 403) with about 150–170 species belongs to Lamiaceae, subfamily Lamiioideae, tribe Phlomideae (Scheen *et al.* 2010). As pointed out by Kamelin & Machmedov (1990), the genus has been largely ignored for the last 200 years. The genus was recently re-circumscribed to encompass the members of *Eremostachys* Bunge (1830: 414) along with part of *Phlomis* L. (1753: 178), *Paraeremostachys* Adylov *et al.* (1986: 112) and some mono- or oligotypic genera (Salmaki *et al.* 2012). The distribution area of the genus extends from central Europe to the Russian Far East. The major centers of diversity of *Phlomoides* are Central Asia, the Iranian highlands (including Afghanistan, Iran, W Pakistan, SW Turkmenistan and NE Iraq) and China, with a diversity hotspot in Yunnan and Sichuan, and some few species extending to Mediterranean Europe.

Phlomoides accommodates species with simple or lacinate to pinnatisect leaves; the upper corolla lip not being laterally compressed, non-flattened, arched shape, always hairy or fringed-incised and with woody rhizomes and/or tuberiform lateral roots. They are non-aromatic or lightly aromatic herbs usually in subalpine and alpine vegetation with a few species growing in desert conditions. In Iran, these taxa are floristic components of steppe and mountain vegetation (Hedge 1967).

The most important infrageneric classification of *Phlomoides* has been made by Kamelin & Machmedov (1990) in which two sections [*P. sect. Phlomoides* and *P. sect. Filipendula* Kamelin & Makhmedov (1990: 245)], 21 subsections and 137 species are recognized. *Phlomoides* sect. *Phlomoides* (ca. 66 species) is characterized by simple leaves, crenate, dentate to entire at margin, and unicolored corolla, whereas *P. sect. Filipendula* (ca. 71 species) is distinguished by pinnatisect leaves (rarely undivided) and bicolored corolla. Considering the general distribution area of *Phlomoides*, the number of species belonging to *P. sect. Phlomoides* decreases from east to west, but *P. sect. Filipendula* shows an opposite tendency in its distribution, dominating the western most part of the distribution area.

Rechinger (1982) reported 41 species of *Eremostachys* from the Iranian highlands, of which 15, including seven endemics, occur in Iran. After *Flora Iranica* (Rechinger 1982), *E. lanata* Jamzad (1987: 112) has been added to this genus in Iran (Jamzad 1987). Due to the inclusion of *Eremostachys* in *Phlomoides* according to molecular phylogenetic studies (Salmaki *et al.* 2012), 17 species of *Phlomoides* are known from Iran (Salmaki *et al.* 2012). However, this treatment received no recognition in Flora of Iran and *Phlomoides* species were sorted into *Eremostachys* and *Phlomis* (Jamzad 2013).

Phlomoides sect. *Filipendula* is the largest section of *Phlomoides* and represents the most diverse and controversial group (Sennikov & Lazkov 2010) of the genus. It includes stout perennial herbs with tuberous rootstock, lacinate to

bipinnatisect leaves, hooded upper corolla lip (often deeply concave), and cordate to ovate median lobe of lower corolla lip, as well as mericarps densely bearded or rarely glabrous at the apex.

During field trips from 2009 to 2011 in NE Iran, Khorasan province, a new *Phlomoïdes* species was observed which did not match any of the Iranian taxa or adjacent areas. Several individuals were collected and studied. The new species was carefully compared with *Phlomoïdes* specimens at B, E, FUMH, G, G-BOIS, G-DC, K, LE, M, MSB, TUH, W and WU herbaria. It is described as new species below.

Taxonomy

Phlomoïdes binaludensis Salmaki & Joharchi, *sp. nov.* (Figs. 1 A–C).

Phlomoïdes binaludensis is very similar to *P. labiosiformis* and *P. laciniata*, but differs from *P. labiosiformis* by discolored corolla being brownish red at upper lip and yellow at lower lip, pale green and glabrous stem up to the middle part and from *P. laciniata* by its non-branched stem as well as larger calyx and corolla.

Type:—IRAN. Khorasan province: West of Mashhad, between Abardeh and Zoshk village, 1350 m, 37°20'21"N, 56°40'36.1"E, 11 May 2011, *Joharchi 44307* (holotype FUMH!).

