

Taxonomic revision of the genus *Poa* L. in Iran, new additions to *Flora Iranica*, and a new identification key

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Received: 17.11.2013 • Accepted: 30.07.2014 • Published Online: 02.01.2015 • Printed: 30.01.2015

Abstract: In this study, an identification key of *Poa* L. species in Iran and descriptions of all species are presented. Based on the results, 19 species and 4 subspecies of *Poa* are known from Iran. Two species, *P. longifolia* Trin. and *P. sterilis* M.Bieb., are new records for the flora of Iran. Some taxa such as *P. versicolor* Besser. subsp. *araratica* (Trautv.) Tzvelev and *P. bactriana* Roshev. subsp. *glabriflora* (Roshev. ex Ovcz.) Tzvelev were placed as subspecies. *Poa supina* Schrad. and *P. aitchisonii* Boiss. were not confirmed to occur in Iran since they were observed neither among the herbarium specimens nor in the localities formerly cited for the flora of Iran.

Key words: *Poa*, Poaceae, taxonomy, revision, new records, Iran

1. Introduction

Poa L. is the largest genus of Poaceae, with over 500 species currently recognized worldwide (Gillespie and Soreng, 2005). The genus has a wide distribution in various regions of the world (Gillespie and Soreng, 2005). Identification of *Poa* species is difficult because of its similar and polymorphic taxa and the existence of polyploidy, hybridization, and apomixis (Stebbins, 1950; Clausen, 1961; Tzvelev, 1983; Hunziker and Stebbins, 1987). Clayton and Renvoize (1986, p. 101) claimed that “*Poa* is an extremely uniform genus for which there is no satisfactory infrageneric classification and useful morphological characters”. More than 200 species have never been placed in a section, or only subgeneric ranks were known for them. The affinities of half of these species are unknown, while the remaining species are considered to belong to several informal species groups (Gillespie et al., 2007; Soreng et al., 2009). Here, we generally follow Tzvelev’s (1983) infrageneric classification of the genus, which we have updated.

According to *Flora Iranica* (Bor, 1970), 13 species of the genus *Poa* occur in Iran. In the Floras of neighboring countries the number of Iranian species recorded varies; for example, *Flora of Turkey* (Edmondson, 1985), 11; *Flora of Iraq* (Bor, 1968), 6; *Flora of Russia* (Tzvelev, 2000), 26; *Flora of the USSR* (Roshevits and Shishkin, 1934), 5; *Grasses of the Soviet Union* (Tzvelev, 1983), 15; and *Flora of*

Pakistan (Cope, 1982), 13. In recent studies, *P. golestanensis* H.Scholz & Akhani (Akhani and Scholz, 1998) and *P. damavandica* Assadi & Kavousi (Kavousi et al., 2009) were described as new species from Iran. In addition, *P. palustris* L., *P. badensis* Haenke ex Willd., and *P. glauca* Vahl were reported as 3 new records from Iran (Kavousi et al., 2010). The objective of the current paper is to provide the first concise taxonomic revision of the genus *Poa* for Iran in the 43 years since the treatment of Poaceae in the *Flora Iranica* (Bor, 1970) was published.

2. Materials and methods

Specimens from the herbaria TARI, TUH, IRAN, FUMH, and IAUH (acronyms according to Holmgren and Holmgren, 1990) were studied. Field studies were done by the first author, and the newly collected materials are deposited in TARI and IAUH. *Flora Iranica* (Bor, 1970), *Grasses of the Soviet Union* (Tzvelev, 1983), *Flora of Turkey* (Edmondson, 1985), *Flora of Iraq* (Bor, 1968), *Flora of Russia* (Tzvelev, 2000), *Flora of Pakistan* (Cope, 1982), *Flora Europaea* (Edmondson, 1980), *Flora Palaestina* (Feinbrun, 1986), and *Flora of the USSR* (Roshevits and Shishkin, 1934) were used as the main sources for the literature review. The morphological characters were measured directly from the herbarium specimens, and the descriptions were prepared based on the new measurements.

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3. Results and discussion

Based on the results of this investigation, 19 species and 4 subspecies of *Poa* are recorded from Iran. Specimens of *P. supina* Schrad. and *P. aitchisonii* Boiss., cited in *Flora Iranica* (Bor, 1970), have not been collected in Iran again. *Poa longifolia* Trin. was noted for Iran in *Flora of Turkey* (Edmondson, 1985) without citation of specimens; in this paper, 2 collections are cited for this species. *Poa sylvicola* Guss. and *P. angustifolia* L., due to lack of adequate diagnostic characters, and following some recently prepared revisions (i.e. Edmondson, 1980; Cope, 1982; Tzvelev, 1983; Feinbrun, 1986), were accepted as subspecies within *P. trivialis* L. and *P. pratensis* L., respectively.

Poa araratica Trautv. and *P. glabriflora* Roshev. were regarded as *P. versicolor* Besser subsp. *araratica* (Trautv.) Tzvelev and *P. bactriana* Roshev. subsp. *glabriflora* (Roshev. ex Ovcz.) Tzvelev, respectively. Additionally, a key to identify the species is presented.

Poa L., Sp. Pl. 67 (1753). Gen. Pl. ed. 5: 31 (1754).

Annuals or perennials, tufted or not, bulbous or nonbulbous at the base of the stem, rhizomatous, not rhizomatous or stoloniferous, sometimes with few and compact nonflowering shoots. Stems solitary to numerous, erect or geniculate ascending, terete or compressed, usually glabrous, sometimes scabrous below panicle, enveloped by leaf sheaths for about 1/2 of their length from the base to below panicle. Leaf blade flat, folded or involute, linear, acute, acuminate, abruptly or gradually tapering at the tip, glabrous or scabrous through the length. Sheaths of basal leaves sometimes scabrous or hairy, variegated to yellow and purple; ligules long or short, acute, obtuse, truncate, or lacerate, sometimes scabrous or hairy on dorsal surface, membranous or slightly thickened. Inflorescence a compact or open panicle, narrowly elliptic to triangular. Spikelets viviparous or not, laterally compressed, elliptic, lanceolate or ovate, with 2 or more compact or more outstretched florets, with glabrous, smooth, scabrous, or pubescent rachilla. Glumes keeled, equal to unequal, always shorter than lemma (in Iran) and spikelet, lanceolate or ovate, with a wide hyaline margin, acute or obtuse, 1- to 3-veined, frequently scabrid on the upper part. Lemma keeled, without any awn, elliptic or ovate in side view, with a wide or narrow hyaline margin, sharply acute or blunt, variegated to yellow and purple, with or without a dorsal tuft of lanate hairs on callus, obviously to obscurely 5-veined, pubescent or glabrous between the veins; marginal and lateral veins pubescent or not. Palea ciliate, pilulose or scabrous on the keels.

3.1. Key to the species of *Poa* L. in Iran

- 1- Base of the stem not bulbous or thickened because of remnants of old leaves at the base. Panicle never with viviparous spikelets 2
- Base of the stem bulbous. Panicle usually with viviparous spikelets 18

- 2- Callus of lemma glabrous or rarely with a few dorsal hairs 3
- Callus of lemma dorsally webbed, web distinct, hairs wooly 9
- 3- Keels of palea pilulose or ciliate in part, but otherwise smooth 4
- Keels of palea scabrid, at least in part, otherwise glabrous 5
- 4- Anthers 0.2–0.5 mm long 11. *P. infirma* Kunth
- Anthers 0.6–1 mm long 12. *P. annua* L.
- 5- Lemma 5-veined, the intermediate veins obvious 10. *P. longifolia* Trin.
- Lemma 5-veined, the intermediate veins obscure 6
- 6- Lemma pubescent between the veins in the lower part 7. *P. alpina* L.
- Lemma glabrous between the veins throughout 7
- 7- Stem compressed, with obviously compressed nodes. The lowest branches of panicle not more than 1 cm long. Callus of lemma glabrous or sometimes with a few hairs 20. *P. compressa* L.
- Stem terete, with obscure nodes. The lowest branches of panicle at least 1 cm long. Callus of lemma glabrous or webbed 8
- 8- Stem with yellowish remnants of old leaves at the base. Panicle narrowly elliptic or triangular, the lowest branch up to 5.5 cm long 16. *P. sterilis* M.Bieb.
- Stem with reddish remnants of old leaves at the base. Panicle narrowly oblong, the lowest branch up to 3 cm long 17. *P. versicolor* Besser subsp. *araratica* (Trautv.) Tzvelev
- 9- Lemma with moderately to strongly expressed intermediate veins 10
- Lemma with indistinct or obscure intermediate veins 13
- 10- Palea muriculate along the keels. Ligule acute, at least 3 mm long 13. *P. trivialis* L.
- Palea with distinctly scabrous keels. Ligule acute or obtuse, 0.5–3 mm long 11
- 11- Lemma pubescent between the veins in the lower part 9. *P. masenderana* Freyn & Sint.
- Lemma glabrous between the veins 12
- 12- Callus of lemma webbed, web distinct, hairs wooly. Panicle with more than 12 branches and 60 spikelets 8. *P. pratensis* L.
- Callus of lemma webbed, web sparse. Panicle with fewer than 12 branches and 60 spikelets 15. *P. palustris* L.
- 13- Palea keels ciliate in lower part, but scabrous in the upper part. Rachilla smooth. Ligule of the uppermost leaf 2–2.8 mm long, obtuse, and minutely toothed at the apex *P. damavandica* Assadi & Kavousi

- Palea keels scabrous or ciliate throughout. Rachilla minutely muriculate or with few hairs. Ligule of the uppermost leaf often less than 2 mm long, obtuse, if longer than 2 mm acute 14
- 14- Lemma broadly ovate, with very wide hyaline margins, appressed hairs between the veins in the lower part 6. *P. badensis* Haenke ex Willd.
- Lemma elliptic, with relatively wide hyaline margins, glabrous between the veins in the lower part 15
- 15- Ligule of the uppermost leaf not more than 0.5 mm long, rarely up to 1 mm 14 *P. nemoralis* L.
- Ligule of the uppermost leaf at least 1 mm long 16
- 16- Plant very glaucous. Stem usually leafy up to the middle; the uppermost node hidden under the leaf sheaths. Panicle with less than 40 spikelets, these aggregated toward the tips of the branches; lower branches 2–3 in number, rarely 5 in number 18. *P. glauca* Vahl
- Plant somewhat glaucous or green. Stem leafy up to 2/3 of the length from the base; the uppermost node in the basal or middle 1/3 of the stem. Panicle with more than 30 spikelets distributed more evenly along the branches; lower branches 2–5 in number 17
- 17- Stem with yellowish remnants of old leaves at the base. Panicle narrowly elliptic or ±triangular; the lowest branch up to 5.5 cm long 16. *P. sterilis* M.Bieb.
- Stem with reddish remnants of old leaves at the base. Panicle narrowly oblong; the lowest branch up to 3 cm long 17. *P. versicolor* Besser. subsp. *araratica* (Trautv.) Tzvelev
- 18- Stem with elongated bulbs at the base. Basal leaves embrace the bulbs and crowd above it, narrowly linear. Lemma veins pubescent in nonviviparous spikelets, callus glabrous; plant from arid region 2 *P. sinaica* Steud.
- Stem with swollen spheroidal bulbs at the base 19
- 19- Callus of lemma glabrous 20
- Callus of lemma webbed, hairs wooly .. 1 *P. bulbosa* L.
- 20- Ligules of nonflowering shoots relatively thickened and whitish, with 1/5 to 1/2 of length of blade. Lemma with a wide hyaline margin; stem with pear-like bulbs at the base 5. *P. timoleontis* Heldr. ex Boiss.
- Ligules of nonflowering shoots relatively thin and hyaline, with not more than 1/5 of the length of blade 21
- 21- Ligules of nonflowering shoots not more than 0.5 mm long, obtuse. Basal leaf blades not more than 0.7 mm wide, fairly hard, with distinct whitish longitudinal stripes corresponding to highly developed sclerenchymatous bands, convolute 4. *P. densa* Troitzky
- Ligules of nonflowering shoots 0.5–3 mm long, acute or obtuse. Basal leaf blades 0.7–1.5 mm wide, linear 22
- 22- Lemma completely glabrous, or sometimes scabrous on upper part of keel, callus glabrous 3. *P. bactriana* subsp. *glabriflora* (Roshev. ex Ovcz.) Tzvelev
- Lemma relatively pubescent on the lower parts of the veins, callus webbed, hairs wooly (if spikelets viviparous, the indumentum is retained only on a few of the least modified lemmas or is absent 1. *P. bulbosa* L.

3.2. Descriptions

3.2.1. Section *Poa*

Perennials, rhizomatous or not rhizomatous. Stems enveloped by leaf sheaths for about 1/4 to 2/3(–3/4) of the length from the base. Panicle with glabrous or somewhat scabrid branches. Spikelets sometimes viviparous. Callus of lemma webbed or glabrous. Palea with scabrous or ciliate keels.

3.2.1.1. *P. bulbosa* L., Sp. Pl. 1: 70 (1753).

Plant with nonflowering shoots. Stems swollen bulbous at the base, enveloped by stem leaf sheaths usually 2/3 of the length from the base to below panicle; the uppermost node in upper part of the middle 1/3 of the stem. Basal leaves 0.8–1.2 mm wide, linear. Ligules of the uppermost leaf 2.7–4 mm long, acute. Panicle triangular, with 12–17 scabrid branches and 39–70 spikelets. Spikelets viviparous or not, ca. 4.5–6.2 mm long, ovate, with 4 or 5 florets; with muriculate or scabrid rachilla; lower glume 2.8–3.5 mm long, rhomboid, acute, 3-veined; upper glume 3–3.8 mm long, rhomboid, acute, 3-veined. The lowest lemma 3.3–4 mm long, ovate, obtuse, obscurely 5-veined, on the lower 2/3 of the keel; 1/3 of the marginal veins ciliate, smooth between the veins and on the intermediate veins; callus webbed or glabrous (if the spikelets of panicle are not viviparous, lemma becomes somewhat pubescent on the lower parts of the veins and callus webbed). Palea with scabrid keels. *Fl.* 4–8.

