

FESTUCA KARATAVICA (POACEAE), A NEW GRASS RECORD FOR THE FLORA OF IRAN

F. Memariani & A. A. Arjmandi

Received 18.04.2012. Accepted for publication 05.09.2012.

Memariani, F. & Arjmandi, A. A. 2013.06.30: *Festuca karatavica* (Poaceae), a new grass record for the flora of Iran. – *Iran. J. Bot.* 19 (1): 57-61. Tehran.

Festuca karatavica (Bunge) B. Fedtsch. (subgen. *Xanthochloa*) is reported as a new species and subgenus record for the flora of Iran from Binalood mountain range in Khorassan. This species is morphologically compared with its closely related species of *Festuca* subgen. *Leucopoa* in Iran. Illustration, distribution map and notes on biogeography, conservation status and habitats are provided.

Farshid Memariani (correspondence <memariani@um.ac.ir>) and Ali Asghar Arjmandi, Dept. of Botany, Research Center for Plant Science, Ferdowsi University of Mashhad, Mashhad, Iran.

Key words. Poaceae, *Festuca karatavica*, new record, biodiversity, conservation, Khorassan, Binalood.

گونه *Festuca karatavica* گزارش جدیدی از تیره گندمیان برای فلور ایران

فرشید معماریانی، عضو هیأت علمی گروه گیاه شناسی، پژوهشکده علوم گیاهی، دانشگاه فردوسی مشهد.

علی اصغر ارجمندی، دانش آموخته کارشناسی ارشد سیستماتیک گیاهی، گروه زیست‌شناسی، دانشگاه شهید باهنر کرمان.

Festuca karatavica از زیرجنس subg. *Xanthochloa* به عنوان گونه و زیرجنس جدیدی برای فلور ایران از رشته کوه‌های بینالود در خراسان معرفی می‌شود. این گونه از نظر ریخت‌شناسی با نزدیکترین گونه‌های خویشاوند خود در زیرجنس *Leucopoa* در ایران مورد مقایسه قرار می‌گیرد. تصویر، نقشه پراکندگی و اطلاعاتی درباره جغرافیای زیستی، وضعیت حفاظتی و زیستگاه آن ارائه می‌گردد.

INTRODUCTION

Festuca L. (Poeae, Poaceae) is one of the largest grass genera which comprises 621 accepted species in the World (Clayton *et al.* 2006 onwards) and distributed in the Holarctic region and in temperate zones of the Southern hemisphere (Watson and Dallwitz, 1992). *Festuca* (subtribe Loliinae) species are characterized by their dorsally rounded lemmas and linear hilum, whereas species of *Poa* L. (subtribe Poinae) are distinguished by their keeled lemmas and round to oval hilum (Catalan *et al.* 2004).

Festuca sensu lato, in contrast to *Poa*, is a highly polymorphic and complex genus that has been differently classified in several infrageneric taxa including subgenera, sections and subsections (Krechetovich & Bobrov 1934; Tzvelev 1976; Alexeev 1977, 1978, 1979; Markgraf-Dannenberg 1985). Several segregates of *Festuca* have been recognized as distinct genera such as

Leucopoa Griseb., *Drymochloa* Holub, *Schedonorus* P.Beauv., *Parafestuca* E. B. Alexeev and *Xanthochloa* (Krivot.) Tzvelev (Bor 1970, Holub 1998, Foggi *et al.* 2005, Tzvelev 2006). However, Clayton *et al.* (2006 onwards) still recognize *Festuca* in its wide sense. In Flora Iranica, Bor (1970) recorded nine *Festuca* species from Iran as well as two *Leucopoa* species. Alexeev (1977, 1979) described some new taxa from Iran and in his revision of this genus in the Flora Iranica area, included *Leucopoa* within *Festuca* and recorded 21 species for the Iranian flora. By taking into account another newly described or recorded species since the Flora Iranica (Termeh 1975, Markgraf-Dannenberg 1981, Tzvelev 1997), the number of *Festuca* taxa in Iran has been reached to 23 species.

During studies on the flora and vegetation of Aladagh and Binalood mountain ranges in NE Iran (Khorassan), several collected grass specimens were identified as new

records or new localities for the relevant species. In this paper, *Festuca karatavica* (subgen. *Xanthochloa*) is reported as a new record for the flora of Iran and compared with its closely related species in subgen. *Leucopoa*. Additional notes on taxonomy and biogeography of the species are provided.

