

# SOME COMMENTS ON THE SPECIES OF *BROMUS* SECT. *BROMUS* (POACEAE) IN IRAN

R. Naderi & M. R. Rahiminejad

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This article is a taxonomic review after Flora Iranica concerning some species of *Bromus* sect. *Bromus*. Comparing the holotype, isotype and paratype of *B. pseudobrachystachys* with the lectotype of *B. brachystachys* and also reexamination of three Iranian and Iraqi herbarium sheets putatively determined under the latter's name showed all belong to the former. *B. racemosus*, *B. arvensis* and *B. secalinus* are confirmed to occur in Iran. Despite *B. tigridis* was identified from Turkey based on the sheet Sorger & Buchner 82-62-54, the Iranian specimen was identified as *B. racemosus*. Furthermore, a new record of this section i.e., *B. macrocladus* is reported here from mountains of Razi village (W Khoy, NW Iran).

Reza Naderi (correspondence <reznaderia@yahoo.com>) and Mohammad Reza Rahiminejad, Department of Biology, University of Isfahan, Isfahan, Iran.

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## توضیحاتی بر گونه‌های *Bromus* sect. *Bromus* (Poaceae) در ایران

رضا نادری، دانشجوی دکتری گروه زیست شناسی دانشگاه اصفهان.

محمد رضا رحیمی نژاد، استاد گروه زیست شناسی دانشگاه اصفهان.

این مقاله به بازبینی تاکسونومیکی برخی از گونه‌های *Bromus* sect. *Bromus* بعد از انتشار فلورا ایرانیکا می‌پردازد. نمونه‌های هولوتیپ، ایزوتیپ و پاراتیپ گونه‌ی *B. pseudobrachystachys* با لکتوتیپ *B. brachystachys* مقایسه شد. گونه‌ی اول با سه ورقه هرباریومی دیگر از ایران و عراق معرفی شد که در گذشته تحت نام گونه‌ی دوم قلمداد می‌شد. وجود گونه‌های *B. racemosus*، *B. arvensis* و *B. secalinus* در ایران تایید شدند. نمونه هرباریومی گزارش شده از *B. tigridis* در ایران *B. racemosus* نام‌گذاری شد و با صفات ارائه شده (شامل بافت کاغذی و رگه‌های برجسته و موازی در پوشه‌ها و پوشینه‌های بالغ) برای این گونه تحت ورقه هرباریومی Sorger & Buchner 82-62-54 از ترکیه همخوانی ندارد لذا حضور این گونه در ایران تایید نمی‌گردد. علاوه بر این گونه‌ی *B. macrocladus* از این بخش برای اولین بار از کوه‌های روستای رازی (غرب خوی، شمال غربی ایران) گزارش می‌شود.

## Introduction

*Bromus* L. is a complex genus that encompasses 150 annual to perennial species (Clayton et al. 2002 onwards). Within *Bromus*, section *Bromus* is considered as the most advanced section and probably originated during the Pleistocene in SW Asia and the Mediterranean region (Stebbins 1981). Most species of this section grow in field margins, roadsides and disturbed habitats so that human activities had a determinant effect on their evolution. Taxonomic problems of some species cause workers to confuse and harden their determination. Taxa are differentiated only by arbitrary characters, however, the number of species

in section *Bromus* is variable from 30 to 40 species (Saarela et al. 2007).

Following the publication of Flora Iranica (Bor 1970) some new changes occurred in section *Bromus* (see Table 1). This study aims to evaluate the taxonomic changes made to and clarify the correctness of the new taxa for the flora of Iran. In addition, a new species of section *Bromus* is reported here.

## Material & Methods

In addition to the special collection for this study, the herbarium sheets of Research Institute of Forests and Rangelands (TARI), Iranian Research Institute of Plant

Protection (IRAN), University of Isfahan, Shahid Bahonar University of Kerman, the Natural History Museum of Vienna (W) and Botanical Garden and Botanical Museum of Berlin (B) were examined. The following commonly applied traits by *Bromus* workers (e.g. Scholz 1972; Smith & Sales 1993) in diagnosis and descriptions were used to evaluate the correct identifications: spikelet length, vein number, length and width of lemma, insertion distance of awn from the apex, the tip shape and the incision depth, awn structure, anther length, and shape and length of caryopsis.