- Spikelets not viviparous subsp. *bulbosa*
- Spikelets viviparous subsp. *vivipara* (Koel.) Arcang.
- subsp. *bulbosa*

Spikelets not viviparous. Lemma somewhat pubescent on the lower parts of the veins, callus webbed.

Selected specimens: -Mazandaran: Sangdeh, Polsefid, 1400 m, Domanchik, TARI-31318. -Gilan: Langerud, 26 m, Naqinezhad, TUH-27742. -Azerbaijan: km 40 W Meshkin shahr, 1130 m, Pabot, TARI-27900. -Kordestan: Baneh, Shikh Ebrahim Shrine, 1480 m, Fattahi et al., TARI-2394. -Kermanshah: Kerend gharb, 45 km W of Kerend gharb, Rijab village, 900 m, Lashkarblooki & Hatami, TARI-132. -Fars: 7 km from Ouz to Lar, 900 m, Assadi & Sardabi, TARI-41689. -Isfahan: Versus Shahreza, 48 km to Shahreza, Kolahghazi, 1700 m, Mousavi & Tehrani, IRAN-21185/1. -Hormozgan: Bandare Abbas, Kuh e Genu, 1900–

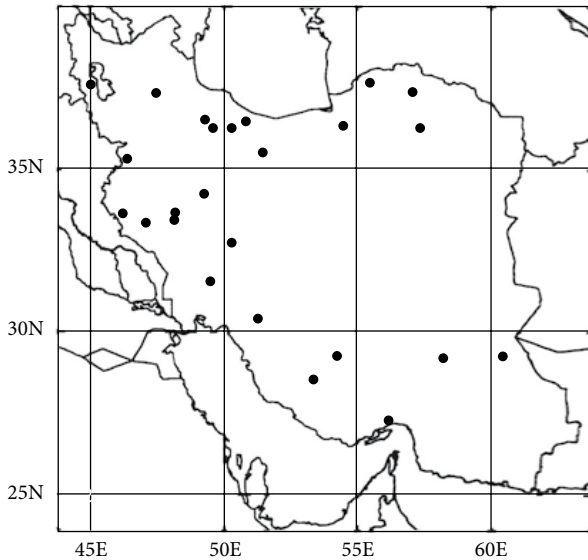


Figure 2. The distribution map of ● *Poa bulbosa* subsp. *vivipara* in Iran.



mm long, rhomboid, acute, 3-veined; upper glume 2.6–3.9 mm long, rhomboid, acute, 3-veined. The lowest lemma 3.3–4 mm long, ovate, obtuse, obscurely 5-veined, on the lower 2/3 of the keel; 1/3 of the marginal veins ciliate or appressed hairy, smooth between the veins and on the intermediate veins; callus glabrous (in viviparous spikelets lemma glabrescent on the lower parts of the veins). Palea with scabrid keels. *Fl.* 4–8.

Habitat: Plant from arid regions.

Selected specimens: -Golestan: 65 km from Gomishan to Marave tappeh, 30 m, Assadi & Maassoumi, TARI-55336. -Mazandaran: Chalus road, 9000 f., Furse & Syngé, IRAN-21196. -Azerbaijan: Moghan road, km 19 Meshkin Shahr, 1000 m, H. Pabot, TARI-27896. -Hamedan: on road from Hamedan to Avaj, Neirij, 1600 m, TARI-8575. -Ilam: Reno, Iranshahr, IRAN-21193. -Isfahan: Ghameshloo Protected Area, Tang e Mooshi, 2300 m, Uosefi, TARI-781. -Yazd: Shirkuh S of Deh e Bala, Sarkuh mountain, 2750 m, Foroughi & Assadi, TARI-18008. -Chaharmahal e Bakhtiari: Borojen, Ganduman, Kuh e Baraftab, 2300 m, Mozaffarian, TARI-54791. -Fars: Jahrom, Khafr, 1130 m, Riazi, TARI-5075. -Hormozgan: Bandar Abbas, top region of Kuh e Genou, 2250 m, Foroughi, TARI-16108. -Khuzestan: 31 km on road from Ramshir to Ahvaz, 120 m, Runemark & Mozaffarian, TARI-31904. -Kerman: 95.5 km S Sirjan, 1860 m, Pabot, TARI-27901. -Baluchestan: 82 km S Zahedan, 2000 m, Babakhanloo, TARI-19777.

-Khorasan: Esferayen, N slope of Kuh e Shah Jahan from Darparcin e bala villages, 1700–2500 m, Mozaffarian, TARI-48528. -Semnan: 20 km SE at road to Biarjomand, 1900 m, Freitag & Mozaffarian, TARI-28320. -Tehran: 20 km S Ghom, 1100 m, Pabot, TARI-27899 (Figure 3).

With the exception of *Flora of Iraq* (Bor, 1968), the above-mentioned references cite *P. reuteriana* as a synonym of *P. sinaica*. Viviparous specimens of *P. sinaica* are very similar to *P. bulbosa* subsp. *vivipara*. In this case it seems useful to use Feinbrun's viewpoint. Feinbrun (1940) distinguished *P. sinaica* by the following characters: 1) ligules of the radical leaf blades and tip of the membranous sheath usually embracing the bulbous base, produced above the tuft of leaf blades; 2) blade of radical leaves very narrow, convolute, densely scabrous on the margins and along the prominent veins of the lower surface; 3) swollen leaf bases oblong, often scarcely inflated below, densely covered by residues of sheaths of preceding years; and 4) tufts rather dense; culms not generally geniculate (Bor, 1968).

3.2.1.3. *P. bactriana* Roshev., Not. Syst. Herb. Hort. Petrop. 4: 93 (1923).

subsp. *glabriflora* (Roshev. ex Ovcz.) Tzvelev Novosti. Sist. Vyssh. Rast. 10: 93 (1973).

Syn.: *P. glabriflora* Roshev., in Komarov, Fl. USSR. 2: 376 (1934) et Act. Inst. Bot. Acad. Sci. USSR. Ser. 1, 2: 99 (1936).

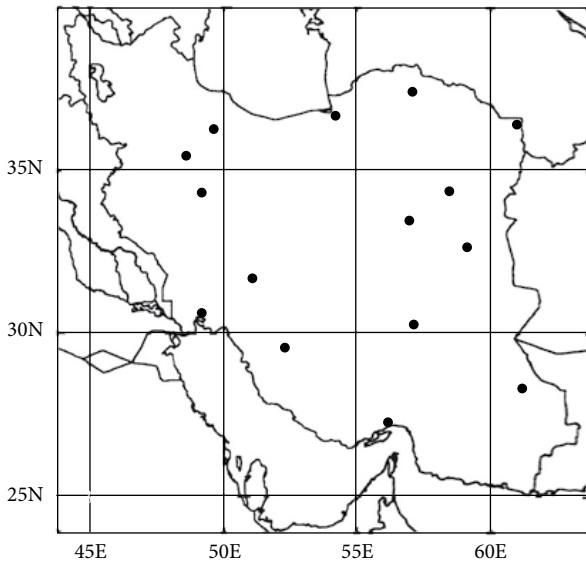
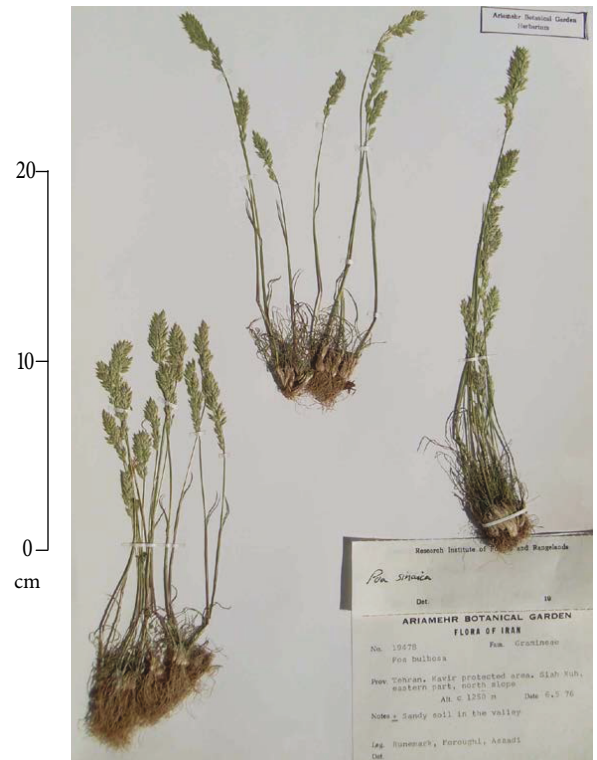


Figure 3. The distribution map of ● *Poa sinaica* in Iran.

Plant with numerous nonflowering shoots. Stems bulbous at the base, enveloped by stem leaf sheaths usually 1/2 of the length from the base to below panicle; the uppermost node in middle 1/3 of the stem. Basal leaves 0.9–1.2 mm wide, folded. Ligules of the uppermost leaf 4–4.5 mm long, usually acute, sometimes obtuse. Panicle narrowly elliptic, with 13–20 scabrid branches and 38–127 spikelets. Spikelets not viviparous, ca. 5.3–6 mm long, ovate, with 6 or 7 florets; with usually muriculate rachilla, sometimes scabrid; lower glume 2.1–3.2 mm long, lanceolate, acute, 1-veined; upper glume 2.7–3.9 mm long, ovate, 3-veined. The lowest lemma 3.2–3.9 mm long, ovate, obtuse, obscurely 5-veined, completely glabrous, scabrid on the upper part of the keel; callus glabrous. Palea keels scabrid. *Fl.* 4–8.

Selected specimens: -Golestan: 157 km E Gonbad e Ghabous, Pabot, TARI-27886. -Mazandaran: Gaduk, Chashm to Nizva, 2400 m, Behbodi & Aellen, IRAN-21199. -Azerbaijan: Sarab, 22 km from Sarab to Ardabil, 2200 m, Ghahremani & Talebpur, TARI-4046. -Isfahan: Golpaigan, Khansar, Kuh e Golestan, 2800–3250 m, Iranshahr, IRAN- 21190/1. -Yazd: Dehbala, Shirkuh, 2800–3200 m, Mousavi & Tehrani, IRAN-21221. -Fars: Bamu protected region, Cheshmeh Fil to ridge of Kuh e Bamu, 1900–2650 m, Wendelbo & Foroughi, TARI-17651. -Kerman: Baft, Gonbadan, Mirtadjadini, TUH-32066.



-Baluchestan: km 44 S Zahedan, 1940 m, Babakhanloo, TARI-19793. -Semnan: 35 km SE of Shahrud on road to Biarjomand, 1700 m, Freitag & Mozaffarian, TARI-28360. -Tehran: 6 km to S of Arak, W of Senejan, Akhani, TUH-1393 (Figure 4).

In *Grasses of the Soviet Union* (Tzvelev, 1983) *Poa bactriana* has 4 subspecies, which are distributed in Central Asia: a) subsp. *bactriana*, b) subsp. *glabriflora* (Roshev. ex Ovcz.) Tzvelev, c) subsp. *zapryagajevii* (Ovcz.) Tzvelev, and d) subsp. *drobovii* Tzvelev. Their diagnostic characters are: length of branches of panicle, presence and density of hairs on the panicle branches, number of spikelets on each branch, size and color of spikelets, length of anthers, leaf blade width, habitat, and height of plant.

3.2.1.4. *P. densa* Troitzky, Trudy Glavn. Bot. Sada. 27: 619, f. 1 (1928).

Plant with nonflowering shoots. Stem with swollen spheroidal bulbs at the base, enveloped by stem leaf sheaths usually 2/3 of the length from the base; the uppermost node in 1/2 of the stem. Basal leaves 0.5–0.7 mm wide, fairly hard, convolute, with distinct whitish longitudinal stripes corresponding to the highly developed sclerenchymatous bands. Ligules of the uppermost leaf 1–2 mm long, obtuse. Panicle long elliptic, with 15–20 scabrid branches and 55–110 spikelets. Spikelets not viviparous, ca. 4–5.1 mm long, lanceolate, usually with 4 florets; usually with scabrid

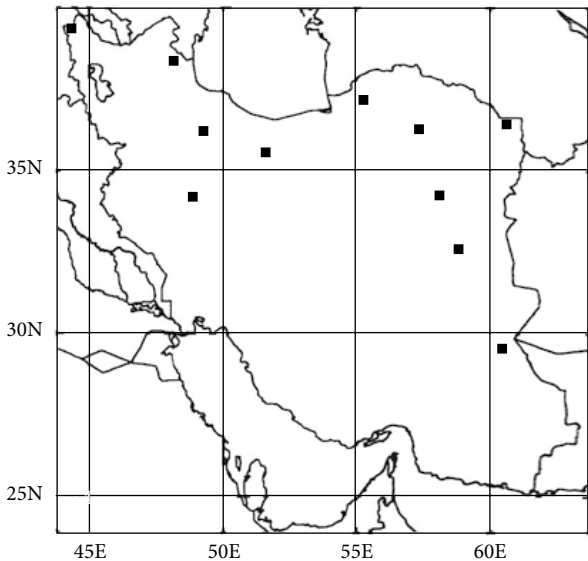
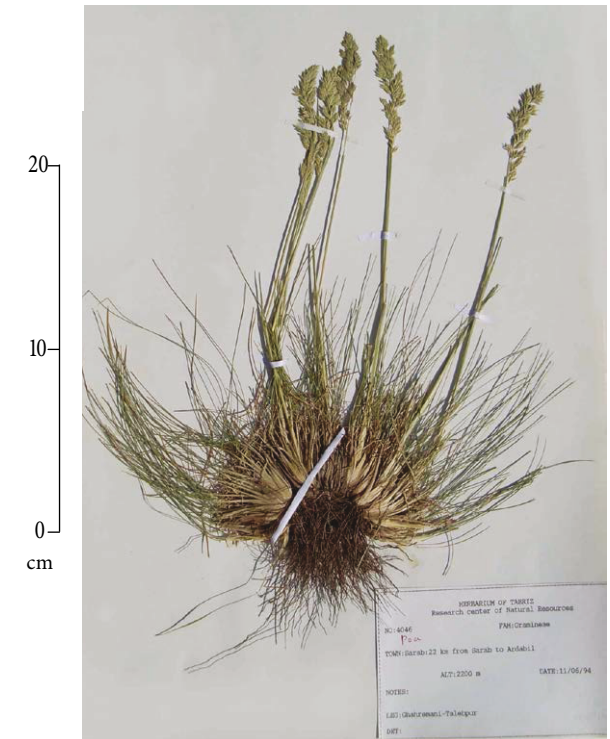


Figure 4. The distribution map of *Poa bactriana* subsp. *glabriflora* in Iran.



racilla; lower glume 2.1–2.8 mm long, lanceolate, acute, 1-veined; upper glume 2.4–3.1 mm long, rhomboid, acute, 3-veined. The lowest lemma 3.2–3.7 mm long, ovate to elliptic, obtuse, obscurely 5-veined, completely glabrous, scabrid on the upper part of the keel; callus glabrous. Palea keels scabrid. *Fl.* 4–7.