MATERIAL AND METHODS

Herbarium specimens of the grasses, collected from NE Iran, were examined and identified using relevant literatures (Krechetovich & Bobrov 1934, Bor 1970, Tzvelev 1976, Alexeev 1979, Markgraf-Dannenbergh 1985). All specimens are preserved in Herbarium of Ferdowsi University of Mashhad (FUMH). The distribution map of the species has been provided using geo-referenced distribution data from Flora Iranica (Bor 1970) and FUMH in DIVA-GIS 7.3 software. The threat status of the species has been determined based on IUCN Red List categories and criteria (IUCN 2010).

RESULTS AND DISCUSSION

New record

Festuca subg. *Xanthochloa* (Krivot.) Tzvelev, Bot. Zhurn. (Moscow & Leningrad) 56 (9): 1253 (1971).

Festuca karatavica (Bunge) B. Fedtsch., Rastit. Turkest. 136 (1915). Fig. 1.

Perennial, densely tufted. Culms 50-100 (-140) cm, glabrous, at base tightly enveloped by brownish butt sheaths. Leaf sheaths glabrous on surface; ligule an eciliate membrane, truncate, 1.5-5 mm long; leaf blades flat, stiff, glaucous, at apex acuminate, glabrous on surface, 20-45 cm long, 2-10 mm wide. Panicle contracted, linear or oblong, 9-18 cm long; primary branches 1-3 cm long. Spikelets comprising 3-5 florets, at apex with diminished florets, ovate, 7-9 mm long, yellowish. Glumes persistent; lower glume lanceolate, 3.5-4 mm long; upper glume ovate, 4-5 mm long. Lemma ovate, acute, on surface scaberulous, 5-6 mm long, 5-nerved. Palea 2-nerved, on keels scaberulous. Lodicules 2, membranous. Anthers 3, 3-3.5 mm long. Ovary glabrous. Caryopsis obovate.

Examined specimens. Khorassan: W Mashhad, 12 km southwest of Zoshk village, 2100-2500 m, Joharchi & Zangooei 20591 (FUMH); W Mashhad, above Kang village, Binalood Mts., 1800 m, Faghiniha & Zangooei 18634 (FUMH); W Mashhad, Binalood Mts., Foresgeh mountains, 2100 m, Faghiniha & Zangooei 18732 (FUMH); S Mashhad, Pivejen, 2100 m, Rashed & Rezaei 10243 (FUMH); W Mashhad, near Dehbar, Rezaei &

Mahvan 10508 (FUMH); NW Mashhad, Gholmakan, Cheshmeh-Sabz, Ayatollahi & Zangooei 13276 (FUMH); W Mashhad, Binalood Mts., between Cheshmeh-Sabz and Boojan, Rashed & Ayatollahi 13413 (FUMH).

Phytogeography and ecology: General distribution of this Irano-Turanian species is from western Tian Shan, southwestern Pamir-Alay, to northeastern and north-central parts of Afghanistan (Bor 1970, Tzvelev 1976). The newly recorded specimens from Binalood Mountains extend the distribution range of *F. karatavica* more westward to NE Iran (Fig. 2). Ecologically, it grows in higher mountain and alpine areas on stony slopes, rocks and scree. In Binalood, it is usually inhabited on metamorphic schistose rocks in high elevations between 1800 up to 3000 m. Westward, in calcareous rocky slopes of North Khorassan province (Aladagh and Salook and Shah-Jahan Mts.), *F. karatavica* is replaced by *F. sclerophylla*, a closely related species which its distribution range extends through Alborz and central Zagros towards north-eastern Turkey and Caucasian mountains (Fig. 2). According to the extent of occurrence and its very peculiar habitats which are highly sensitive to climate change, *F. karatavica* is evaluated as an endangered (EN, B1ab(ii, iii)) species in Iran.

Taxonomy: *F. karatavica* belongs to subgenus *Xanthochloa*, a group of broad-leaved perennial *Festuca* species that differs from subg. *Schedonorus* (P.Beauv.) Petern. by lacking auricles and lemma awns, and from subg. *Drymanthele* V.I.Krecz. & Bobrov by hyaline glumes. *Festuca karatavica* is closely related to the species of subg. *Leucopoa* (Griseb.) Tzvelev, however, it differs from the species of the latter subgenus by glabrous ovary (Tzvelev 1976, Alexeev 1979) and also by contracted yellowish panicles (Fig. 1). *F. karatavica* can be distinguished from *F. sclerophylla* by its shorter and contracted panicles, shorter primary branches of panicles and its yellowish spikelets (Table 1).