## Results & discussion

Distribution of *B. brachystachys* is restricted to Central Europe, particularly in Germany (Liang et al. 2006). Scholz (1972) introduced the new species *B. pseudobrachystachys* to the science from the Middle East. He believed that specimens of Turkey, Syria, Lebanon, Palestine, Iraq, Iran and Afghanistan belong to *B. pseudobrachystachys*, and asserted to their differences in spikelet structure. Smith & Sales (1993) also declared that the awn insertion of *B. pseudobrachystachys* is up to 0.5 mm below the apex of lemma but rarely is less than 1 mm in *B. brachystachys*. The shape of lemma tip in the holotype and isotype of *B. pseudobrachystachys* (Bornmüller, Iter Persico-turcicum 1850: B, W) were compared with the lectotype of *B. brachystachys* (Hornung s.n.: W). The former has an integrate-serrate-emarginate tip contrast to short-bidentate one in the latter, as well as the different measurement of awn insertion until the lemma apex. In addition, *B. pseudobrachystachys* is confirmed by the following specimens from Iran and Iraq:

1. ***B. pseudobrachystachys*** H. Scholz, Bot. Jahrb. Syst. 91(4): 462 (1972). – Ic: Scholz, *op. cit.* 464 (1972); Smith & Sales, Edinb. J. Bot. 50(2): 152 fig. 1d, 158 figs. 3a-c (1993). Type: Iraq: Assyria, ad Kerkuk, 23.4.1893, Bornmüller Iter Persico-turcicum 1850 (holo. B!, iso. W!). Paratype: Palestine: Jeridus (Jericho), ad fluvium Jordanum, 1897, Bornmüller Iter Syriacum 1704 (W!); Plaine de Mersina (Cilicie), 1855, Balansa Plantes d'Orient 752 (W!).

*Distribution.* Turkey, Iran (N & W), Afghanistan, Iraq, Syria, Lebanon and Palestine.

*Specimen seen.* **Iran:** Mazandaran: Nour, Park-e Jangali (Nour jungle), 9. 7. 2002, -15 m, Sahebi s.n. (University of Isfahan). Fars: Kazerun, Ghal'eh Narenji, Narges-Zar, 6. 5. 2011, Naderi 96189 (TARI), Naderi s.n. (University of Isfahan).

**Iraq:** Khalis, 22. 4. 1960, Haines W1660 (W).

Smith (1985) in the list of doubtful species of Turkey, thereafter, Smith & Sales (1993) revealed the

distribution of *B. tigridis* throughout E Mediterranean, Egypt, Iraq, Iran and Turkey. Based on their observation, the type of glume and lemma texture taxonomically is a valuable character, so that *B. tigridis* has a relatively thin tissue and with prominent veins (papery or chartaceous lemmas or glumes). On the other hand *B. racemosus* has a relatively thick and with inconspicuous veins (coriaceous lemmas or glumes). Two duplicates of *B. tigridis* under Esfandiari 10015E are kept in IRAN (29173/1, 2), which were reported by Termeh (1987). Also, the same specimen with number 23848 was dissected in TARI herbarium and was compared with the mentioned morphological characters of Smith & Sales (1993). The chartaceous tissues in the glumes and lemmas together with conspicuous parallel nerves have not been seen, in the other word, the features somewhat are blurred in Iranian specimens but the papery and fine glumes and lemma obviously exhibit in the specimen of Turkey under Sorger & Buchner 82-62-54 (W). Although, all specimens of *B. brachystachys* (reported by Bor 1970) has not been seen, however, firstly, with the compared types of *B. brachystachys* and *B. pseudobrachystachys*, secondly, in reviewing of the latter species in Iran and Iraq, and thirdly, along our determination of *B. racemosus* on the sheet Esfandiari 10015E (IRAN, TARI) and Jacobs 6959 (W), the European endemic brome grass *B. brachystachys* doesn't seem to occur in Iran.

2. ***B. racemosus*** L., Sp. Pl. ed. 2: 114 (1762). –Ic: Spalton, Watsonia 24: 195 fig 2c (2002); Saarela, J. Bot. Res. Inst. Texas 2(1): 348 figs 11f-i (2008). Type: sheet 93/31 (lecto. LINN), designated by Smith, Notes RBG Edinb. 42(3): 499 (1985).

*Distribution.* Europe, Turkey, Iran (N & W), Caucasus, Russia, Central Asia, Afghanistan and North America.