Selected specimens: -Golestan: on the top of mountain on road to Bojnurd, 27 km E of Marave tappeh, 1300 m, Hower, TARI-3843. -Ardabil: ca. 20–30 km from Masuleh to Khalkhal, 2100 m, Assadi, TARI-86476 (Figure 5).

The closest species is *P. bactriana*. In *Grasses of the Soviet Union* (Tzvelev, 1983), *P. densa* differs from *P. bactriana* by the following characters: length of ligules of nonflowering shoot, basal leaf blades wide and with distinct whitish longitudinal stripes corresponding to highly developed sclerenchymatous bands.

3.2.1.5. *P. timoleontis* Heldr. ex Boiss., *Fl. Or.* 5: 607 (1884). Plant with numerous nonflowering shoots. Stem with pearl-like bulbs at the base, enveloped by leaf sheaths usually 2/3 of the length from the base; the uppermost node under the leaf sheaths. Basal leaves 0.5–0.8 mm wide, folded. Ligules of the uppermost leaf 2.5–3.7 mm long, acute, relatively thickened, and whitish. Panicle ovate, with 10–13 scabrid branches and 20–25 spikelets. Spikelets viviparous, ca. 5–6.1 mm long, ovate, with 4 or 5 florets; lower and upper glumes 2.1–2.3 mm long, rhomboid, acute, 3-veined. The lowest lemma 2.5–3 mm long, ovate, obscurely 5-veined,

completely glabrous; callus glabrous. Palea keels scabrid. *Fl.* 4–6.

Selected specimens: -Kerman: Baft, Gonbadan, Mirtajadini, TUH-32100. -Khorasan: Dargaz, between Shekarab and Tandoore, 1650 m, Rafee & Zangoee, FUMH-29052. -Semnan: 35 km from Shahmirzad to Fuladmahalleh, 2300 m, Assadi & Mozaffarian, TARI-40414 (Figure 6).

Poa timoleontis is bulbous at the base and similar to *P. bulbosa* subsp. *vivipara*. It is distinguished by characters such as the relative length of ligule to length of lamina, the milky white ligules of the lower sheaths, and white wide margins of lemma.

3.2.1.6. *P. badensis* Haenke ex Willd., *Sp. Pl.* 1: 392 (1797). Perennials, densely tufted. Stems enveloped by leaf sheaths usually 2/3 of the length from the base; the uppermost node in basal 1/2 of the stem. Basal leaves 2–3.9 mm wide, linear. Ligules of the uppermost leaf 2.5–4.5 mm long, acute. Panicle ovate, with 10–14 smooth branches and 40–80 spikelets. Spikelets not viviparous, ca. 5.5–6.1 mm long, broadly ovate, with 4 or 5 florets; with smooth rachilla; lower glume 2.1–3.2 mm long, ovate, acute, 1-veined; upper glume 2.7–3.9 mm long, broadly rhomboid, 3-veined. The lowest lemma 4–4.7 mm long, broadly ovate, obtuse, with very wide hyaline margin, obscurely 5-veined, smooth, with appressed hairs between the veins in the lower part; callus webbed. Palea on the upper 2/3 of the keel ciliate and scabrid. *Fl.* 6–8.

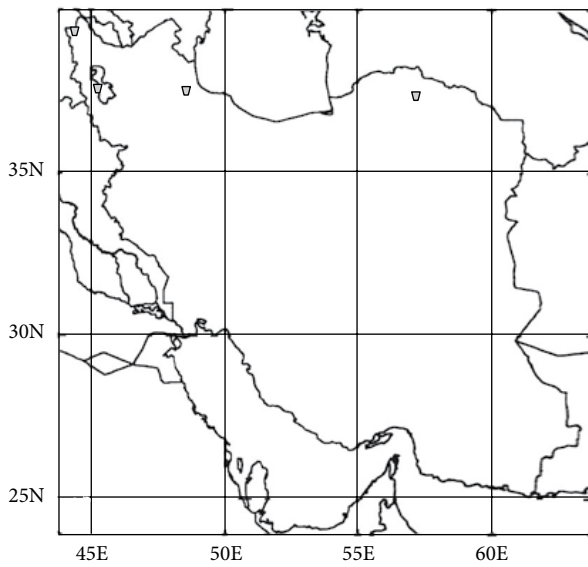


Figure 5. The distribution map of ▽ *Poa densa* in Iran.

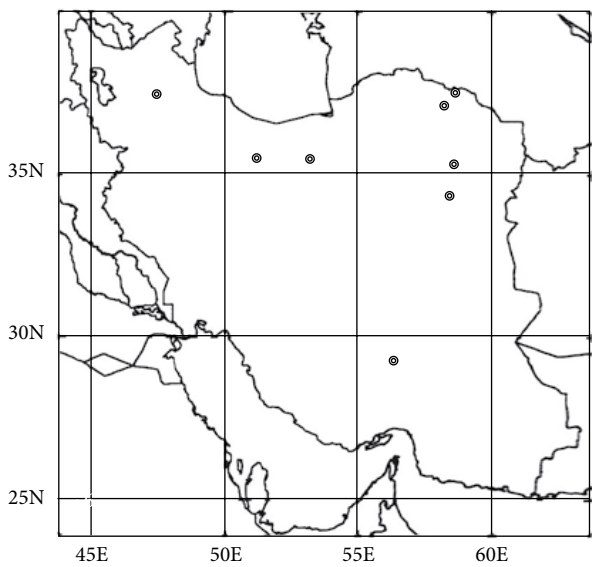


Figure 6. The distribution map of ● *Poa timoleontis* in Iran.



Specimen seen: -Azerbaijan: Arasbaran protected area, Toopkhaneh road, 2400 m, Hamzehèe & Asri, TARI-81964 (Figure 7).

The closest species is *P. alpina*. *Poa badensis* differs from *P. alpina* by the following characters: glaucous plants, densely tufted, stem leaves short and folded, rather firm with cartilaginous margins, ligules 2.5–4 mm long and acute, and the panicles more narrowly contracted.

3.2.1.7. *P. alpina* L., Sp. Pl. 1: 67 (1753).

Perennial, laxly tufted. Stems enveloped by leaf sheaths for about 1/2 of the length from the base; the uppermost node in basal 1/2 of the stem. Basal leaves 1.1–1.8 mm wide, linear. Ligules of the uppermost leaf 1.1–2 mm long, lacerate, sometimes obtuse. Panicle triangular with ca. 12 smooth branches and ca. 80 spikelets. Spikelets sometimes viviparous, ca. 5 mm long, elliptic, with 2 florets; with smooth rachilla; lower glume ca. 3.2 mm long, elliptic, acute, with a wide hyaline margin, 1-veined; upper glume ca. 4 mm long, ovate, acute, with a wide hyaline margin, 3-veined. The lowest lemma ca. 4 mm long, elliptic, obtuse, obscurely 5-veined, on the lower 2/3 of the keel; 1/3 of the marginal veins ciliate or appressed hairy, with appressed hairs between the veins in the lower part; callus glabrous. Palea on the lower 2/3 of the keel scabrid. *Fl.* 7–9.

Specimen seen: -Azerbaijan: Sabalan, 2300 m, Javanshir, TARI-755 (Figure 8).

Diagnostic characters of *P. alpina* are: laxly tufted, shape (lacerate) and length of ligules of the uppermost leaf, size of basal leaves, shape (obtuse) and length (1 mm) of their ligules; panicle contracted.

3.2.1.8. *P. pratensis* L., Sp. Pl. 1: 67 (1753).

Perennials rhizomatous. Stems enveloped by leaf sheaths for about 1/2 of the length from the base to below panicle; the uppermost node in basal 1/3 of the stem. Basal leaves 1–4 mm wide, linear. Ligule of the uppermost leaf acute or obtuse, less than 3 mm long. Panicle triangular to narrowly elliptic, with more than 12 branches and 60 spikelets. Spikelets 3–6.2 mm long, ovate to elliptic, with 2–6 florets; smooth rachilla; lower glume 1.5–3.1 mm long, ovate or lanceolate, acute, with a wide hyaline margin, 1- or 2-veined; upper glume 2.1–3.2 mm long, ovate or lanceolate, acute, with a wide hyaline margin, 1- to 3-veined. The lowest lemma 2.2–4 mm long, elliptic or ovate, truncate or obtuse, obviously 5-veined, on the lower 2/3 of the keel; 1/3 of the marginal veins ciliate or appressed hairy, smooth between the veins and on the intermediate veins; callus webbed, hairs wooly. Palea with scabrid keels in the lower part. *Fl.* 4–7.

- Lower leaves 3–4 mm wide; panicle triangular subsp. *pratensis*
- Lower leaves 1–3 mm wide; panicle narrowly ovate subsp. *angustifolia* (L.) Gaud.
- subsp. *pratensis*

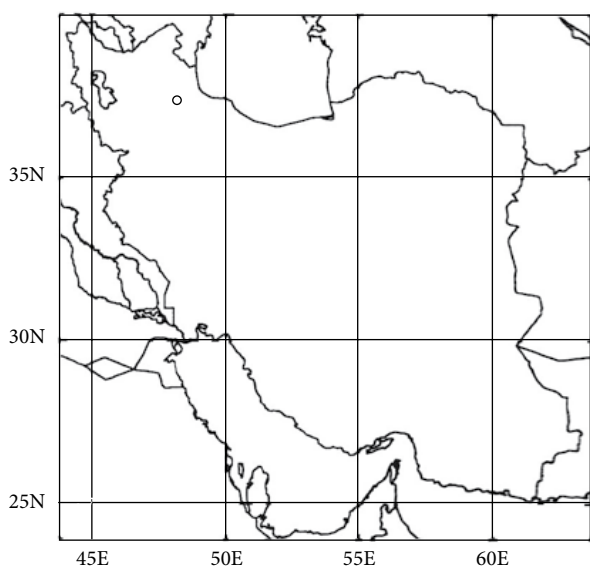


Figure 7. The distribution map of *Poa badensis* in Iran.



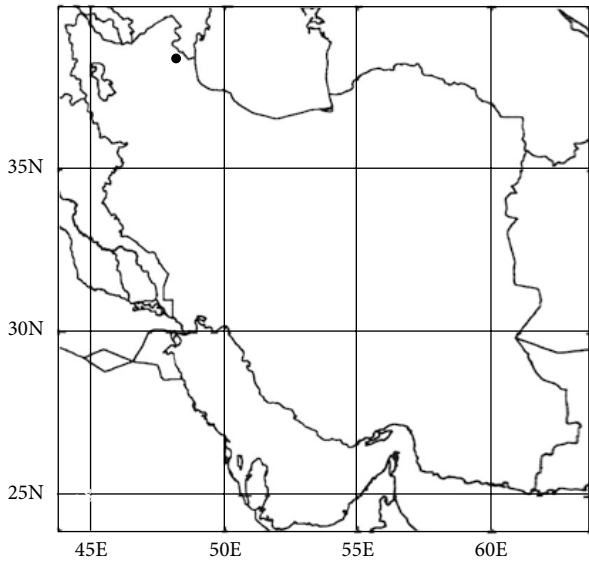


Figure 8. The distribution map of ● *Poa alpina* in Iran.

Lower leaves of stem more than 2 mm wide. Panicle triangular.

