

CORRESPONDENCE

On the recent record of “*Chenopodium badachschanicum*” (Chenopodiaceae) from Iran

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Abstract

Chenopodiastrum badachschanicum (Tzvelev) S. Fuentes, Uotila et Borsch has been recently reported (as *Chenopodium badachschanicum* Tzvelev) from Iran in the article published in *Modern Phytomorphology*. Unfortunately, the article contains some errors and outdated information on taxonomy of this species. Most importantly, the image of herbarium specimens reproduced in the article definitely represents not *C. badachschanicum* but, undoubtedly, a species of *Spinacia* L., most probably *S. turkestanica* Iljin. Judging from its distribution pattern, *C. badachschanicum* may be expected in Iran, especially in eastern mountain areas. However, there is no positive evidence of its occurrence in Iran yet and its recent record is based on a misidentification.

Keywords: Chenopodiaceae, *Chenopodium*, *Chenopodiastrum*, taxonomy, distribution, Iran

Introduction

In one of the latest issues of *Modern Phytomorphology*, *Chenopodium badachschanicum* Tzvelev (Chenopodiaceae) was reported from Iran, supposedly for the first time for the flora of that country (Keshavarzi *et al.* 2016). However, there are some evident problems with that record and the article itself, which stimulated the present note, where I provide corrected and updated information about

the species, as well as some comments on the record itself.

Taxonomy of *Chenopodiastrum badachschanicum* and related taxa: a brief overview

Chenopodium badachschanicum was described by Tzvelev (1960) from the Pamir Mountains in Tajikistan (holotype, LE: “Tadzhikistania,

Pamir occidentalis, in declivitate lapidosa paulo ruderata in valle fl. Murgab 3–4 km intra ostium fl. Pschart occidentalis, alt. circa 3300 m s. m., 19 VI 1958, № 220, N. Tzvelev”; “Таджикская ССР, Западный Памир, несколько засоренная осыпь мелких камней по склону правого берега р. Мургаб, в 3–4 км ниже устья р. Западный Пшарт, около 3300 м над ур. м., 19 VI 1958, № 220, Н. Цвелев”). When discussing his new taxon, Tzvelev did not mention its affinity to *Chenopodium hybridum* L. (now *Chenopodiastrum hybridum* (L.) S. Fuentes, Uotila & Borsch: see Fuentes-Bazan *et al.* 2012b) but instead considered some other supposedly related taxa of *Chenopodium* L., viz. *C. bryoniifolium* Bunge, *C. atripliciforme* Murr, and *C. murale* L. For some time, this species was indeed considered a relative of *C. bryoniifolium* and/or *C. atripliciforme*.

Uotila (1993, 1997, 2001) clarified the taxonomic position and patterns of geographical distribution of *Chenopodium atripliciforme* and *C. badachschanicum* and demonstrated the close relationships of *C. badachschanicum* and *C. hybridum*. Later the *Chenopodium hybridum* group (including the widespread but originally probably European – western Asian *C. hybridum* s. str., mountain Asian *C. badachschanicum*, and North American *C. simplex* (Torrey) Raf.) was transferred to a new genus *Chenopodiastrum* S. Fuentes, Uotila & Borsch, and the relevant nomenclatural combinations have been made for these three species (Fuentes-Bazan *et al.* 2012b). These taxa belong to the Eurasian–North American section *Chenopodiastrum* sect. *Grossefoveata* (Mosyakin) Mosyakin (see nomenclatural citations and synonymy in Mosyakin (1993, 2013)). As I noted earlier (Mosyakin 2013), “This section includes three currently recognized species, *Chenopodiastrum hybridum*, *C. badachschanicum* (Tzvelev) S. Fuentes, Uotila, & Borsch (*Chenopodium badachschanicum* Tzvelev), *C. simplex* (Torr.) S. Fuentes, Uotila, & Borsch (*Chenopodium simplex* (Torr.) Raf.; *C. gigantospermum* Aellen), and probably one yet undescribed East Asian entity (species or subspecies) discussed by Baranov (1964) and mentioned by Zhu *et al.* (2003)”. Additional

comments on still problematic and probably undiscovered taxa of that group are available from Sukhorukov (2014) and Sukhorukov & Kushunina (2014). Carpology of taxa of *Chenopodium* and related genera (including the *Chenopodiastrum hybridum* aggregate) was recently studied (Sukhorukov & Zhang 2013; Sukhorukov 2014) in light of new phylogenetic evidence.