Stout perennial herbs with distinctive basal leaves. Stem thick, 50–60 cm tall, simple, erect, pale green, internodes 7–20 cm long, often glabrous below inflorescence, rarely sparsely covered with long vermiform hairs. Basal leaves oblong to elliptic, the limb 12–14 × 6–8 cm, pinnatisect; the segments oblong to lanceolate, 3.5–5 × 1–1.5 cm, irregularly dentate at margin; petiole 8–10 cm, prominently nerved on lower surface, often glabrous, rarely covered with few long vermiform hairs; cauline leaves oblong to oblong-lanceolate, similar to basal leaves but smaller, 10–12 × 4.5–6 cm, pinnatisect; segments lanceolate, 2–3.5 × 0.5–1 cm, irregularly dentate at margin; petiole 2–6 cm, often glabrous, rarely covered with few long vermiform hairs; floral leaves lanceolate, 4–7 × 0.7–2 cm, irregularly dentate at margin, sessile, acute at apex. Verticillasters 4–5, remote throughout or a few congested above, 4–19 cm distant, 8–10-flowered, pedicels 1.5–2 mm. Bracteoles numerous, lanceolate, herbaceous, 6–10 mm long, spinescent at apex, glabrous or sparsely covered by softly simple long hairs. Calyx tubular, 2.5–3.2 × 0.7–1 cm, covered with simple long hairs and sub-sessile to sessile glandular ones; teeth subequal, lanceolate, erect to slightly recurved in fruit, 5–7 mm long, sparsely covered with simple long hairs. Corolla discolored, brownish red at upper lip and yellow at lower lip, 4–5 cm long; tube sub-included in the calyx, 2–2.5 cm long; upper corolla lip usually exceeding the lower lip, brownish-red, 2.0–2.5 × 1.2–1.4 cm, densely covered with exerted simple long hairs inside; lower corolla lip tri-lobed, yellow, 1.6–1.8 × 1.4–1.6 cm. Stamens 4, exerted from corolla tube. Style lobed unequally. Mature mericarps not seen, densely bearded at apex.

Distribution and ecology:—*Phlomoïdes binaludensis* is found in the mountain steppes of Binalud Mountains in NE Iran. Its distribution area overlaps with that of *P. labiosiformis* (Popov) Adylov *et al.* (1987: 97) to some extent (Fig. 2). The new species inhabits mountainous gravelly slopes mostly with limestone as substrate, exposed cliffs and ridges, at elevation of 1350–2000 m. It grows on steep slopes and open habitats that include other annual, perennial species or geophytes, such as *Allium kuhsorkhense* R.M.Fritsch & Joharchi, *Euphorbia densa* Schrenk, *Onosma longiloba* Bunge, *Scutellaria litwinowii* Bornm. & Sint., etc.

Etymology:—The specific epithet refers to Binalud Mountains in Khorasan province, where this species is found.

Phenology:—Flowering between late April and early June and fruiting between early June and late June.

Conservation remarks:—*Phlomoïdes binaludensis* can be considered as Endangered (EN) according to the IUCN Red List (IUCN 2010) categories and criteria B1ab (iii). It is known only from few localities in Khorasan province in Iran with sparse patches of limited individuals. Therefore, a conservation planning for the threatened ecosystem and species is needed.

Additional specimen examined (paratypes):—Khorasan province: 5 km after Zoshk village toward the peak of Binalud mountains, W Mashhad, 1750–2200 m, 36°19'74" N, 59°11'26" E, 28 May 2009, *Salmaki et al. 38145* (M!, TUH!); N Neyshabor, Mirabad towards peak of Binalud mountains, 1700 m, 20 May 1978, *Zargari 2435* (FUMH!); W Mashhad, Zoshk, 1500 m, 5 May 1985, *Joharchi & Safavi 12562* (FUMH!); SW Chenaran, Dahan-e Akhlamad, 1500 m, 11 May 1985, *Ayatollahi & Rezaei 12723* (FUMH!); SE Neyshabor, S Dizbad-e Olia, 1700 m, 19 May 1996, *Raafei & Zangooei 26951* (FUMH!); S Mashhad, Moghan, near the cave, 2000 m, 25 May 2009, *Joharchi & Zangooei 42656* (FUMH!).

