

FIRST RECORD OF *CHENOPODIUM FICIFOLIUM* SUBSP. *BLOMIANUM* (CHENOPODIACEAE) IN NORTH AMERICA

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ABSTRACT

Chenopodium ficifolium Sm. subsp. *blomianum* (Aellen) Aellen (*C. blomianum* Aellen) (Chenopodiaceae), an introduced (alien in North America) subspecies presumably native to southeastern Asia, is reported from Florida based on the specimen from MO and an image of the specimen from FLAS. Diagnostic characters, taxonomy and distribution of this taxon are discussed.

The Eurasian species *Chenopodium ficifolium* Sm. (earlier often known under a misapplied name *Chenopodium serotinum* L.; for nomenclatural details see Aellen 1941 and Uotila 1979) was reported as introduced (alien, adventive) for several states of the USA and provinces of Canada. Aellen and Just (1943) mentioned this species (as “*C. serotinum* L.”) in their treatment of American taxa of *Chenopodium* and indicated that it “may be found adventive in America.” In the *Flora of North America North of Mexico* (FNANM), it was reported (Clemants & Mosyakin 2003) from Quebec, Florida, Missouri, Oregon, and Pennsylvania. It is now also additionally reported from British Columbia and Ontario in Canada (NatureServe 2015) and Arizona and New York in the USA (USDA, NRCS. 2016).

However, caution has to be used for records not confirmed by herbarium specimens. Despite being a rather easily recognizable and morphologically well-characterized species, *Chenopodium ficifolium* is quite often misidentified in North American and Asian herbaria and probably overlooked in the field. Some North American specimens identified as *C. ficifolium* proved to be other taxa of *Chenopodium*; for example, a specimen from Arizona deposited at the ASU herbarium, judging from the image available online (SEINET 2016), in fact belongs to some form of the *C. album* group (not reliably identifiable from the image), but definitely not to *C. ficifolium*.

Recent dramatic rearrangements in generic placements of many taxa previously placed in *Chenopodium* (Fuentes-Bazan et al. 2012) did not affect *C. ficifolium*, which will remain in *Chenopodium* sensu stricto if the proposal (Mosyakin 2015) to conserve the name *Chenopodium* with *C. album* L. as the conserved type (and not with *C. rubrum* L., which is now placed in *Oxybasis* Kar. & Kir.) is accepted.

Several hybrids of *Chenopodium ficifolium* with other species of the genus were described and reported, mainly from Europe (Aellen 1960–1961; Dvořák 1989); they are also briefly mentioned in our FNANM treatment (Clemants & Mosyakin 2003). However, the species is normally a diploid with $2n = 18$ and its hybrids with other taxa of *Chenopodium*, especially those with different ploidy levels (for example, tetraploids of the informal groups of *C. strictum* Roth aggr., *C. berlandieri* Moq. aggr. and hexaploids of the *C. album* L. group) are considered rather improbable or at least very rare (Mandák et al. 2012). Moreover, recent molecular phylogenetic data indicated (Walsh et al. 2015) that *C. ficifolium* is phylogenetically rather distant from the main clade containing *C. album* and numerous other taxa of the genus.

Two subspecies are usually recognized within *Chenopodium ficifolium*: subsp. *ficifolium* and subsp. *blomianum* (Aellen) Aellen (Aellen 1928, 1929, 1960–1961; Mosyakin 1996; Uotila 1997, 2001a, 2001b, 2001c; Clemants & Mosyakin 2003; Zhu et al. 2003; Sukhorukov et al. 2016 etc.). These subspecies are distinguished mainly by their pericarp and seed testa sculpture (testa in subsp. *blomianum* with pits [depressions] less pronounced than in subsp. *ficifolium* and with radial furrows between pits, pit margins often curved; the “honeycombed” pattern of pericarp less evident than in subsp. *ficifolium*) and leaf shape. Clemants and Mosyakin (2003: 294) provisionally mentioned the second subspecies and reported its main diagnostic characters: “*Chenopodium blomianum* Aellen [= *C. ficifolium* subsp. *blomianum* (Aellen) Aellen] was described from Sweden based on alien plants of presumably East Asian origin (P. Aellen 1928). According to Aellen, that subspecies occurs in southern and southeastern Asia and differs from *C. ficifolium* subsp. *ficifolium* in having leaves with spreading basal lobes almost perpendicular to the central lobe and seeds with shallow elongate depressions.” However, it was noted that “All North American plants of *C. ficifolium* belong to subsp. *ficifolium*.” Now this information has to be updated.