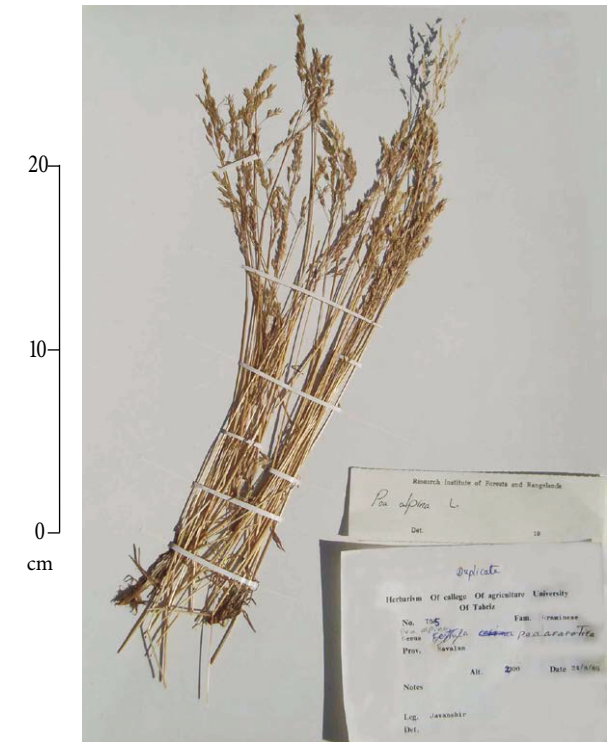
Selected specimens: -Golestan: Golestan forest, Golzar, Attar et al., TUH-38491. -Mazandaran: S of Ramsar, W of Javaherdeh, ca. 1800 m, Runemark & Maasoumi, TARI-20797. -Azerbaijan: Ardabil, E of Sabalan mountain, Abgarne Sardabeh, 1750–2000 m, Assadi, TARI-86601. -Lorestan: 61 km on road from Aligodarz to Shoulabad, valley after the pass, 2400 m, Runemark & Lazari, TARI-26268. -Yazd: Dare Abshar, 15 km SE of Shirkuh, 2100 m, Edmondson & Milller, TARI-1518. -Tehran: 8 km to Tunnel Kandvan, 1 km to Pol e Zanguleh, 2280 m, Amin & Mousavi, TARI-11193 (Figure 9).

-subsp. *angustifolia* (L.) Gaud., Agrost. Helv. 1: 214 (1811).

Syn.: *P. angustifolia* L., Sp. Pl. 1: 67 (1753).

Lower leaves of stem less than 2 mm wide. Panicle narrowly ovate.

Selected specimens: -Mazandaran: Pol sefid, Sangdeh, Ashak, 1600–2600 m, Assadi, TARI-73612. -Azerbaijan: Arasbaran protected region, Hejrاندust to Makidi, 1400–1750 m, Assadi & Maasoumi, TARI-20123. -Hamedan: km 8 SW Hamedan, 2100 m, Pabot, TARI-27906. -Isfahan: Najafabad, Asefi, TARI-24617. -Baluchestan: Taftan Mnt. Region, Tamendan valley, 2300–2500 m, Mozaffarian, TARI-53158. -Khorasan: Nishabour, Akhlamad, Rechinger et al., IRAN-21270. -Tehran: Gharieh Shulunbeh, road



of Firuzkuh, 1950 m, Bazargan & Arazm, TARI-11227 (Figure 10).

Poa pratensis subsp. *pratensis* and *P. pratensis* subsp. *angustifolia* are very similar with several overlapping characters. The 2 taxa in some local literature (Tzvelev, 1983) have been regarded at the subspecific rank, which is followed here as well.

3.2.2. Section *Homalopoa* Dumort. Observ. Gram. Belg.: 110, 113, s. str. (1823).

Perennials, rhizomatous or not rhizomatous. Stems enveloped by leaf sheaths for about 2/3 to 5/6 of the length from the base. Panicle with scabrid branches. Spikelets not viviparous. Callus of lemma webbed, web sparse. Palea with scabrous or ciliate keels in the lower part.

3.2.2.1. *P. masenderana* Freyn & Sint., Bull. Herb. Boiss. 2, 2: 915 (1902).

Perennials rhizomatous. Plant with nonflowering shoots. Stems enveloped by leaf sheaths for about 2/3 of the length from the base; the uppermost node in middle 1/3 of the stem. Basal leaves 1–3.8 mm wide, linear. Ligule of the uppermost leaf acute or obtuse, less than 3 mm long. Panicle triangular, with more than 8–12 branches and 24–56 spikelets. Spikelets 5.1–5.8 mm long, ovate, with 3 or 4 florets; smooth rachilla; lower glume 2–3.2 mm long, lanceolate, acute, with a wide hyaline margin, 1-veined; upper glume 2.7–3.5 mm long, ovate, acute, with a wide

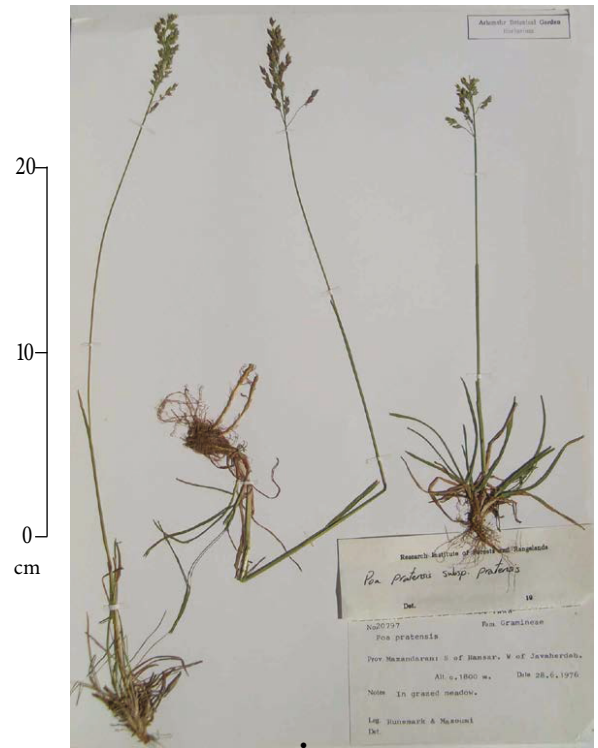
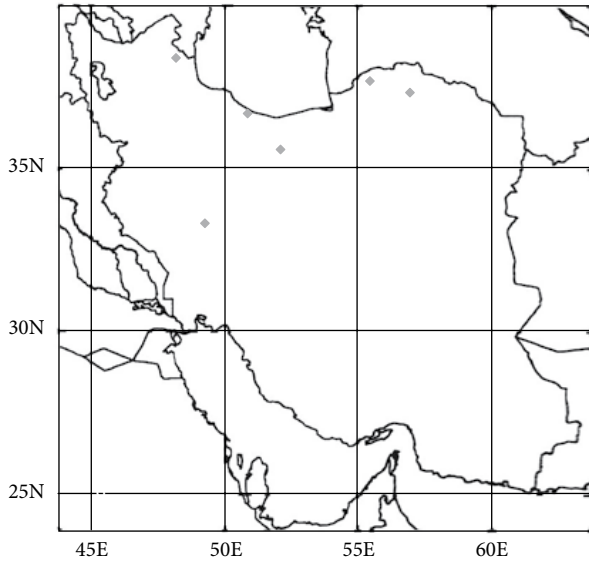


Figure 9. The distribution map of \blacklozenge *Poa pratensis* subsp. *pratensis* in Iran.

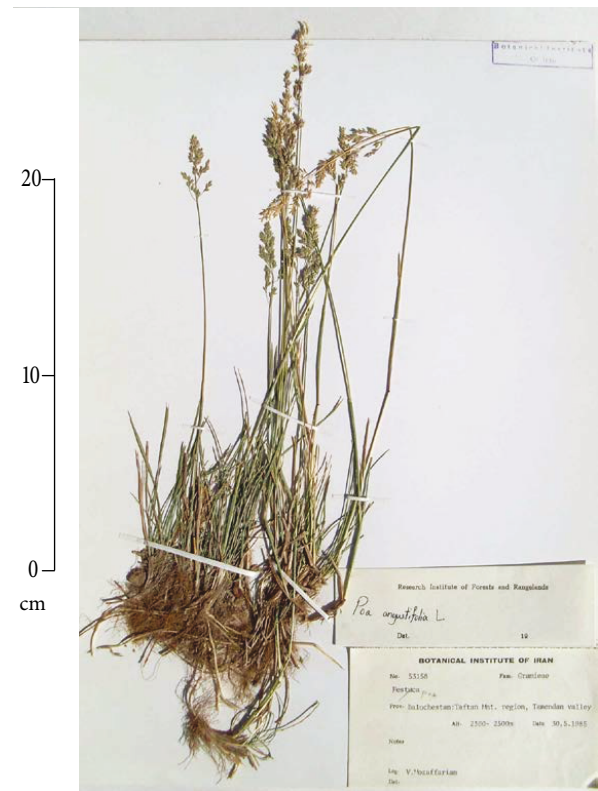
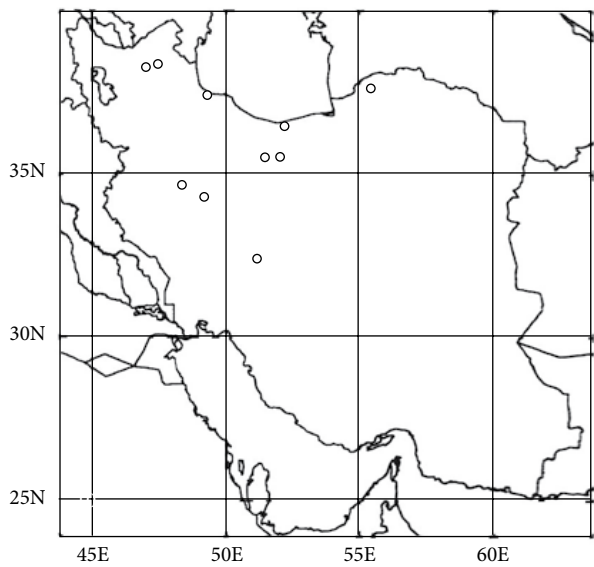


Figure 10. The distribution map of \circ *Poa pratensis* subsp. *angustifolia* in Iran.

hyaline margin, 3-veined. The lowest lemma 3.2–4 mm long, elliptic to ovate, acute, with a narrow hyaline margin, obviously 5-veined, on the lower 2/3 of the keel and 1/4–2/3 of the marginal veins ciliate or appressed hairy, pubescent between the veins in the lower part; callus webbed. Palea 2.8–3.6 mm long, on the lower 1/2–3/4 of the keel ciliate. *Fl.* 4–8.

Selected specimens: -Golestan: Golestan forest, Abshoor, Danesh Pajhooh, IRAN-21247. -Mazandaran: near Veysar, 1500 m, Wendelbo & Shirdelpur, TARI-11722. -Gilan: Asalem to Khalkhal, 1000–1500 m, Terme & Matin, IRAN- 21249 (Figure 11).

Poa masenderana is distinguished by the following characters: lemma with moderately to strongly expressed intermediate veins, pubescent between the veins in the lower part, palea with distinctly scabrous keels, ligule of the uppermost leaf 0.8–1.2 mm long.

3.2.3. Section *Macropoa* F.Herm. ex Tzvelev, Novosti Sist. Vyssh. Rast. 9: 49 (1972).

Perennials, rhizomatous or not rhizomatous. Stems enveloped by leaf sheaths for about (1/3–)2/3–5/6(–1/4) of the length from the base. Panicle with usually scabrid branches. Spikelets not viviparous. Lemma and callus glabrous. Palea with scabrous keels.

3.2.3.1. *P. longifolia* Trin., Mém. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 4, 2: 61–62 1: 619 (1836).

Perennials. Plant with numerous nonflowering shoots. Stems enveloped by leaf sheaths for about 5/6 of the length from the base to below panicle; the uppermost node in upper 1/3 of the stem. Basal leaves 1–2 mm wide, linear. Panicle compact, with usually scabrid branches, with ca. 15 short branches and ca. 70 spikelets. Spikelets 6–7 mm long, ovate, with 4–6 florets; with smooth rachilla; lower glume 2–3.1 mm long, elliptic, acute, with a wide hyaline margin, 1-veined; upper glume 3–4 mm long, wide elliptic, acute, with a wide hyaline margin, 3-veined. The lowest lemma 3.2–4.2 mm long, ovate, obtuse, with a narrow hyaline margin, obviously 5-veined with obvious lateral veins, smooth; callus glabrous. Palea with scabrid keels in the upper part. *Fl.* 6–8.

Specimens seen: -Tehran: Taleqan Alamut, 3400 m, Mirfakhrai, TARI-11178. Alamut Qazvin, 2900 m, Mirfakhrai, TARI-11241 (Figure 12).

The type of *P. golestanensis* H.Scholz & Akhani [Edinburgh J. Bot. 55(3): 449. (1998)] is preserved in a private herbarium in Iran and was not available for examination. However, its diagnostic characters match with the characters of *P. longifolia*. *P. golestanensis* might be a synonym of *P. longifolia*. The previous record of *P. longifolia* subsp. *longifolia* var. *nigrescens* from Iran by Hamzehèe (2000) was based on a specimen of *Catabrosa aquatica* (L.) Beauv.

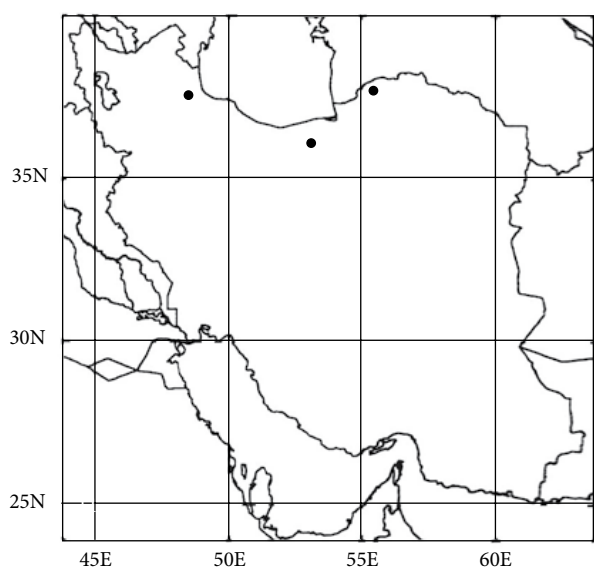
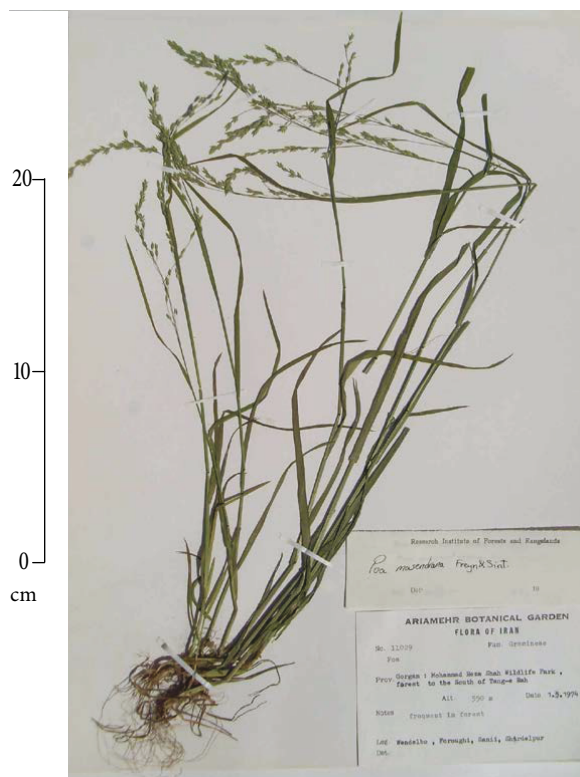


Figure 11. The distribution map of ● *Poa masenderana* in Iran.



