Dysphania sect. Botryoides (Amaranthaceae s.lat.) in Asia

Author: Perth, Uotila

Source: Willdenowia, 43(1) : 65-80

Published By: Botanic Garden and Botanical Museum Berlin (BGBM)

URL: https://doi.org/10.3372/wi.43.43107
Dysphania sect. Botryoides (Amaranthaceae s.lat.) in Asia

Abstract


Of the seven species of Dysphania sect. Botryoides recognized from Asia, the Mediterranean and Central Asian D. botrys is widespread in the area and D. nepalensis is widespread in the Hindu Kush, Himalaya and China. They are sympatric only from the E Hindu Kush and Pamir to NW Himalaya. Dysphania schraderiana from East Africa and the Arabian Peninsula has a restricted area in NW Pakistan, and the recently described D. bhutanica is known from Bhutan and China (Xizang). Two species are described here as new to science and illustrated: D. kitiae from China (Gansu) and D. himalaica from high altitudes in N India, Nepal and China (Xizang). Dysphania tibetica, also from high altitudes in N India to China (Xizang), is transferred from Chenopodium to Dysphania. Dysphania kitiae has narrowly lobed leaves, the back of the perianth lobes with a forward-projecting tooth near the apex and seeds with an undulate testa; D. himalaica is characterized by vertical seeds, previously almost unknown in this section; and D. tibetica has a very dense indumentum and the ultimate branchlets of its inflorescence are sterile. Descriptions for all recorded species are provided, a key to them is presented and distribution maps for D. botrys, D. himalaica, D. nepalensis and D. tibetica are given. A lectotype for C. foetidum (= C. schraderianum, D. schraderiana) is designated.

Additional key words: Chenopodiaceae, Chenopodium, Dysphania himalaica, Dysphania kitiae, Dysphania tibetica, distribution, taxonomy, China, India, Nepal, Pakistan

Introduction

The genus Chenopodium L. (Chenopodiaceae or Amaranthaceae s.lat.) is very heterogeneous, and several species had already been transferred to Suaeda Forsk. ex J. F. Gmel. and Bassia All. in the 1700s and early 1800s. The remaining major part of the genus has been under active research during the last few years, and it was divided into seven different genera, four of them belonging to the tribe Atripliceae Duby (Chenopodiastrum S. Fuentes & al., Chenopodium s.str., Lipandra Moq. and Oxybasis Kar. & Kir.), one to Anserineae Dumort. (Blitum L.) and two to Dysphanieae R. Br. (Dysphania R. Br. and Teloxys L.) (Fuentes-Bazan & al. 2012b). Transferring of the aromatic species of Chenopodium to the genus Dysphania took place in the 2000s, and to the present knowledge, the genus includes ten original Australian Dysphania species (Wilson 1983) and 33 species later transferred from Chenopodium by Mosyakin & Clemants (2002, 2008) and Verloove & Lambinon (2006). Taking in consideration the new species from Sukhorukov (2012) and three additional species described and combined here, the number of known Dysphania species is now 47.

No further phylogenetic division of Dysphania has been proposed so far. However, on a morphological basis, the aromatic Chenopodium species, now belonging to Dysphania, have been divided into several sections (e.g. Aellen 1960; Mosyakin 1996). The native Asiatic species belong to D. sect. Botryoides (C. A. Mey.) Mosyakin & Clemants; excluded are D. ambrosioides (L.) Mosyakin & Clemants (D. sect. Adenois Moq.) Mosyakin & Clemants, originally an American species but naturalized and...
widespread in southern parts of Asia, and members of the Australian *D.* sect. Botryoides in Asia widespread in southern parts of Asia, and members of the Australian *D.*... with flowers; flowers solitary in branch axils and in small fairly compact cymes.

66 Uotila: *Dysphania sect. Botryoides* in Asia

---

Terms of Use: https://bioone.org/terms-of-use

---

Material

When preparing the accounts of *Chenopodium* for Flora Iranica (Uotila 1997) and Flora of Pakistan (Uotila 2001), specimens from SW Asia, Central Asia, the Himalaya and China were revisited from the following herbaria: B, BM, C, E, FI, G, G-BOISS, G-DC, H, K, KUH, LD, LE, LG, M, NEU, OXF, PI, S, W and WU; later also specimens from BP, FRU, KAS, MHA, MW, PR, herb. Kliměš (PRA) and herb. Miehe (Marburg) were studied. Early in 2000 Leos Kliměš from Třeboň (Czech Republic) sent several tiny plants for identification, and two unknown species, considerably different from each other and from all *Chenopodium* (s.lat.), were recognized from them. In 2012 the rich material collected by Kliměš in 1999–2005 from Ladakh Province in Jammu and Kashmir, India, was studied. His specimens of *Chenopodium* (s.lat.) were very well determined, and the two unknown taxa were provided with the names *C. himalaicum* ined. and *C. tibeticum* A. J. Li. Sadly, Kliměš disappeared during his excursion to the area in 2007. Until now his material has been kept separate in Třeboň, but in due time it will be incorporated in PRA.