The Iranian record as reported by Keshavarzi *et al.* (2016)

Keshavarzi *et al.* (2016) cited in their article several rather irrelevant references but failed to mention and cite the publications directly relevant to the species under discussion. For example, they mentioned the molecular phylogenetic study by Fuentes-Bazan *et al.* (2012a), in which the *Chenopodium hybridum* – *C. murale* group was already reported as a clade separate from *Chenopodium* s. str., but did not cite the following article by Fuentes-Bazan *et al.* (2012b) with phylogenetic information updated and a new taxonomic treatment proposed. Some other important references that were glaringly missing in Keshavarzi *et al.* (2016) are cited here. A simple Google search with the keywords “*Chenopodium badachschanicum*” easily brings most of those publications; many of them are open access resources.

The text of the article was evidently in need of considerable editing, both linguistic and scientific. Some references were also cited incorrectly. For example, Uotila is cited as the author of the treatment of *Chenopodiaceae* in *Flora Iranica*. In fact, he prepared the treatment of *Chenopodium* (Uotila 1997), while the whole treatment of *Chenopodiaceae* in *Flora Iranica* was authored by seven contributors (see Hedge *et al.* 1997). There are some other problems, which are not discussed here for brevity’s sake.

Most importantly, the image of the herbarium specimen(s) reproduced in the article definitely represents not *Chenopodiastrum badachschanicum* but, without any doubt, a species belonging to a different genus (not *Chenopodiastrum* and

not *Chenopodium*), and even to a different tribe. In my opinion, the plants illustrated on Fig. 2 (Keshavarzi *et al.* 2016: 33) belong to *Spinacia turkestanica* Iljin, a species previously known for Iran (Hedge *et al.* 1997). Other illustrations (close-ups; Keshavarzi *et al.* 2016: 34, Fig. 3) most probably also represent parts of inflorescences of staminate individuals of that species. My identification of the plants illustrated in Keshavarzi *et al.* (2016: 33, Fig. 2) has been confirmed also by other experts in Chenopodiaceae, Alexander Sukhorukov and Pertti Uotila (personal communications, email messages to Sergei Mosyakin). Of course, our identification of the specimen from the ALH herbarium is based on images only. However, the characters visible on the images are sufficient. In particular, the characteristic features are: general branching habit, remnants of the basal leaf rosette, peculiar hastate leaves with rather long horizontal basal lobes, and the inflorescence shape. It is also worth noticing that only staminate flowers seem to be visible on close-up images, which is what to be expected if only staminate plants of a dioecious *Spinacia* were studied. Keshavarzi *et al.* (2016) also did not report any original information on morphology of fruits – the most important characters for distinguishing *C. badachschanicum* from *C. hybridum* and other similar taxa. Instead, they for some reason provided non-diagnostic images of the leaf surface and pollen grains.

Following the request by the editor of *Modern Phytomorphology*, Andriy Novikov (Andrew Novikoff), made already after the article has been published, the authors provided some field photographs showing plants probably indeed belonging to a species of *Chenopodiastrium* (personal communication by the editor). Positive species-level identification of plants on those images is impossible or at least highly problematic because no reliable diagnostic characters are visible (in particular, fruits: see Uotila (1997, 2001), Sukhorukov (2014) and references therein), while the general appearance of plants can be misleading. By the date of the completion of the present note the authors did not provide any additional herbarium specimens or their scanned images,

except for the one illustrated in the article (that of *Spinacia turkestanica*). Thus, at present there is no reliable evidence supporting their claim of a new country record of *C. badachschanicum* and its recent reporting for Iran is based on a misidentification.

Conclusions

The article reporting “*Chenopodium badachschanicum*” from Iran is evidently not an achievement of the authors, reviewers and editors. Forthcoming articles submitted to *Modern Phytomorphology*, a journal that is gaining popularity and outreach, should be prepared for publication with better scientific and editorial scrutiny. I do hope that this brief critical note will result in improving future articles of this journal.

Judging from its distribution pattern, *Chenopodiastrium badachschanicum* may be indeed expected to be found somewhere in Iran, especially in the mountain areas of the eastern part of the country. If a species of *Chenopodiastrium* has been indeed found in Iran by the authors, as they claim, solid evidence on its identity has to be presented. Probably new collections and morphological studies will be needed. However, now we should conclude that at present there is no positive evidence of *C. badachschanicum* occurring in Iran.

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