During a recent visit (April 2016) to the Missouri Botanical Garden, when reviewing unidentified North American specimens of *Chenopodium* at the MO herbarium, I found a specimen collected in Florida which, judging from its morphological characters, belongs to *C. ficifolium* subsp. *blomianum*. The label information is provided below.

USA. Florida. Dade Co.: between Miami and Homestead, E of Princeton, E side of 112 Avenue (= Allapattah Road) ca 1 mi S of SW 248 Street (= Coconut Palm Drive), 0.6 mi S of FL Turnpike overpass, between large canal (labeled C-102) to N and small canal on N side of SW 264 Street; weedy roadside edge of palm nursery, with *Sporobolus indicus*, *Digitaria ciliaris*, *Panicum maximum*, *Bidens alba*, *Pouzolzia zeylanica*, *Sorghum arundinaceum*, *Conochea multifida*, *Ammannia coccinea*, *Mecardonia procumbens*, *Parthenium hysterophorus*, *Euphorbia graminea*, *E. heterophylla*, *Equisetum hyemale*, *Pentodon pentandrus*, *Ipomoea indica*, *Physalis angulata*, *Phyla nodiflora*, *Portulaca oleracea*, *Chamaesyce ophthalmica*, *Hedyotis corymbosa*, *Lepidium virginicum*, *Cyperus esculentus*, *C. polystachyos*, *C. surinamensis*, *C. rotundus*, *Echinochloa colonum*, *Pilea microphylla*, *Cardamine hirsuta*, *Vigna luteola*, *Phyllanthus urinarius*; erect herb, common, 25.52303° N, 80.37193° W, 26 Sep 2008, Abbott 25233 (MO). A scanned image of the specimen is reproduced here as Figure 1 and is available from Tropicos (2016).

A duplicate of the same collection is also deposited at FLAS (information received from the collector, J. Richard Abbott), and its image is also available online (FLAS 2016). Judging from this image, the plants from FLAS are morphologically rather uniform and identical to plants from MO.

The leaf shape of plants from Florida is typical for subsp. *blomianum*: the lateral lobes at the bases of leaves are almost perpendicular to the axis of the main central lobe. There are also other less evident and not readily verbalized leaf shape patterns that point to the southeastern Asian origin of the Florida plants (e.g., central lobes with rather large irregular teeth, as in some Asian varieties and forms of the subspecies described or recognized in Aellen 1960–1961). Judging from a few immature fruits available, the plants from Florida have rather glabrous pericarp and seed testa sculpture patterns, corresponding to the characters of subsp. *blomianum*. However, because the fruits are not completely mature and few, and the pericarp and testa sculpture are not yet clearly expressed, additional collections are needed to check these characters in fully mature material.