Based on our observations, the spikelets of *F. karatavica* are usually 3-5 flowered. This character state agrees with the original description by Bunge (1851) and also with the description in Flora of the USSR (Krechetovich & Bobrov 1934). However, Bor (1970) recorded 7-9 florets in spikelets based on the specimens collected from Afghanistan. The leaf width in our specimens collected from Binalood Mts. varies between 2 up to 10 mm which is much wider than the ranges recorded in original description and in Flora Iranica.

Although dioecism is not a major phenomenon in family Poaceae, there has been recorded sporadic



Fig. 1. *Festuca karatavica*, a new record for the flora of Iran, -18634 (FUMH).

Table 1. Comparison of morphological characters in *Festuca karatavica* (subgen. *Xanthochloa*) and *F. sclerophylla* (subgen. *Leucopoa*).

| | <i>F. karatavica</i> | <i>F. sclerophylla</i> |
|--------------------------|-------------------------|------------------------|
| Ligule | 1.5-5 mm long | 3-6 (-8) mm long |
| Panicle density | contracted | open |
| Panicle length | 9-18 cm | up to 30 cm |
| Primary panicle branches | 1-3 cm long | 7-15 cm long |
| Spikelet color | yellow, brownish yellow | whitish green |
| Spikelet length | often 7-9 mm | 10-12 (-15) mm |
| Lemma apex | muticous | muticous or mucronate |
| Ovary | glabrous | pubescent on apex |

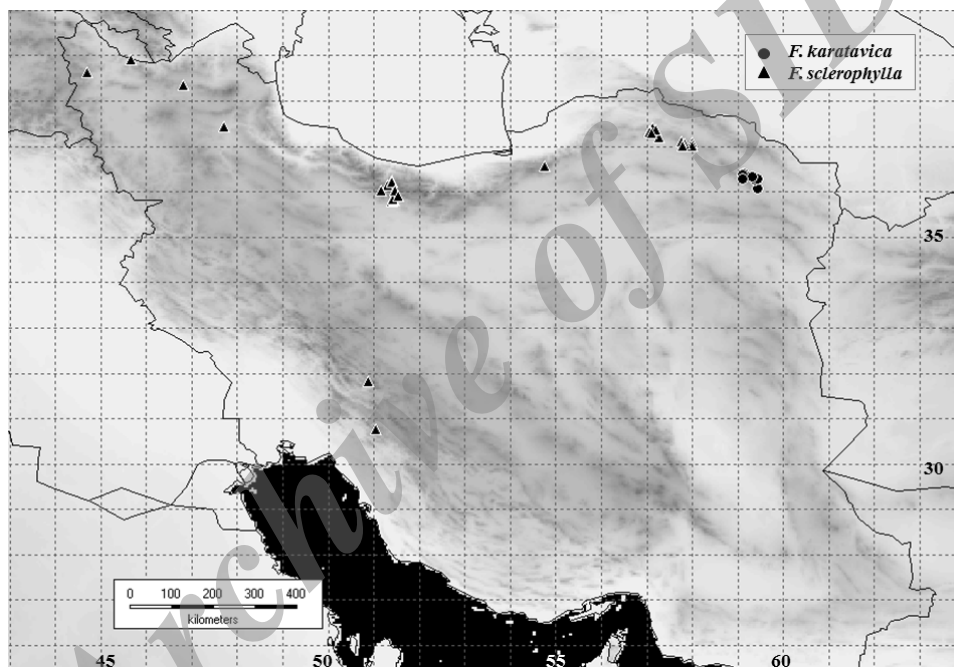


Fig. 2. Distribution map of *Festuca karatavica* (●) and *F. sclerophylla* (▲) in Iran.

dioecism in *Festuca* subgen. *Leucopoa* (Connor 1981). Most examined individuals of *F. karatavica* from Binalood appear to be unisexual. It seems this species is morphologically polymorphic in dioecious and monoecious populations across the entire area of its distribution range. Nomenclature history of the species shows that it has been differently treated as several species and varieties such as *F. turkestanica* Franch., *F. subspicata* var. *griffithiana* St.-Yves, *F. griffithiana* (St.-Yves) Krivot., and also within distinct genera as *Glyceria subspicata* Regel, *Leucopoa karatavica* (Bunge) Krecz.

& Bobr., and *Xanthochloa karatavica* (Bunge) Tzvelev. However, *F. karatavica* is the oldest accepted name for this group (Clayton *et al.* 2006 onwards). More investigation is needed to find how reproductive biology of this species affects the morphological characters all over its distribution range.