All *Dysphania* specimens seen have been provided with a revision slip (before 2012 as *Chenopodium*). The label information from the specimens was written in an Excel file and geographical coordinates were sought for the collecting localities for mapping the distributions of the species. Images available at the Chinese Virtual Herbarium (Qin & Ma) were checked, but identities often remain uncertain because the perianth characters are not visible, and those images have not been used in preparing the distribution maps.

**Key to the Asiatic *Dysphania* sect. Botryoides**

1. Branches of the inflorescence flat, with narrow opposite wings, ultimate branchlets sterile, forming short tips; flowers solitary in branch axils. 1. *D. tibetica*

   Branches of the inflorescence ± terete (sometimes narrowly winged near axils), ultimate branchlets ending with flowers; flowers solitary in branch axils and in small fairly compact cymes.
2. Seeds vertical; perianth lobes / segments lanceolate; leaves narrowly elliptic to lanceolate, margin entire to sinuous  ........................................  2. *D. himalaica*
– Seeds almost always horizontal; perianth lobes / segments narrowly ovate to broadly ovate; leaves elliptic-ovate, margin pinnatisect to pinnatifid  ........................................  3
3. Perianth divided into narrowly ovate segments, back of segments hardly keeled; glandular hairs distinctly stalked with small globular pale yellow heads  ........................................  3. *D. botrys*
– Perianth divided into ovate to broadly ovate segments or lobes, back of segments and lobes apically swollen or variously keeled; glandular hairs subsessile, heads yellow to orange  ........................................  4
4. Perianth divided into lobes, with simple eglandular hairs, back of lobes evenly swollen to keeled with long narrow lobes  ........................................  5
– Perianth divided into lobes or segments, without simple eglandular hairs, back of segments cristate or back of lobes with a prominent projection near apex  ........................................  6
5. Leaf blade pinnatifid, lobes ovate to semiorbicular, sinus as broad as or narrower than lobes; glands ± yellow  ........................................  4. *D. nepalensis*
– Leaf blade pinnatisect to deeply pinnatifid, lobes narrowly oblong to lanceolate, sinus broader than lobes and often containing rounded teeth at centre; glands orange to yellowish orange  ........................................  5. *D. bhutanica*
6. Leaf blade pinnatisect to deeply pinnatifid, lobes narrowly oblong to lanceolate; perianth divided into lobes, back of lobes with an undivided projection near apex  ........................................  6. *D. kitaie*
– Leaf blade pinnatifid, lobes broadly entire to dentate; perianth divided into segments, back of segments cristate, with several lobes  ........................................  7. *D. schraderiana*

**Taxonomy**

All species of *Dysphania* sect. *Botryoides* are annuals. Due to glands they are aromatic, probably of different intensity and even of different tinge of odour, but the odour soon disappears in herbarium material and information of fresh plants is very scant.


Illustrations — Fig. 1; Li & Ma (1983: 639, as *Chenopodium tibeticum*).

Description — Herbs (2–)5–10(–22) cm tall, with simple, long and curly hairs and shortly stipitate glands; glands pale yellow, obovate, c. 0.04 mm in diam. Stems erect or ascending, often red, densely hairy and with glands, only basally branched and lowermost branches subopposite (sometimes with several main stems). Leaves brownish; blade elliptic-trullate, 0.5–2 cm, as long as or longer than petiole, hairy on both surfaces, glandular only below, margin almost entire to sinuate with 1–3 shallow ± obtuse lobes on both sides, apex ± obtuse. Bracts smaller than leaves, narrowly obovate to spatulate, margin entire. Inflorescence elongate; partial inflorescences 0.5–1.5(–3.5) cm, slightly falcate 1-sided dichasia and monochasia; branches fairy stiff, flat, with 2 opposite wings, abaxial side greenish, rounded, with some hairs and glands, adaxial side with strong, elevated and whitish midrib, glabrous, margin hairy; ultimate branchlets dichasial, forming sterile short often somewhat hooked tips. Flowers solitary in axils of branches on adaxial side, sessile (without swollen receptacle). Perianth segments 5, free to near base but not spreading in fruit, broadly ovate, c. 0.8 × 0.6 mm, herbaceous with very narrow membranous margin widening towards apex, midrib visible on both surfaces but not prominent, back almost flat, somewhat swollen near apex, densely pubescent and with glands, apex deep red (sometimes apical part of segment deep red), obtuse to acute, hardly acuminate, often strongly backward curved at least after flowering. Stamens 1–5. Stigmas 2, c. 0.2 mm. Fruits