It is often stated that only mature seeds can be used for identification of the two subspecies of *Chenopodium ficifolium*. For example, Uotila (2001a: 33) noted under subsp. *blomianum* that “[t]he rank accepted here should be considered provisional especially because the variation is badly known in the vast other Asian areas of *C. ficifolium*. Even if there are also differences between Indian and European *C. ficifolium* in leaf shape, the variation is wide and partly overlapping, and in some cases



Figure. 1. *Chenopodium ficifolium* subsp. *blomianum* from Florida (Abbott 25233, MO)

the races cannot be separated with certainty without seeds.” However, judging from my experience with herbarium specimens (consulted mainly at HUJ, K, KW, LE, MO, NY, US and a dozen other Eurasian and North American herbaria) and plants in the field, the characteristic leaf shape patterns typical for subsp. *blomianum* almost never occur in plants of subsp. *ficifolium* (despite its wide variability), and in most cases it is sufficient for reliable identification. The plants collected in Florida (totally 7 individual plants on two herbarium sheets from MO and FLAS, 3 and 4 plants, respectively) are rather uniform in their leaf shape pattern and other observable characters; it probably indicates a single case and source of their introduction. The presence in the collection locality of numerous weedy plants (as listed on the label) native to southeastern Asia or commonly occurring there as weeds is additional evidence that the discussed taxon of *Chenopodium* was probably introduced to the place from southeastern Asia.

Precise native distribution of *Chenopodium ficifolium* subsp. *blomianum* remains insufficiently understood. In particular, Aellen (1960–1961) reported this subspecies as native to India, Nepal, China, Korea, East Siberia, Japan, and “Formosa” (Taiwan) and listed scattered localities of occasionally introduced plants in Europe. Other authors have mentioned only southern and/or southeastern Asia (Mosyakin 1996; Uotila 2001c; Clemants & Mosyakin 2003; Zhu et al. 2003) or the “Indian subcontinent” (Uotila 2001a), without further geographical details. Sukhorukov et al. (2016: 174) suggested that distribution of subsp. *blomianum* is “probably the same as type subspecies.” Some authors either do not mention subspecies in *C. ficifolium* at all (Ignatov 1988; Lomonosova 1992; Sukhorukov & Kushunina 2014) or totally reject the taxonomic value of subsp. *blomianum*. For example, Dostálek (1986: 275), after studying plants from at least seven localities in North Korea, concluded that “subsp. *blomianum* (Aellen) Aellen is most likely one of the many types within the range of variability of *C. ficifolium* Smith.” However, the presence of plants with characters of subsp. *blomianum* in southern and southeastern Asia (where *C. ficifolium* sensu lato is rather common) is an established fact.

Recent records of subsp. *blomianum* from southwestern Asia are more problematic. In my opinion, the densely farinose plants occurring in arid regions of southwestern Asia (probably from Pakistan and Afghanistan westward to Iraq, or probably even further westward to Egypt) related to *Chenopodium ficifolium*, usually treated in recent floras (Uotila 1997, 2001a, 2001c; Sukhorukov et al. 2016) as belonging to subsp. *blomianum*, differ in their vegetative and fruit characters from both subsp. *ficifolium* and subsp. *blomianum* and deserve recognition as a separate subspecies or probably even an independent species. The formal description of this new taxon will be published separately (Mosyakin, in preparation).

The nomenclatural citation for *Chenopodium ficifolium* subsp. *blomianum* is provided below.

Chenopodium ficifolium Sm. subsp. **blomianum** (Aellen) Aellen in Hegi, *Illustrierte Flora von Mitteleuropa*, ed. 2, 3(2): 624. 1960. *Chenopodium blomianum* Aellen, *Bot. Not.* [vol. of 1928]: 203. 1928. **LECTOTYPE** (*Flora Suecica*, Göteborg, bei Dampfmühle “Kvarnen Tre Lejon”, 19.VII.1927, Carl Blom): (G, sheet No. 10602 of Aellen’s herbarium; designated by Uotila 2001b: 97).

More collections (preferably with mature fruits) are needed to clarify the patterns of distribution of the discussed alien taxa in North America. Since *Chenopodium ficifolium* subsp. *blomianum* seems to be restricted mainly to subtropical and partly tropical regions, with only scattered occurrence of occasionally introduced plants in temperate areas, new finds of this subspecies in southern states of the USA are possible. I hope that this note will draw attention of collectors to possible new North American localities of *C. ficifolium* in general and its southeastern Asian subspecies in particular.

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