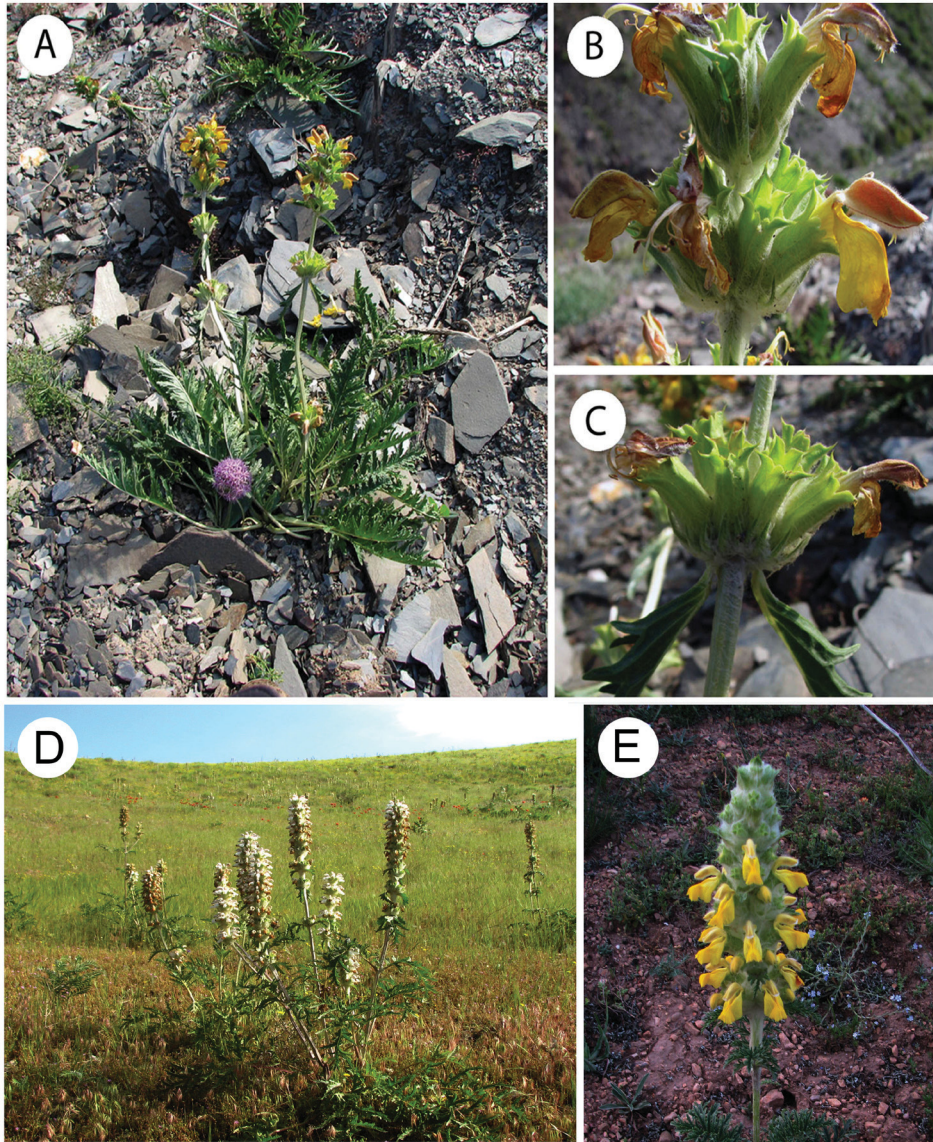


FIGURE 1. *Phlomoides binaludensis*. A. Habit. B. Inflorescence. C. Corolla, calyx and bracteoles; D. *Phlomoides laciniata*; E. *Phlomoides labiosiformis*. Photographs by Yasaman Salmaki.