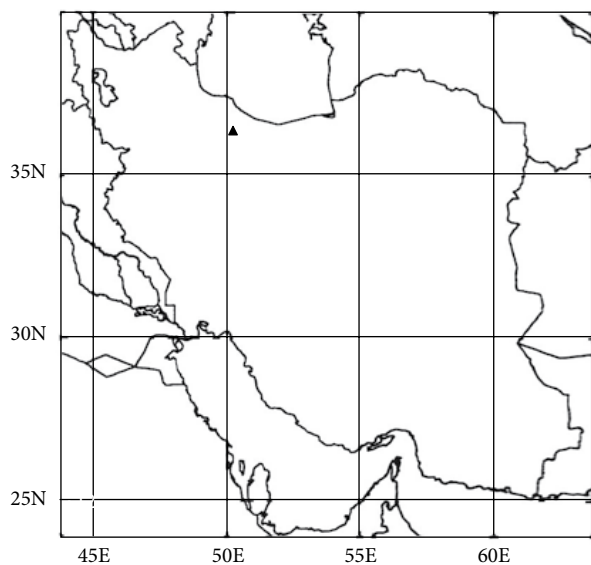


Figure 12. The distribution map of ▲ *Poa longifolia* in Iran.



3.2.4. Section *Micrantherae* Stapf, Fl. Brit. India 7(22): 343 1897 [1896].

Syn.: Sect. *Ochlopoa* (Aschers. et Graebn.) Jiras., Vestn. Kral. Ces. Spol. Nauk. 2: 3 (1935).

Perennials or annuals rarely rhizomatous or not rhizomatous. Stems enveloped by leaf sheaths for about 1/3–2/3 of stem length from the base. Panicle with glabrous or somewhat scabrid branches. Spikelets not viviparous. Lemma glabrous on the interveins and callus glabrous. Palea with ciliate or pilulose keels.

3.2.4.1. *P. infirma* Kunth, Nov. Gen. et Sp. 1: 158 (1816).

Syn.: *P. annua* L. var. *exilis* Tomm. ex Freyn, Verh. Zool. Bot. Ges. Wien 27: 469 (1878).

Annual. Stems enveloped by leaf sheaths for about 1/2 of the length from the base to below panicle; the uppermost node under leaf sheaths. Basal leaves 2–2.3 mm wide, linear. Ligule of the uppermost leaf acute, 2 mm long. Panicle open, triangular, with 10–13 thin branches and 17–26 spikelets. Spikelets 2.8–3.1 mm long, elliptic, with 3 florets; with smooth rachilla; lower glume 1–1.2 mm long, lanceolate, acute, with a narrow hyaline margin, 1-veined; upper glume 1.4–1.6 mm long, lanceolate, obtuse, with a narrow hyaline margin, 3-veined. The lowest lemma 2–2.2 mm long, ovate, obtuse, with a narrow hyaline margin, obviously 5-veined with obvious lateral veins, on the lower 3/4 of the keel and 1/3 of the marginal and middle veins ciliate; callus glabrous. Palea with pilulose keels. Anthers 0.3 mm long. *Fl.* 3–6.

Selected specimens: -Golestan: Gorgan, Bazargan, IRAN-21239. -Fars: 18 km on road from Kazerun to Dalaki, 800 m, Runemark & Mozaffarian, TARI-26755. -Khuzestan: 3 km S of Ramhormoz, 250 m, Runemark & Mozaffarian, TARI-30935 (Figure 13).

3.2.4.2. *P. annua* L., Sp. Pl. 1: 68 (1753).

Annuals or sometimes perennials, mostly not rhizomatous. Stems enveloped by leaf sheaths throughout the length; uppermost node in middle of the stem. Basal leaves 1.2–4 mm wide, linear. Ligule of the uppermost leaf obtuse, 1.5–3.1 mm long. Panicle open, triangular, with 6–16 branches and 18–37 spikelets. Spikelets 2.7–6 mm long, ovate or elliptic, with 4 or 5 florets; smooth rachilla; lower glume 1.5–3.1 mm long, lanceolate, obtuse, 1-veined; upper glume 1.7–3.5 mm long, rhomboid, acute, 3-veined. The lowest lemma 2.1–3.7 mm long, elliptic, with a wide hyaline margin, obtuse, obviously 5-veined with obvious lateral veins, on the lower 3/4 of the keel and 1/3 of the marginal and middle veins appressed hairy; callus glabrous. Palea with pilulose keels in the lower part. Anthers at least (0.5–) 0.6 mm long. *Fl.* 3–9.

Selected specimens: -Golestan: Azdar Tappeh, village near Minou Dasht, 100 m, Hewer, TARI-3649. -Mazandaran: Tonekabon, 10 m, Ghahreman & Mozaffarian, TUH-9888. -Gilan: Rasht, Someesara, Mirkamali, IRAN-21279. Talesh, 1000 m, Esfandiari, IRAN-21278. -Azerbaijan: Ardabil, Sardabe, 2107 m, Ghahreman et al., TUH-35309. Khuzestan: Shush, 110 m,

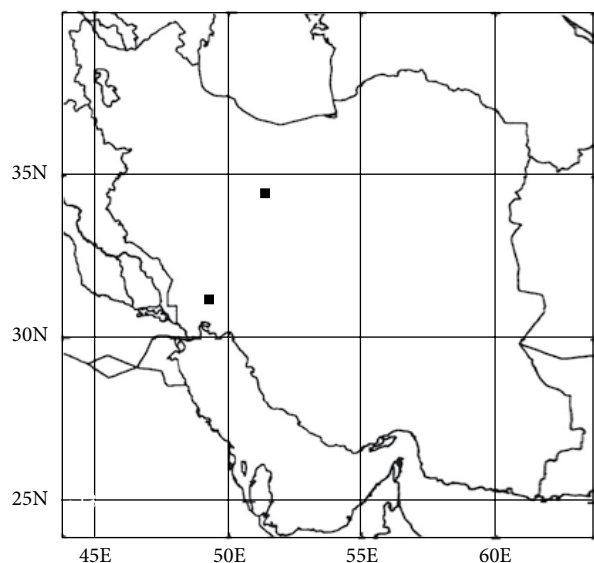
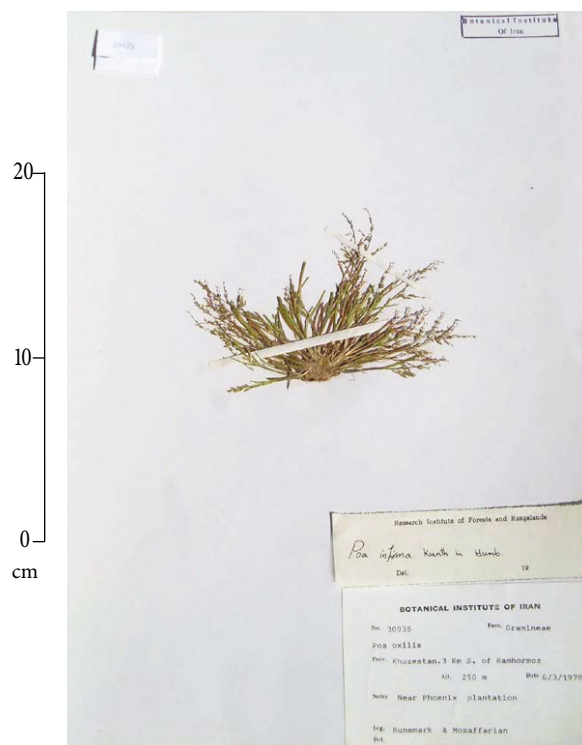


Figure 13. The distribution map of *Poa infirma* in Iran.



Mozaffarian, TARI-62205. -Khorasan: Sabzevar, 80 km NE of Sabzevar in Yam valley, Ardang area, 1650 m, Eftekhari & Filekesh, TARI-190. -Tehran: Botanical Institute of Iran, 1320 m, Buttler, TARI- 31826 (Figure 14).

In *Flora of Pakistan* (Cope, 1982), the diagnostic characters distinguishing *P. annua* and *P. supina* are: spikelets aggregated or not toward the tips of the branches, length of anthers.

3.2.5. Section *Pandemos* Asch. & Graebn., Syn. Mitteleur. Fl. 2: 425 (1900).

Perennials, rhizomatous or stoloniferous. Stems enveloped by leaf sheaths for about 1/4 to 1/3 of the length from the base. Panicle with scabrid branches. Spikelets not viviparous. Lemma with scabrid veins in the lower part and callus webbed and hairs wooly. Palea with tuberculate or muriculate keels.

3.2.5.1. *P. trivialis* L., Sp. Pl. 1: 67 (1753).

Perennials, rhizomatous to stoloniferous. Stems enveloped by leaf sheaths for about 1/2 of the length from the base; the uppermost node in middle of the stem. Basal leaves 1.2–4 mm wide, linear. Ligule of the uppermost leaf acute, at least 3 mm long. Panicle elliptic to triangular, with up to ca. 30 branches and ca. 250 spikelets. Spikelets 2.4–4.5 mm long, ovate, with 2–4 florets; with smooth rachilla; lower glume 1.4–2.5 mm long, lanceolate, acute, 1-veined; upper glume 1.8–3.1 mm long, rhomboid, acute, 3-veined.

The lowest lemma 2.2–3.2 mm long, elliptic, obtuse, with a wide hyaline margin, with semi- or, more usually, obvious lateral veins; on the lower 1/2–3/4 of the keel and 1/6–1/3 of the marginal veins appressed hairy; callus webbed, web distinct, hairs wooly. Palea with very short scabrous or muriculate keels. Fl. 5–9.

- Panicle relatively open; stolons slender and terete subsp. *trivialis*
- Panicle relatively compact; stolons moniliform and rather firm subsp. *sylvicola* (Guss.) H.Lindb.
- subsp. *trivialis*

Perennials, rhizomatous. Stolons slender. Panicle relatively open.

Selected specimens: -Golestan: Golestan forest, SW of Tangrah, lower waterfall, 900 m, Faghihnia et al., FUMH-25517. -Mazandaran: Pol e Zangole, 2300 m, Nazarian, TUH-33126. -Gilan: Bandar Anzali, 20 m, Mozaffarian, TUH-6836. -Azerbaijan: ca. 9 km from Khalkhal on the road to Asalem, 2050 m, Assadi & Shahsavari, TARI-66003. -Kordestan: Ghorveh, Sabeti, IRAN-21289/1. -Hamedan: Soltan Bolagh, Sabeti, IRAN-21290/1. -Kermanshah: 30 km N of Kerend Gharb, Sarabe Babamaghsod, 1700 m, Hamzehèe & Hatami, TARI-1415. -Yazd: Taft, Dehbala, 2280 m, Mousavi & Tehrani, IRAN-21305. -Chaharmahal e Bakhtiari: Shahre kurd, between Gahro and Naghan, Chamanare Sulegan, ca. 2100 m, Mozaffarian, TARI-

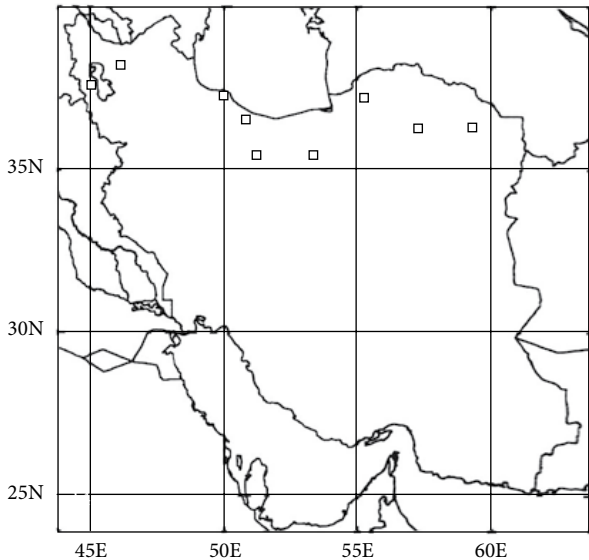


Figure 14. The distribution map of \square *Poa annua* in Iran.