Fig. 1. *Dysphania tibetica* – A–C: parts of an inflorescence from L. Klimeš 1741 (PRA). Note scars of fallen flowers at branch axils (C). – Photo and drawings by M. Koistinen.
falling without perianth; pericarp white, thickish, fairly easily scratched from seed, papillae low. Seeds horizontal, rarely vertical in lowermost narrow axils, brownish black, orbicular to ovate in outline, 0.7–1.2 × 0.6–0.9 × 0.4–0.6 mm, margin obtuse to keeled; testa lustrous, faintly pitted.

**Distribution and habitats** — *Dysphania tibetica* is known from three areas in Xizang, China: Gyangze Xian and Cuqin Xian at 3900–4600 m (Li & Ma 1983) and the Upper Arun Valley, and from Ladakh in Jammu and Kashmir, India (Fig. 2). The altitude given for the specimens seen is 4020–4810 m. Further, three images (PE 00235089, PE 00235090, PE00235091) in the Chinese Virtual Herbarium (Qin & Ma) represent *D. tibetica*. The specimens were collected from sandy ground and grassland near (salty) lakes and from subalpine grassland. According to Li & Ma (1983), *D. tibetica* is known near villages and on roadsides. No ecology was given by Klimeš on his labels.

**Taxonomic remarks** — Klimeš regarded *Chenopodium tibeticum* as a good species, despite it being synonymized with *Teloxys aristata* in Flora of China (Zhu & al. 2003). Both the description and good drawing in Li & Ma (1983) show that the species is remarkably different from *T. aristata* and also indicate that the species belongs to *Dysphania*.

*Dysphania tibetica* is densely hairy, with simple curly hairs. It further, it has subsessile pale yellow glandular hairs. The number of glands seems to be less than usual in *D. botrya* and *D. nepalensis*, and this is obviously the reason for its not-so-strong odour, as observed by Li & Ma (1983). On the contrary, *Teloxys aristata* bears neither glands nor simple long hairs. It is only slightly ve

cence. They are almost terete, longer than the branchlets of *D. tibetica* and end with a knot-like rudimentary flower.

*Dysphania tibetica* has slightly elongated seeds commonly with a truncate margin and a faintly pitted black testa; these seeds match well with other Asiatic *Dysphania* species. *Teloxys aristata* has rounded relatively flat seeds usually with an acute or even winged margin, and the testa is smooth (Sukhorukov & Zhang 2013).

The peculiarities of the inflorescence as a whole, together with dense long hairs, make *Dysphania tibetica* morphologically a quite unique member of the genus.

**Specimens seen** — **INDIA**: JAMMU AND KASHMIR: LADAKH: Region Indus Valley: Zhung, Chukirmo, 33°49.5’N, 77°39.1’E, 4150 m, 8 Sep 2001, L. Klimeš 1657 (PRA); Zhung, Lato, 33°40.7’N, 77°43.8’E, 4020 m, 5 Sep 2001, L. Klimeš 1545 (PRA); Zhung, Stagar (Sakti) to Wari La, 34°2.8’N, 77°49.3’E, 4240–4270 m, 12 Sep 2001, L. Klimeš 1741 (PRA); Stot (E), above the Tiri village, 33°31.5’N, 77°58.6’E, 4330–4460 m, 1 Aug 2001, L. Klimeš 1190 (PRA). Region Rupshu: Rupshu, 32°58.5’N, 77°24’E, c. 4600 m, 11 Jul 2000, code 00-10-4, L. Klimeš (H 1757589); Samand Rockhen, Thukje village to Nyamur, 33°20.13’N, 78°1.67’E, 4560 m, 9 Sep 2005, L. Klimeš 6268 (PRA); Tso Moriri, Karzok to Peldo, 32°59.5’N, 78°15’E, 4550 m, 13 Sep 2005, L. Klimeš 6309 (PRA); Tso Moriri, Lapgo River Valley, 32°58.7’N, 78°21.3’E, 4810 m, 11 Jul 2000, L. Klimeš 6268 (PRA). **CHINA**: XIZANG: Tibetan Himalaya, Upper Arun Valley, N of Xegar (Tingri), 28°37’N, 87°10’E, 4400 m, 5 Oct 1989, B. Dickoré 5919 (KAS).