*Specimens seen.* **Iran:** Mazandaran: 33 km Sari to Kiasar, Alamdardeh, Doseleh, along rice field, 27. 4. 2009, Naderi s.n. (University of Isfahan). –Gilan: Talesh, Asalem, 16. 6. 1965 (?), Esfandiari 29173 (IRAN), Esfandiari 23848 (TARI); 10 km Asalem to Khalkhal, jungle region, 600 m, 23. 6. 1988, Assadi & Shahsavari 66028 (TARI); 25 km to Masooleh from Fooman, 200 m, 6. 7. 1995, Assadi 73729 (TARI). –Kordestan: Sanandaj, 35° 56' N, 47° 01' E, 1800 m, 18. 6. 1963, Jacobs 6959 (W).

**Afghanistan:** Kabul, Guzar Gah, 10. 6. 1951, Neubauer 174 (this sheet was determined by Scholz in 1979 and Bor in 1964 as *B. tigridis* and *B. racemosus*, respectively. But there is an affinity to *B. tigridis*, W).

*B. tigridis* Boiss. & Noë recorded from Iran by Termeh (1987) is in fact *B. racemosus*.

3. ***B. arvensis*** L., Sp. Pl. 77 (1753). Ic: Smith & Sales,

Table I: A summary of some new taxonomic changes (*Bromus* sect. *Bromus*) made to the flora of Iran since Bor (1970).

| Taxa                                    | References  |
|---|---|
| <i>B. pseudobrachystachys</i> H. Scholz | new species from the Middle East which has been wrongly identified as <i>B. brachystachys</i> Hornung until Scholz (1972) |
| <i>B. racemosus</i> L.                  | Termeh (1987)/new report under Myrzayan 9056E (IRAN).   |
| <i>B. tigridis</i> Boiss. & Noë         | Termeh (1987)/new report under Esfandiari 10015E (IRAN).  |
| <i>B. arvensis</i> L.                   | Noori et al. (2004)/new report under 3 specimens.   |
| <i>B. secalinus</i> L.                  | Nourouzi et al. (2005)/new report under Nourouzi 2016 (MPH).  |

Edinb. J. Bot. 50(2): 166 figs. 6c & d (1993). Type: sheet 93/21 (lecto. LINN), designated by Smith, Notes RBG Edinb. 42(3): 499 (1985).

*Distribution.* Europe, Turkey, Iran (NW), Caucasus, Russia, Central Asia, China and America.

*Specimens seen. Iran:* Gilan: Heiran neck, 5. 7. 2002, Mirtadzadini 1424 (Shahid Bahonar University of Kerman). –Azerbaijan: ad ripas argillosas rivi Qaranqu prope Lamashan, 34 km a Siah Chaman austro-occidentum versus, 1550 m, 14. 6. 1977, Rechinger Iter Iranicum X 56693 (this sheet was determined by Scholz in 1979 as *B. popovii* Drobov (synonym of *B. racemosus* L.), but its anther is 5 mm and palea is equal to lemma, W); 89 km to Mianeh from Zanjan, along Ghezel Ozun river, 1430 m, 9. 7. 1991, Zehzad et al. 70475 (TARI); Arasbaran jungle, 30. 7. 2012, Rahiminejad 17004 (University of Isfahan); Jolfa, Aras river, 790 m, 11. 6. 1972, Foroughi 5210 (TARI); Khoy to Makoo, before Gharah Ziaeddin, 1065 m, 10. 7. 2003, Rahiminejad & Dehghan 14975 (University of Isfahan); 35 km to Makoo from Marand, 1900 m, 28. 6. 1978, Assadi & Mozaffarian 30080 (TARI).

This species was recorded from Iran by Noori et al. (2004).

4. ***B. secalinus*** L., Sp. Pl. 76 (1753). Ic: Hitchcock, Man. Grass. U.S. 49 fig. 36 (1935); Saarela, J. Bot. Res. Inst. Texas 2(1): 357 figs 16a-e (2008). Type: sheet 93/1 (neo. LINN), designated by Smith, Notes RBG Edinb. 42(3): 497-498 (1985).

*Distribution.* Europe, Turkey, Iran (NW), Caucasus, Russia, China, Japan and America.

*Specimen seen. Iran:* Azerbaijan, 35 km Ardabil to Astara, Fandoghlu jungle, 20. 8. 2003, Nourouzi s.n. (TARI).

This species was recorded from Iran by Nourouzi et al. (2005).