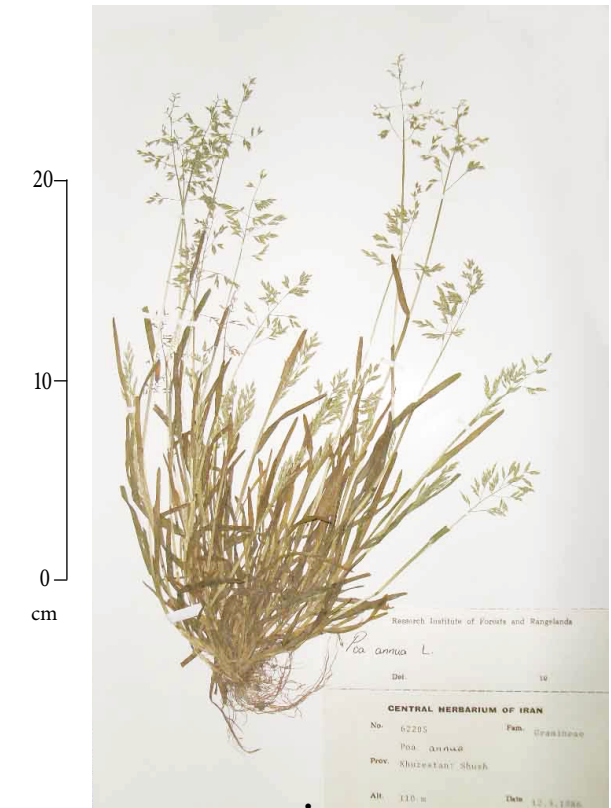
54849. -Isfahan: Samirom, Vanak, Ganat spring, 1950 m, Parishani, FUMH-14496s. -Kerman: Baft, 1900 m, Mack Kannel, TARI-32255. -Khorasan: E of Kalat, 1000 m, Ayatollahi & Joharchi, FUMH-13117. -Tehran: Lar valley, 2650 m, Mozaffarian, TARI-81145 (Figure 15).

-subsp. *sylvicola* (Guss.) H.Lindb, Oefvers. Förh. Finska Vetensk. Soc. 48(13): 9 1906.

Syn.: *P. sylvicola* Guss., Enum Pl. Inarim. 371, pl. 18 (1854).

Perennials, rhizomatous. Stolons moniliform, rather firm. Panicle relatively compact.

Selected specimens: -Mazandaran: Lar valley, 2420 m, Wendelbo & Asaadi, TARI-13303. -Azerbaijan: Tabriz, Ahar, Meshganbar, 1820 m, Mirdamady, IRAN-21299. -Kordestan: river coast of Salwat abad village, E of Sanandaj, 12 km from Sanandaj, 1480 m, Fattahi & Khaledian, TARI-276. -Hamedan: 8 km SW of Hamedan, Pabot, IRAN-21283. -Kermanshah: 45 km W of Kernd gharb, Rijab village, Iranshahr, IRAN-21282/1. -Lorestan: 21 km on road from Shoulabad to Aligodarz, 2000 m, Runemark & Lazari, TARI-26409. -Isfahan: Naragh, 49 km NW Kashan, 2130 m, Babakhanlou & Amin, IRAN-29205. -Yazd: Taft to Nir, Garden e Sakhvid, 2700–2900 m, Mozaffarian, TARI-77544. -Chaharmahal e Bakhtiari: Shahr e Kord, Baba Heidar, 2150–2500 m, Mozaffarian,



TARI-54821. -Kerman: Khansir spring, 3 km of Deh Bakri, 40 km W of Bam, 1900 m, Assadi et al., TARI-2007. -Khorasan: ca. 25 km SW of Darreh Gaz, Tandooreh National Park, Chehel Mehr, 1200 m, Assadi & Maasoumi, TARI-50769. -Tehran: Lar valley, 2420 m, Wendelbo & Assadi, TARI-43732 (Figure 16).

In fact, these taxa have many overlapping characters, and their differences are confined to the shape of stolons and type of panicle.

3.2.6. Section *Stenopoa* Dum., Observ. Gram. Belg.: 110, 112, s. str. (1823).

Perennials, not rhizomatous, rarely (in *P. compressa*) rhizomatous, usually forming somewhat dense tuft. Stems enveloped by leaf sheaths less than 1/5 of the length from the base. Panicle with very scabrid branches. Spikelets not viviparous. Lemma somewhat pilose in the lower part, at least on the keel and marginal veins; callus glabrous or with a few hairs. Palea with scabrid keels in the upper part, sometimes with ciliate keels in the lower part.

3.2.6.1. Subsection *Breviligulatae* V. Jirásek Věstn. Král. České Společn. Nauk, Tr. Mat.-Přír. 2: 4 (1935).

Syn. subsect. *Longiligulatae* V. Jirásek, l. c.: subsect. *Glaucopoa* V. Jirásek, l. c.

Plants with cylindrical or slightly compressed stems and nodes.

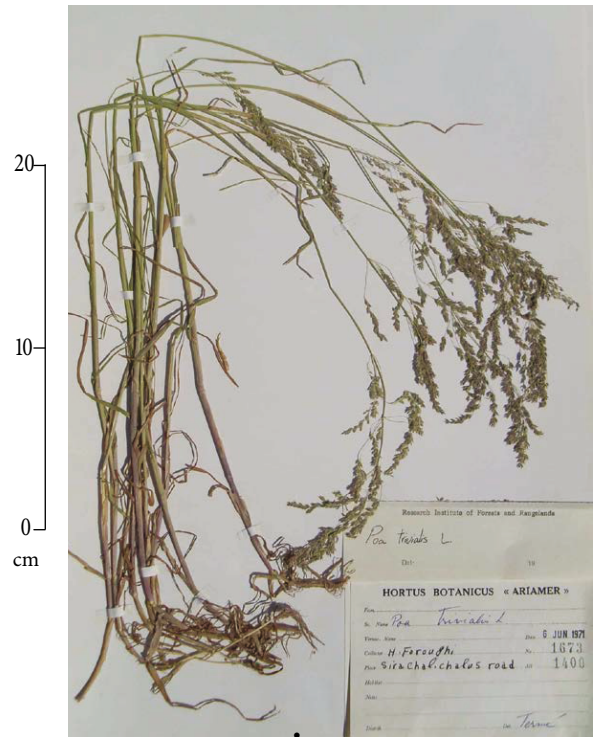
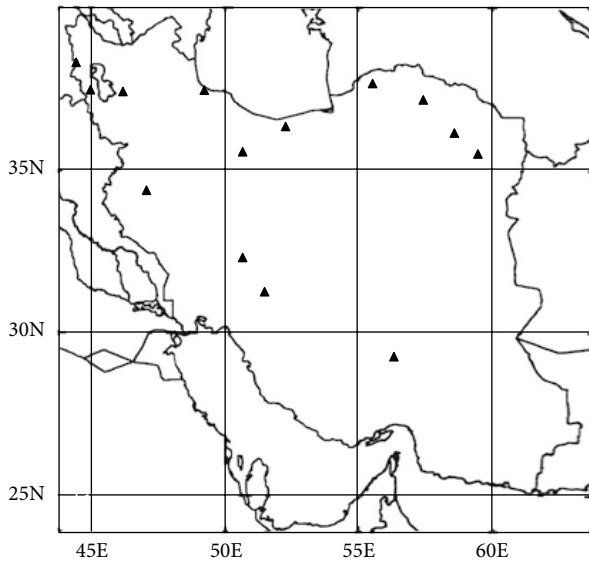


Figure 15. The distribution map of ▲ *Poa trivialis* subsp. *trivialis* in Iran.

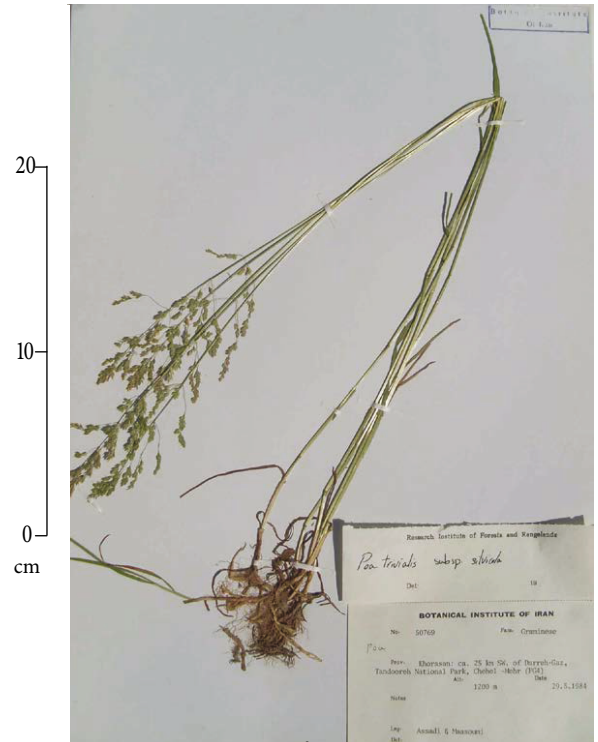
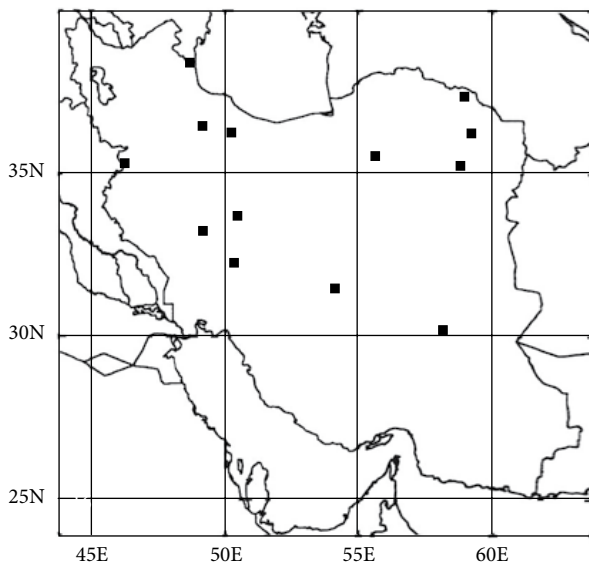


Figure 16. The distribution map of ■ *Poa trivialis* subsp. *sylvicola* in Iran.

3.2.6.1.1. *P. nemoralis* L., Sp. Pl. 1: 69 (1753).

Plants laxly caespitose, with numerous cylindrical stems. Stems enveloped by leaf sheaths for about 1/2 of the length from the base; the uppermost node in upper 1/3 of the stem. Basal leaves 1–2.2 mm wide, convolute. Ligule of the uppermost leaf less than 0.5 mm long, rarely up to 1 mm. Panicle open, triangular to narrowly elliptic, with 15–25 branches and 23–110 spikelets. Spikelets 3–5.2 mm long, ovate or elliptic, with 2 (rarely 4) florets; with hairy rachilla; lower glume 2.1–3.2 mm long, lanceolate, acute, 3-veined; upper glume 2.2–4 mm long, lanceolate, acute, 3-veined. The lowest lemma 2.8–4 mm long, lanceolate to ovate, with a wide hyaline margin, acute, obscurely 5-veined, on the lower 1/3 of the keel and marginal veins appressed hairy; callus webbed. Palea with scabrid keels. *Fl.* 5–9.

Selected specimens: -Golestan: Golestan National Park, 550–600 m, Terme & Matin, IRAN-21251/1. -Mazandaran: Chalus to Karaj, between Pol e Zanguleh and Harijan, 2400 m, Nazarian, TUH-33120. -Gilan: near Damash, E of Rudbar, 1700 m, Wendelbo & Ann Ala, TARI-18249. -Azerbaijan: Kaleibar, near the castle of Babak, 1500 m, Ghahreman et al., TUH-17504. -Semnan: Shahrod, Chehel dokhtar, Ghatry village, Kuh e Ghasem, 1000–2500 m, Mousavi, IRAN-21259; ca. 50 km N of Semnan, between Sheli and Hikuh villages, 2400 m, Assadi & Mozaffarian, TARI-40567. -Tehran: mountains of Shahneshin, 3000 m, Amin & Bazargan, TARI-33092 (Figure 17).

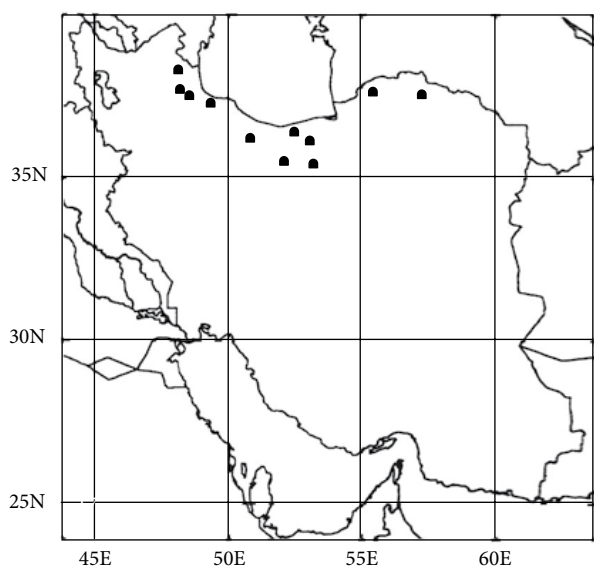
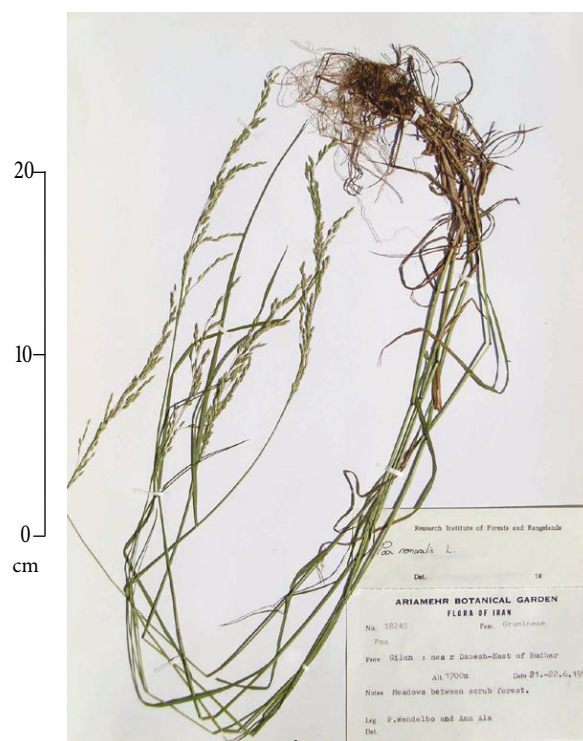


Figure 17. The distribution map of *Poa nemoralis* in Iran.