Additional specimens examined of *Phlomoides labiosiformis* and *P. laciniata*:—[specimens of *P. labiosiformis*]: Prov. Khorasan: Gulul Sarani protected area, Kopet Dagh mts., 12 May 1973, *Rechinger 53360* (E!, M!, W!); Shirvan, Namanlu, Kuhha-ye Gulul (Protected Region), 14 June 1975, *Termeh 22849* (IRAN!). Prov. Golestan: Gorgan, 20 km SE Shahpasand (Azad-Shahr), 10 May 1966, *Pabot 22850* (IRAN!); Gorgan, Gonbad-Ghabous (Gonbad-Kabus), Malek tappeh, 23 May 1956, *Sharif 22851* (IRAN!). Prov. Mazandaran: S. Amol in valley Haraz river, *Furse 7064* (K!); In apertis carpetinorum 38–46 km NW Fulad Mahalleh, 30 May 1975, *Rechinger 52390* (B!, W!); Golestan forest, *Sabeti 5446* (G!, TARI!); Prov. Tehran: Jajrud, toward Latiyan mts, 9 May 1975, *Matin & Termeh 22847b* (IRAN!); Marzan-Abad versus Kelardasht, 17 April 1978, *Termeh & al. 22853* (IRAN!). [specimens of *P. laciniata*]: Prov. Qazvin: Qazvin mts., *Bornmüller 7886* (B!). Prov. Tehran: between Karadj et Gachsar, *Schmid 5701* (G!); Elburz mts. ad basin septentr. alpinum Totschal, prope Shahrestanak, *Bornmüller 7887* (B!, G!); *Pabot 3239* (G!); Evin-Darakeh, 3 May 1967, *Termeh & al., 22871* (IRAN!); Evin-Darakeh, Velenjak, *Termeh 22866c* (IRAN!); *Pichler s.n.* (LE!); Firuzkuh, pol-e Veresk, *Gheissari 1321* (G!, TARI!); Firuzkuh, Pol-e Veresk, 13 June 2010, *Salmaki & Zarre 39154* (TUH!). NW Tehran, 5 km on the road to Emamzadeh Davoud, 29 May 2010, *Salmaki & Zarre 39221* (TUH!). Prov. Gilan: in montibus ad Manjil, *Bornmüller 7884* (B!, WU!).

The new species according to its morphological characters certainly belongs to *Phlomoides* sect. *Filipendula*. Morphologically similar species are *P. labiosiformis* and *P. laciniata* (L.) Kamelin & Makhmedov (1990: 249). The species is characterized by its pale green to white and glabrous stem (below inflorescence), simple leaves, 4–

5 verticillasters per inflorescence, large corolla and calyx and discolored corolla. It looks very different in natural habitat from perhaps its closest relative, *P. labiosiformis* (Fig. 1E). The most obvious distinguishing feature is the corolla color, which is bicolored (upper corolla lip being brownish-red and lower lip yellow) in *P. binaludensis*, but concolour in *P. labiosiformis* (upper and lower corolla lips being yellow). Moreover, *P. binaludensis* is easily recognizable from *P. labiosiformis*, by its large calyx (25–32 mm) and corolla (40–50 mm) as well as a glabrous stem. *Phlomooides labiosiformis* is frequent in NE Iran and has been attributed to the *P. laciniata* complex, which is known as a taxonomically difficult group (Rechinger 1982). *Phlomooides labiosiformis* is distinguished by a calyx 20–28 mm long and corolla up to 40 mm. This species differs from *P. laciniata* (Fig. 1D), with similar habit and habitat, mainly in its calyx and corolla length, corolla color as well as stem indumentum. The main difference between *P. labiosiformis* and *P. laciniata* is the yellow corolla in the former, which is covered with long simple hairs, as well as glandular hairs on vegetative organs. The latter has a short calyx (14–16 mm) and corolla (20–25 mm), white corolla flushed with pale brown dots on lower lip. Important diagnostic characters of the new species in comparison with *P. labiosiformis* and *P. laciniata* are given in Table 1.

TABLE 1. Comparison of characters between *Phlomooides binaludensis*, *P. labiosiformis* and *P. laciniata*.