### New report

5. ***B. macrocladus*** Boiss., Diagn. Ser. 1(13): 64 (1854). Fig. 1. – Type: Turkey (B2 Izmir), in collibus ad radices meridionales Tmoli inter Terrassa et Birgui in Lydia, 1842, Boissier s.n. (holo. G).

Annual, up to 65 cm tall. Culm pubescent. Leaf blade flat, wide, with long white cilia up to 16 cm long, 7 mm wide; leaf sheath with long white cilia. Panicle open, 25 cm long; branches ascending, patent or drooping; pedicles and branches much longer than spikelet. Spikelet glabrous, scabrous or strigose, 28 mm long (excluding awns), 36.5 mm long (including awns); rachilla 2 mm long; lower glume 6.5 mm long, 2 mm wide, 4 veined; upper glume 8.2 mm long, 3 mm wide, 7 veined; lemmas 9.5-10 mm long, 4-4.5 mm wide, 7-8 veined, at the tip with short obtuse bifid tooth, up to 0.5 mm long; awns divaricate or twisted at the middle, 6-12.5 mm long, inserted 2-3 mm below the apex; palea 1.5 mm shorter than lemma; anthers 3-6 mm long, lower 6 mm long, middle 4-5 mm long, upper 3 mm long.

*Distribution.* Turkey and Iran (NW).

*Specimen seen. Iran:* Azerbaijan, almost 70 km W Khoy, upper mountains of Razi village, 2000-2250 m, 26. 7. 1990, Assadi & Olfat 68901 (TARI).

*B. macrocladus* in a general aspect, because its anthers are 3-6 mm long, is similar to *B. arvensis*, but insertion of its awn is more than 1.5 mm below the apex of lemma (i.e. 2-3 mm) similar to that of *B. japonicus*. In contrast, the awn insertion in *B. arvensis* and its other relatives (e.g. *B. pseudobrachystachys* and *B. racemosus*) is less than 1.5 mm below the apex. *B. macrocladus* is reported here at the first time for the flora of Iran.



Fig. 1. *Bromus macrocladus* Boiss., Assadi & Olfat 68901 (TARI).

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### References

- Bor, N. L. 1970: Bromeae. In: Rechinger, K.H. (ed.), Flora Iranica 70: 105–141. –Akademische Druck- u. Verlagsanstalt, Graz-Austria.
- Clayton, W. D., Harman, K. T. & Williamson, H. 2002 onwards: World grass species: descriptions, identification, and information retrieval. – <http://www.kew.org/data/grasses-db.html> (June 2012).
- Liang, L., Guanghua, Z. & Ammann, K. H. 2006: Bromus L. In: Zhengyi, W. & Raven, P. H. (eds.), Flora of China, 22: 371–386. –Science Press, Beijing & Missouri Botanical Garden Press, St. Louis.
- Noori, A., Nourozi, M., Azizian, D., Sheidai, M. & Termeh, F. 2004: Bromus arvensis (Poaceae), a new record for the flora of Iran. –Iran. J. Bot. 10(2): 173–175.
- Nourouzi, M. Sheidai, M., Nouri, A. & Assadi, M. 2005: Bromus secalinus L. (Poaceae), a new record for flora of Iran. –Iran. J. Bot. 11(1): 71–73.
- Saarela, J. M., Peterson, P. M., Keane, R. M., Cayouette, J. & Graham, S. W. 2007: Molecular phylogenetics of Bromus (Poaceae: Pooideae) based on chloroplast and nuclear DNA sequence data. –Aliso 23: 450–467.
- Scholz, H. 1972: Bromus brachystachys Hornung und Br. pseudobrachystachys H. Scholz spec. nov. –Bot. Jahrb. Syst. 91(4): 462–469.
- Smith, P. M. & Sales F. 1993: Bromus L. sect. Bromus: Taxonomy and relationship of some species with small spikelets. –Edinb. J. Bot. 50(2): 149–171.
- Smith, P. M. 1985: Bromus L. In: Davis P. H. (ed.), Flora of Turkey and the East Aegean Islands 9: 272–301. –University Press, Edinburgh.
- Stebbins, G. L. 1981: Chromosome and evolution in the genus Bromus (Gramineae). –Bot. Jahrb. Syst. 102: 359–379.
- Termeh, F. 1987: Contribution à l'étude de quelques Graminées nouvelles pour la Flore de l'Iran. Fasc. 2. –Ministry of Agriculture, Plant Pests & Diseases Research Institute, Tehran (in Persian).

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