In most Floras the length of the ligule of the uppermost leaf is recorded as up to 0.5 mm long. However, some herbarium specimens and collected plant specimens from Arasbaran have ligules of up to 1 mm long and callus of lemma webbed (web sparse). Presence of a web on the callus was not mentioned in the *Flora of Turkey* (Edmondson, 1985), *Flora Europaea* (Edmondson, 1980), or *Flora of Pakistan* (Cope, 1982). In *Flora Iranica* (Bor, 1970), the callus of the lemma was described as distinctly webbed with wooly hairs, but in *Grasses of the Soviet Union* (Tzvelev, 1983), *Flora Palaestina* (Feinbrun, 1986), and *Flora of the USSR* (Roshevits and Shishkin, 1934) a sparse web was mentioned.

3.2.6.1.2. *P. palustris* L., Syst. Veg., ed. 10, 2: 874 (1759).

Plants laxly caespitose, not rhizomatous. Stems enveloped by leaf sheaths for about 2/3 of the length from the base to below panicle; the uppermost node in middle 1/3 of the stem. Basal leaves 2–3.5 mm wide, linear. Ligule of the uppermost leaf obtuse, 1–3 mm long. Panicle open, elliptic, with 8–15 scabrid and mostly horizontal branches, spikelets 30–62(–84). Spikelets 4.2–6.2 mm long, ovate, with 3 or 4 florets; with smooth rachilla; lower glume 2–3.4 mm long, lanceolate, acute or obtuse, usually 1-veined; upper glume 2.5–4.5 mm long, ovate, acute or obtuse, 3-veined. The lowest lemma 3–4.7 mm long, ovate, with a narrow hyaline margin, obtuse, obscurely 5-veined, on the lower 2/3 of the keel and 1/4–2/3 of the marginal veins ciliate; callus webbed. *Fl.* 4–8.



Selected specimens: -Mazandaran: Tonekabon, Janat Rudbar, 1600–2700 m, Mozaffarian & Ghahreman, TUH-9871. -Gilan: mountains above Damash, E of Rudbar, 1900 m, Wendelbo & Ann Ala, TARI-18173 (Figure 18).

Poa palustris is distinguished from *P. trivialis* by its smooth stem leaf sheaths and blunt ligules. It differs from *P. nemoralis* by its longer ligules. It is distinguished from *P. pratensis* by its longer ligules and the absence of rhizomes (Kavousi et al., 2010).

The authors of some references, e.g., *Flora of Turkey* (Edmondson, 1985) and *Grasses of the Soviet Union* (Tzvelev, 1983), cited Iran within the geographical distribution of this species, but without citing any specimens.

3.2.6.1.3. *P. sterilis* M.Bieb., Fl. Taur.-Cauc.1: 62 (1808).

Plants densely caespitose, somewhat glaucous or green. Stems slender, enveloped by leaf sheaths up to 2/3 of the length from the base, with unobvious nodes, the uppermost node usually in the middle and sometimes in the basal 1/3 of the stem, with yellowish remnants of old leaves at the base. Basal leaves 1–2 mm wide, convolute. Ligule of the uppermost leaf at least 1 mm long. Panicle elliptic or triangular; the lowest branch up to 5.5 cm long with more than 30 spikelets distributed along the branches; lower branches 2–5 in number. Lemma elliptic, 5-veined with obscure lateral veins, glabrous between the veins in the lower part; callus glabrous or webbed. Fl. 4–8.

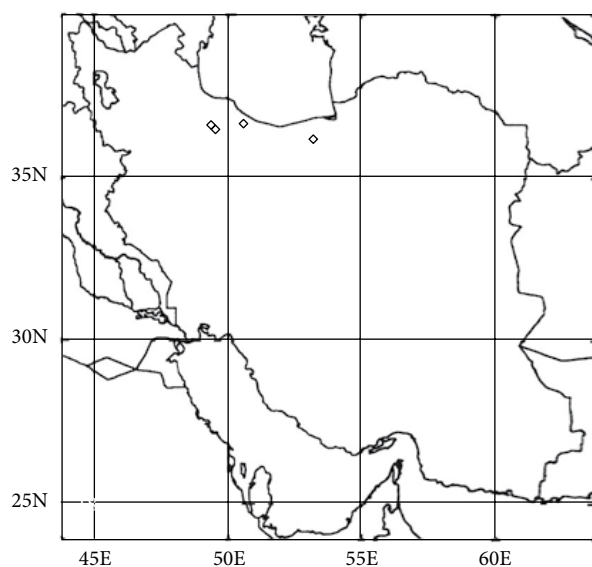


Figure 18. The distribution map of ◊ *Poa palustris* in Iran.

Selected specimens: -Mazandaran: Sangdeh, Sabeti, IRAN-21180. -Gilan: Asalem to Khalkhal, 2350 m, Aellen, IRAN-29224/1. -Azerbaijan: Shahbil, Kuh e Sabalan, 3000 m, Foroughi & Assadi, TARI-13889. -Lorestan: Ghali Kuh (E of the pass on road Aligodarz to Shoulabad), Runemark & Lazari, 3600 m, TARI-26475. -Yazd: Shirkuh, from Deh e bala and Sheikh Alishah and Lagerd valleys, 2400–3400 m, Mozaffarian, TARI-77638. -Kerman: Kuh e Hazar, Hazargol valley, 2800–3200 m, Foroughi & Assadi, TARI-16259. -Khorasan: Kopet Dagh range, 40 km N NE of Shirvan, Kuh e Zakariyah, 7 km SE of Cheshmeh e Gabri, 2600 m, Edmondson, TARI-1254. -Tehran: Firouzkuh, Arjomand, 1900 m, Malekpour, TARI-9278 (Figure 19).

In *Grasses of the Soviet Union* (Tzvelev, 1983) and *Flora of Turkey* (Edmondson, 1985), the record of this species from Iran by Bor (1970) is known as a probable mistake. Its closest species is *P. versicolor* subsp. *araratica*.

3.2.6.1.4. *P. versicolor* Besser, Enum. Pl. 41 (1822).

subsp. *araratica* (Trautv.) Tzvelev, Nov. Sist. Vyssh. Rast. 11: 31 (1974).

Syn.: *P. araratica* Trautv., Trudy Imp. S. - Peterburgsk. Bot. Sada 2(1): 486 (1873).

Plants densely caespitose, somewhat glaucous or green. Stem slender, with unobvious nodes, the uppermost node in the basal 1/3 of the stem, with reddish remnants of old leaves at the base, up to 2/3 of their length from the base enveloped by stem leaf sheaths. Basal leaves 1–1.8 mm



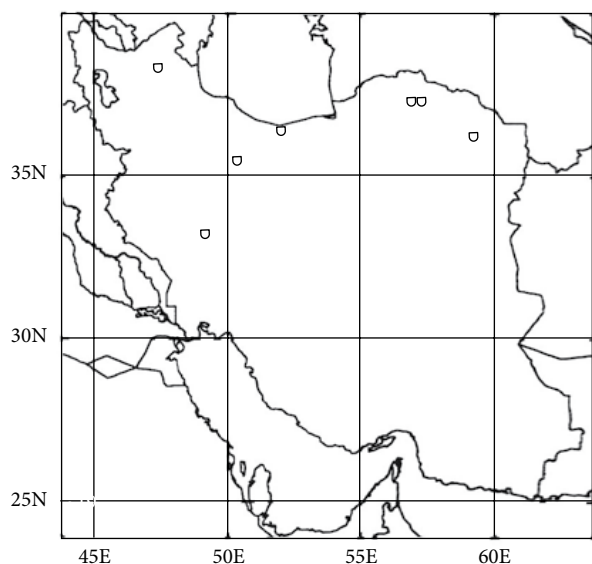


Figure 19. The distribution map of *Poa sterilis* in Iran.

wide, convolute. Ligule of the uppermost leaf at least 1 mm long. Panicle narrowly oblong; the lowest branch up to 3 cm long; lower branches 2–5 in number. Lemma elliptic, 5-veined with obscure lateral veins, glabrous between the veins in the lower part; callus glabrous or webbed. *Fl.* 6–8. Selected specimens: -Mazandaran: Kandovan Tunnel, 2550 m, Babakhanloo & Amin, IRAN-29213. -Azerbaijan: Marand, opposite Yam, Mishudagh, 2200 m, Ghahreman & Mozaffarian, TUH-17392. -Khorasan: Esferayen, Shah Jahan Mts. Region, rocky mountains Tourkan, from deep gorge close to Noushirvan village, 1400–2500 m, Mozaffarian, TARI-48583. -Semnan: 12 km from Firouzkuh on the road to Semnan, 2100 m, Assadi, TARI-40308. -Tehran: Dizin, Chalus road, Gachsar, 2300–3800 m, Ghahreman & Mozaffarian, TUH-6997 (Figure 20).

In *Grasses of the Soviet Union* (Tzvelev, 1983), the diagnostic characters distinguishing *P. versicolor* and *P. araratica* are: length of branches of panicle, number of the lowest branches of panicle, number of florets in each spikelet, and size and color of spikelets.

Other diagnostic characters of *P. versicolor* subsp. *araratica* are presence of thick rhizome, red old remnants of leaf sheaths at the base of stem, uppermost node in the lower 1/3 of the stem, narrowly oblong panicle, length of lower branches of panicle up to 3 cm long, and acute or obtuse ligule of uppermost leaf.



3.2.6.1.5. *P. glauca* Vahl, *Fl. Dan.* 6 (17): 3 pl. 964 (1790). Plants densely caespitose, without nonflowering shoots, very glaucous. Stems usually leafy up to the middle; the uppermost node under the leaf sheaths. Basal leaves 0.6–2.2 mm wide, convolute. Ligule of the uppermost leaf at least 1 mm long. Panicle with less than 40 spikelets that aggregate in the apex of the branches; lower branches 2–3 in number, rarely 5 in number. Lemma elliptic, with obscure lateral veins, glabrous between the veins in the lower part, callus webbed. *Fl.* 5–7.

Selected specimens: -Mazandaran: Sangdeh, 30 km SE of Pol sefid, 2000–2500 m, Renz & Iranshahr, IRAN-21178/1. -Azerbaijan: N of Sahand, Ghochgoli, 3000 m, Rajabi, IRAN-21182. -Yazd: Shirkuh, from Deh e bala and Sheikh Alishahr and Lagerda valleys, 2400–3400 m, TARI-77639. -Semnan: ca. 50 km N of Semnan, mountains above Hikuh, 2400–2700 m, Assadi & Mozaffarian, TARI-40742. -Tehran: Karaj valley, Dizin, 3300 m, Wendelbo & Kobham, TARI-14030 (Figure 21).

This species has a wide circumpolar distribution. Among the specimens collected in the same area and at the same time, high variation in morphology was observed. The density of hairs between the veins of the lemma in the lower part changes from totally glabrous to completely hairy with increasing altitude. This point has not been discussed in any other descriptions or references.

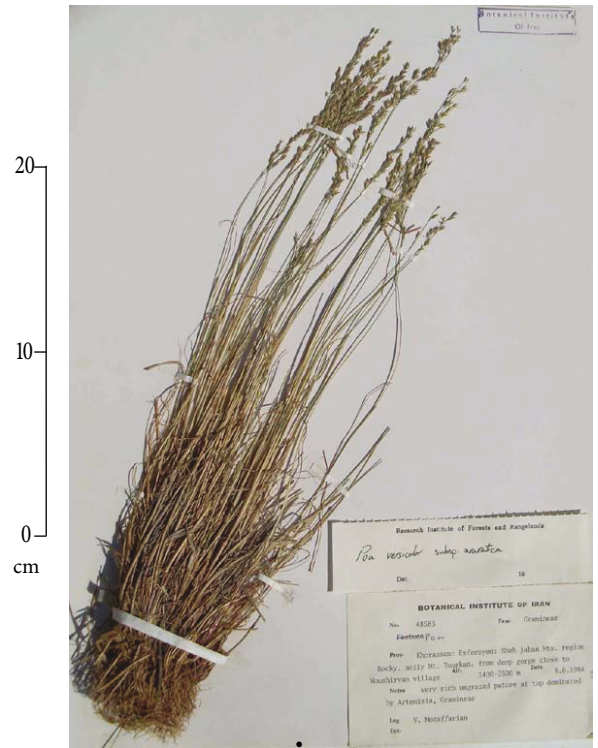
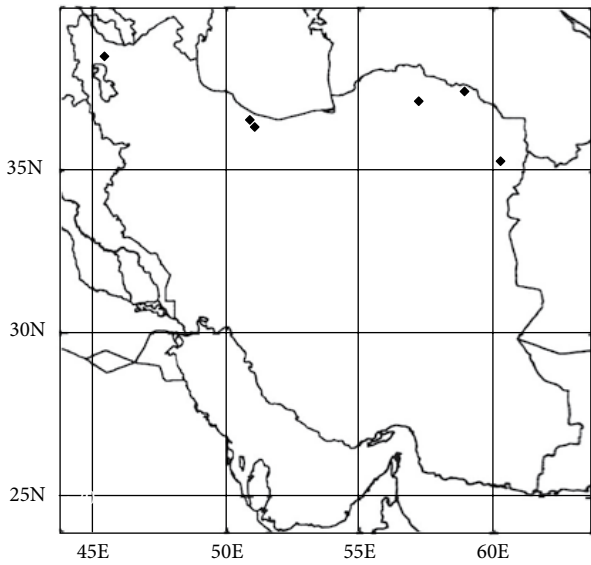


Figure 20. The distribution map of *Poa versicolor subsp. araratica* in Iran.