Character	<i>P. binaludensis</i>	<i>P. labiosiformis</i>	<i>P. laciniata</i>
Habit			
growth form	perennial herb	perennial herb	perennial herb
height (cm)	50–60	50–100	60–120
Stem			
branching	non branched	non branched	usually branched from the middle
color	pale green	brownish	white
indumentum	often glabrous up to the middle	sparsely covered by vermiform hairs from the base	densely covered by vermiform hairs from the base
Leaves			
petiole length (cm)	8–10	3–17	10–20
blade form	simple	compound, pinnate	compound, pinnate
blade divisions	pinnatisect	segments broad	segments narrow
blade or segment margin	irregularly dentate	crenate to dentate	irregularly dentate
blade length (cm)	12–14	7–16	15–30
Inflorescence			
length (cm)	25–35	15–20(–25)	30–40(–45)
number of verticillasters	4–5	6–10	10–20
flowers per verticillaster	8–10	6–8	8–10
Floral bracts			
shape	lanceolate	narrowly lanceolate to linear	lanceolate to broadly lanceolate
length (mm)	6–10	8–17	10–15
apex shape	acute	acute	acute to acuminate
Calyx			
length (mm)	25–32	20–28	14–16
indumentum	glabrous	sparsely covered by vermiform hairs from the base	densely covered by vermiform hairs from the base
Corolla			
length (mm)	40–50	(30) 35–40	20–25
color	discolored	unicolored	unicolored
upper lip color	brownish red	yellow	white
lower lip color	yellow	yellow	white with pale brown dots
Distribution	Iran	Afghanistan, Iran, Turkmenistan	Afghanistan, Armenia, Azerbaijan, Georgia, Greece, Iran, Lebanon, Palestine, Syria, Turkemistan, Turkey

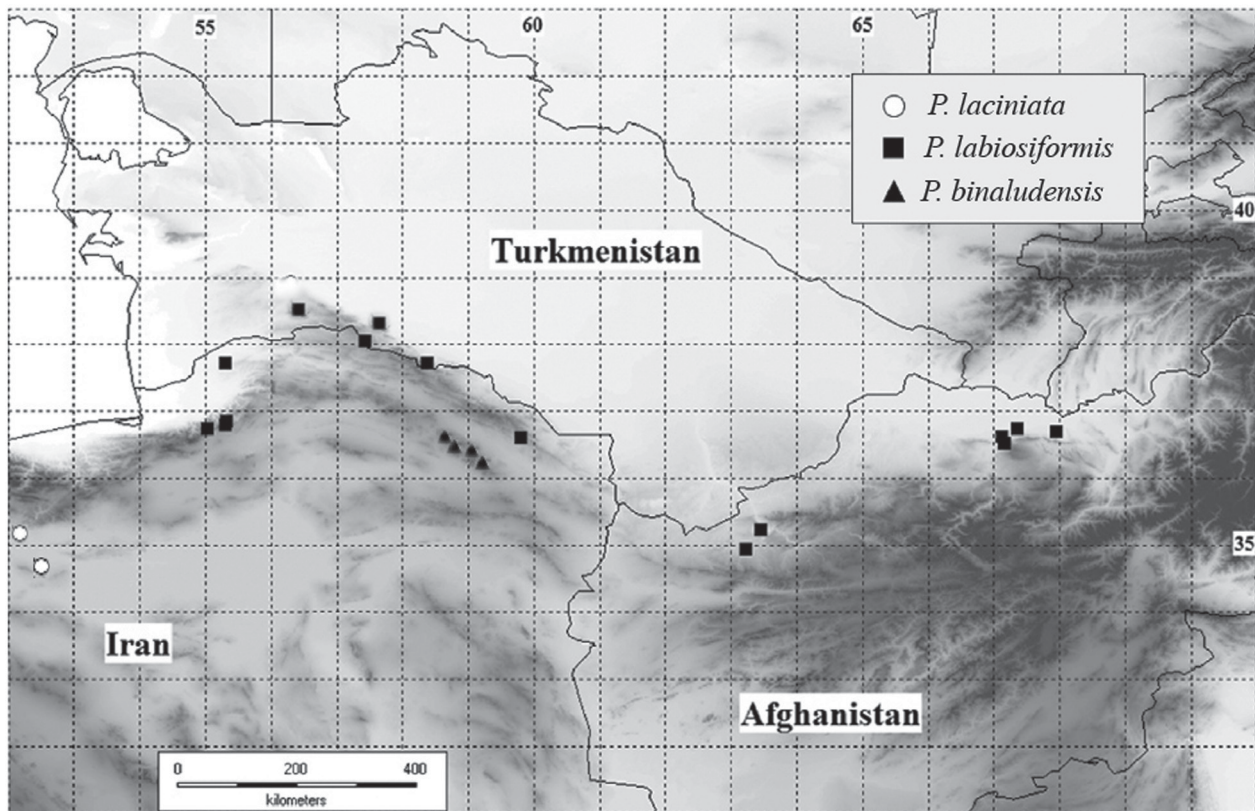


FIGURE 2. Distribution map of *Phlomooides binaludensis*, *P. labiosiformis* and *P. laciniata*.

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