ACKNOWLEDGEMENTS

This work is part of results of research project on floristic studies of Aladagh mountain range supported by the Research Council of Ferdowsi University of Mashhad.

The field assistance of FUMH staff is gratefully acknowledged.

REFERENCES

- Alexeev, E. B. 1977: To the systematics of Asian fescues (*Festuca*). 1. Subgenera *Drymanthele*, *Subulatae*, *Schedonorus*, *Leucopoa*. -Byull. mosk. Obshch. Ispyt. Prir., Otd. biol. 82 (3): 95-102.
- Alexeev, E. B. 1978: To the systematics of Asian fescues (*Festuca*). 2. Subgenus *Festuca*. -Byull. mosk. Obshch. Ispyt. Prir., Otd. biol. 83 (4): 109-122.
- Alexeev, E. B. 1979: Genus *Festuca* in Florae Iranicae et territoriorum confinium. -Nov. Sist. Vyssh. Rast. 16: 7-35.
- Bor, N. L. 1970: Gramineae. - In: Rechinger, K. H. (ed.). Flora Iranica, no. 70. -Akademische Druck-Verlagsanstalt, Graz.
- Bunge, A. 1851: Beitrag zur Kenntniss der Flor Russlands und der Steppen Central- Asiens. - Kaiserlich Akademie der Wissenschaften, St. Petersburg.
- Catalan, P., Torrecilla, P., Lopez-Rodriguez, J.A. & Olmstead, R. G. 2004: Phylogeny of festucoid grasses of subtribe Loliinae and allies (Poae, Pooideae) inferred from ITS and *trnL-F* sequences. -Molecular Phylogenetics and Evolution, 31: 517-541.
- Clayton, W. D.; Vorontsova, M. S.; Harman, K.T. & Williamson, H. 2006 onwards: GrassBase- The Online World Grass Flora. Available at: <http://www.kew.org/data/grasses-db.html>.
- Connor, H. E. 1981: Evolution of reproductive systems in the Gramineae. -Ann. Missouri Bot. Gard., 68 (1): 48-74.
- Darbyshire, S. J. & Warwick, S. I. 1992: Phylogeny of North American *Festuca* (Poaceae) and related genera using chloroplast DNA restriction site variation. -Can. J. Bot., 70: 2415-2429.
- Foggi, B., Scholz, H. & Valdéz, B. 2005: The Euro+Med treatment of *Festuca* (Gramineae)- new names and new combinations in *Festuca* and allied genera. - Willdenowia, 35: 241-244.
- Holub, J. 1998. Reclassifications and new names in vascular plants- 1. -Preslia, 70: 97-122.
- IUCN. 2010. Guidelines for Using the IUCN Red List Categories and Criteria. Version 8.1. -Prepared by the Standards and Petitions Subcommittee in March 2010.
- Krechetovich, V. I. & Bobrov, E. G. 1934: *Festuca* L. s.str. - In: Komarov, V. L., Rozhevits, R. Y. & Shishkin, B. K. (eds.), Flora of the U.S.S.R., vol. 2. - Akademija Nauk SSSR, Leningrad, pp. 497-535 (translated from Russian).
- Markgraf-Dannenberg, I. 1981: The genus *Festuca* (Gramineae) in Turkey: new taxa and new names. - Willdenowia, 11 (2): 201-210.
- Markgraf-Dannenberg, I. 1985: *Festuca*. - In: Davis, P. H. (ed.), Flora of Turkey and the East Aegean Islands, Vol. 9. -Edinburgh University Press, p.p. 400-442.
- Scholz, H. 1987: Neue synonyme der *Festuca arundinacea* (Poaceae). -Bot. Jahrb. Syst. 108: 293-299.
- Termeh, F. 1975: Contribution à l'étude de quelques Graminées nouvelles pour la flora de l'Iran. Institut de Recherches Entomologiques et Phytopathologiques d'Evine, Departement de Botanique No. 5. -Teheran. (in Farsi with French summary).
- Tzvelev, N. N. 1976: Grasses of the Soviet Union, Part I & II. -Nauka Publishers, Leningrad.
- Tzvelev, N. N. 1997: A new species of the genus *Festuca* (Poaceae) from Iran. -Bot. Zhurn. 82 (4): 118-119.
- Tzvelev, N. N. 2006: Synopsis of the mannagrass genus, *Glyceria* (Poaceae). -Bot. Zhurn. 91 (2): 255-276.
- Watson, L. & Dallwitz, M. J. 1992: The Grass Genera of the World. -C.A.B. International, Wallingford, Oxon, UK.