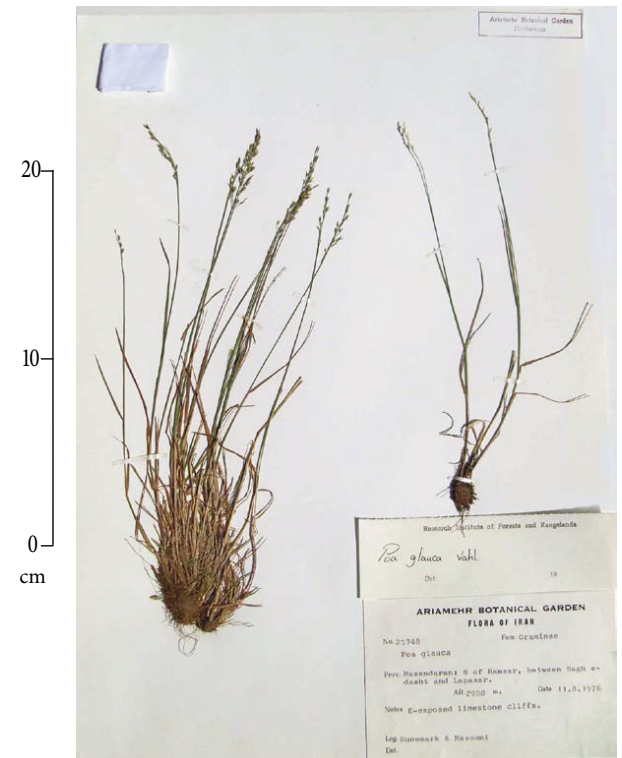
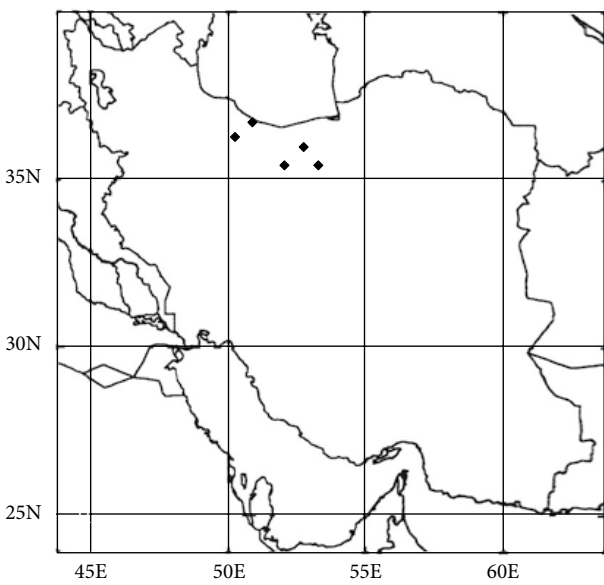


Figure 21. The distribution map of *Poa glauca* in Iran.

3.2.6.1.6. *P. damavandica* Assadi & Kavousi, Iran. J. Bot. 15(1): 57 (2009).

Plant with numerous nonflowering shoots. Stems enveloped by leaf sheaths for about 2/3 of the length from the base; the uppermost node under the leaf sheaths. Basal leaves 1.1–2 mm wide, convolute. Ligule of the uppermost leaf 2–2.8 mm long, obtuse. Panicle compact, with 12 scabrid vertical branches and 15–55 spikelets. Spikelets 6 mm long, ovate, with 4 florets; smooth rachilla; lower glume 3 mm long, elliptic, acute, 3-veined; upper glume 3.5 mm long, wide ovate, acute, 3-veined. The lowest lemma 3.2–3.5 mm long, elliptic, obtuse, obscurely 5-veined, on the lower 1/2 of the keel and 1/3 of the marginal veins ciliate; callus webbed. Fl. 5–7.

Specimen seen: -Tehran: south slope of Kuh-e Damavand (XV1), 3700–4350 m, Assadi & Hamdi 85739 (holotype TARI) (Figure 22).

It seems that the closest species is *P. stepposa* (Kryl.) Roshev. The differences between the 2 species are as follows:

- The absence of compact nonflowering shoots in *P. stepposa* and the presence of numerous nonflowering shoots in *P. damavandica*.
- Nodes exerted from leaf sheaths in the former and not exerted in the latter.
- Stems apparent in the former and hidden in the leaf sheaths in the latter.

d) Stems with apparent nodes in the former and no nodes along the stem in the latter.

e) Stems almost completely leafless in the upper part in the former and leafy in the latter.

f) All leaves 0.5–1.25 mm wide in the former and basal leaves 1.1–2 mm wide in the latter.

Poa rangkulensis Ovcz. & Czuk., another relative, is quite different from *P. damavandica*, having lemmas densely short-pilulose in the lower part between the veins. Among the Iranian species, *P. sterilis* M.Bieb. and *P. araratica* Trautv. are similar to the new species; therefore, they are compared in the Table.

3.2.6.2. Subsection *Tichopoa* (Aschers. et Graebn.) Maire, Fl. Afr. Nord., 3: 95 (1955).

Plants often rhizomatous with distinctly compressed stems all along their length.

3.2.6.2.1. *P. compressa* L., Sp. Pl. 69 (1753).

Plants laxly caespitose. Stems compressed, with obvious nodes, enveloped by leaf sheaths for about 2/3 of the length from the base; the uppermost node in the middle 1/3 of the stem. Basal leaves 2–2.5 mm wide, convolute. Ligule of the uppermost stem leaf 0.8 mm long, obtuse. Panicle compact, the lowest branches not more than 1 cm long, with 10–12 branches and 18–23 spikelets. Spikelets

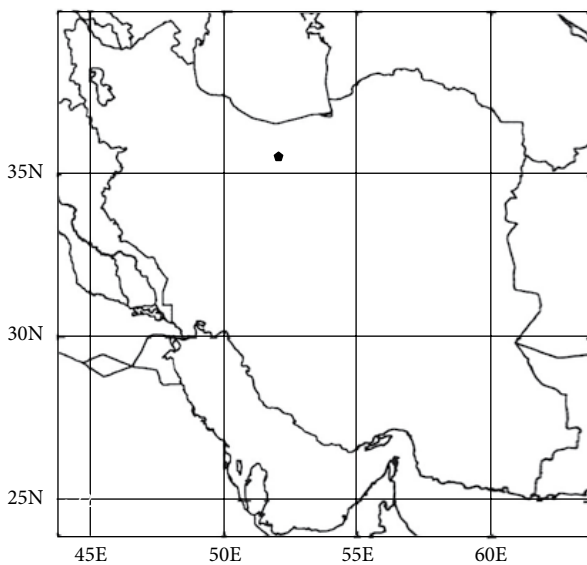


Figure 22. The distribution map of *Poa damavandica* in Iran.

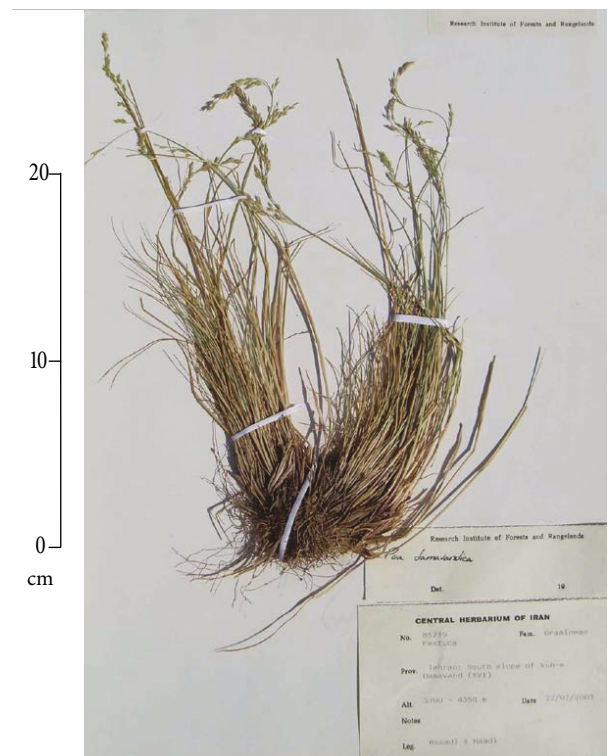


Table. Comparison of *Poa damavandica* with *P. araratica* and *P. sterilis*.

Species	Characters Rhizome	Leaf apex	Basal, stem, and flag leaf (L × W), mm	Nonflowering shoots	Ligule in uppermost leaf	Uppermost node	Rachilla
<i>P. damavandica</i>	None	Blunt	20.5–35 × 1.1–2 66–77 × 1–1.3 48–72 × 0.5–0.8	+	2.8 mm, elongated with rounded tip	Not evident and under the leaf-sheath	Smooth
<i>P. sterilis</i>	Thin	Acute	18–67 × 1–2 19–92 × 0.8–2 21–93 × 0.8–2	-	Up to 2 mm, truncate	Usually in the middle 1/3	Papillose to very pilulose
<i>P. araratica</i>	Thick	Acute	5–53 × 0.6–2 31–107 × 0.8–1.8 26–88 × 0.5–1.6	-	Up to 2 mm, truncate, acute or obtuse	In basal 1/3	Papillose to pilulose

4.7–5 mm long, with 4 or 5 florets; smooth rachilla; lower glume 1.9–2.1 mm long, ovate, acute, 3-veined; upper glume 2–2.2 mm long, ovate, acute, 3-veined. The lowest lemma 3 mm long, ovate, obtuse, with a narrow hyaline margin, obscurely 5-veined, on the lower 1/3 of the keel ciliate; callus webbed. *Fl.* 5–7.

Specimen seen: -Azerbaijan: Arasbaran protected area, between Saigram Dagh and Kaleibar, 2000 m, Assadi & Sardabi, TARI-24389 (Figure 23).

Diagnostic characters are: stem and nodes obviously compressed, lowest branches of panicle not more than 1 cm long, callus of lemma webbed, and web sparse.

3.3. Doubtful taxa in Iran

3.3.1. *Poa aitchisonii* Boiss.

Specimens of *P. aitchisonii* that were cited in *Flora Iranica* (Bor, 1970) were not available for examination. The specimens of this species have not been collected again in Iran. This species is distributed in Pakistan. According to *Flora of Pakistan* (Cope, 1982), its diagnostic characters are: plant not rhizomatous, panicle branches smooth and paired at the lower nodes, lower glume 1-veined, and anthers 1.3–2 mm long. Plants with these characteristics were not found among our collections from the habitat mentioned or in the visited herbaria.

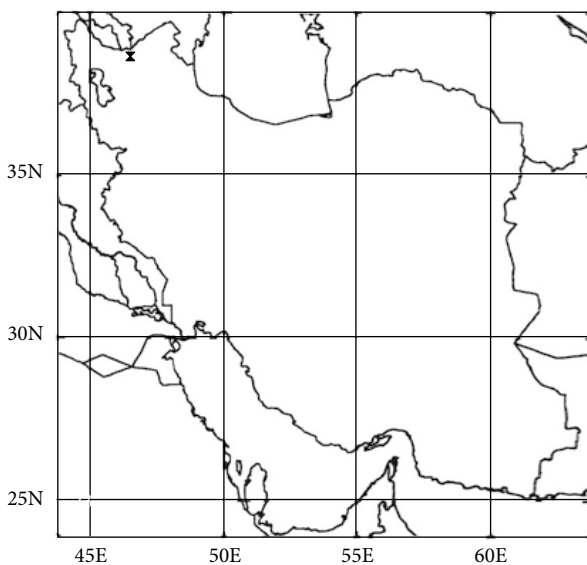
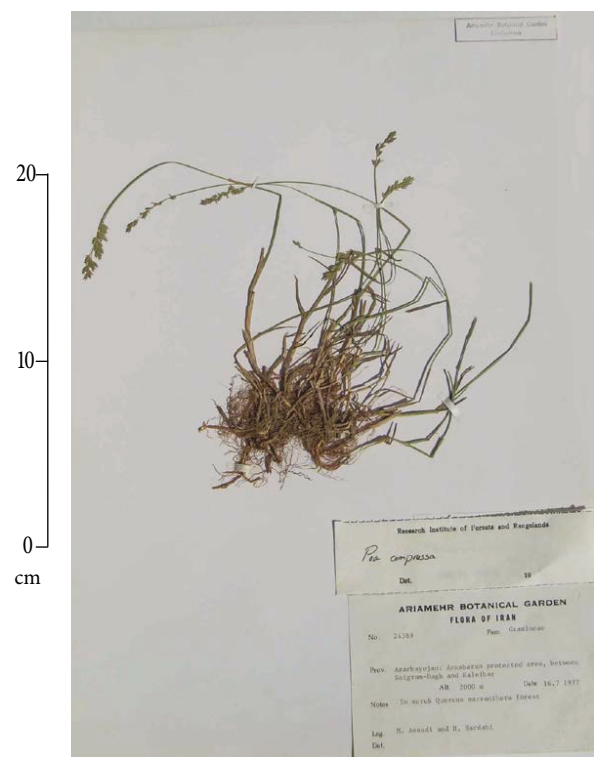


Figure 23. The distribution map of **X** *Poa compressa* in Iran.



3.3.2. *Poa supina* Schard.

According to *Flora Iranica* (Bor, 1970), *P. supina* was recorded from Gilan and Tehran provinces. It differs from its nearest relative, *P. annua*, by long anthers and glabrous middle veins of lemma. Moreover, the aggregation of spikelets at the end of the panicle branches is another characteristic trait according to *Flora of Pakistan* (Cope, 1982). *Poa supina* occurs in Pakistan and Afghanistan and all across Eurasia. Generally, in considering these

characters, specimens matching *P. supina* were not found among the collected plant specimens from the mentioned habitats in Iran. Therefore, it seems that the record of *P. supina* from Iran may be incorrect.

Acknowledgments

The authors would like to thank the anonymous reviewers and the editor for their insightful comments and suggestions.

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