2. *Dysphania himalaica* Uotila, sp. nov.

Holotype: India, Jammu and Kashmir, Ladakh, Region Indus Valley, Stot (E), Nyi [Nior Nis; Njurnis] to
Willdenowia 43 – 2013


– Chenopodium himalaicum Klimeš, in schedis.

Illustrations — Fig. 3 and 4 (illustrated here for the first time).

Description — Herbs (2–)5–10(–14) cm tall, sometimes turning red in fruiting stage, with long simple curly hairs and subsessile glands; glands pale yellow, obovate, c. 0.05 mm in diam. Stems erect, often red or red-striped, hairy and with few glands, much branched basally (sometimes with several main stems). Leaves green on both surfaces; blade gradually tapering into a short petiole, to 2 × 0.8 cm, narrowly elliptic to lanceolate, with glands and hairs on both surfaces, especially along midvein abaxially, margin sinuate with 2–5 shallow lobes on both sides, lobes and apex obtuse. Inflorescence ebracteate, elongate to length of most or whole of stem, diffuse, broad, ± thyrsoïd, lax, with all branches fertile, composed of solitary flowers in branch axis, even in lowermost ones, and of more condensed groups of few flowers in ultimate parts of inflorescence. Flowers with 0.1–0.3 mm long stipe; receptacle strongly swollen. Perianth segments 4 or 5, persistent, at first united above middle but during maturity splitting to base, lanceolate, 1–1.2 × 0.35–0.4 mm, herbaceous, margin narrowly membranous, at maturity broadly membranous apically and basally so that only strong midrib connects segment to receptacle, back of segment swollen to somewhat keeled near apex, ± hairy and with glands especially near margin, apex long acuminate, usually strongly red and recurved at least in seed stage (sometimes major part of segment red). Stamens 0–5. Stigmas 2, 0.2–0.5 mm.

Fruits falling without perianth; pericarp whitish, fairly thick, soft, easily scratched from seed, papillae low. Seeds vertical, brownish black, somewhat elongate in outline, 0.75–0.9 × 0.65–0.8 × 0.4–0.45 mm; margin rounded to truncate; testa almost smooth, faintly reticulate.

Distribution and habitats — Dysphania himalaica is known from India (Ladakh in Jammu and Kashmir), Nepal and China (Xizang) (Fig. 5) and is reported at altitudes of 3410–4765 m. Also two images (PE 00235087 and PE 00235088) in the Chinese Virtual Herbarium (Qin & Ma) represent D. himalaica. The species has been collected from various grassy habitats, pastures on limestone rock. The Indian specimens bear no information on habitats.
Dysphania himalaica is the most infrequent taxon in Klimeš’s material of Dysphania. It is often collected from the same localities as D. nepalensis and D. tibetica, but mostly from higher altitudes than those of D. nepalensis and especially D. botrys. However, they all grow more or less sympatrically in Ladakh.

**Taxonomic remarks** — The species does not match well with the current concept of *Dysphania* sect. Botryodes (see, e.g., Aellen 1960; Clemants & Mosyakin 2003). It has four or five perianth segments and vertical seeds, which are more or less unknown in the species so far included in the section. However, at least in *D. botrys* and *D. tibetica* there are sporadically vertical seeds. In other sections fewer than five perianth segments or lobes and vertical seeds are not uncommon and they seem to correlate with each other. Also in other characters (swollen receptacle, narrow perianth segments with low keel, relatively long stigma) *D. himalaica* resembles *D. botrys* more than other *Dysphania* species.

**Additional specimens seen (paratypes)** — **INDIA: JAMMU AND KASHMIR: LADAKH**: Region Pangong: Lukung, 33°59.5’N, 78°24.6’E, 4300 m, 9 Sep 2002, code 02-39-10, *L. Klimeš* 6627 (PRA). Region Indus Valley: Zhung (Leh), Chogdo to Chukirmo, 33°49.4’N, 77°38.9’E, 4180–4310 m, 8 Sep 2001, code 01-41-10, *L. Klimeš* 1627 (PRA); Zhung (Leh), Gya to Lato, 33°40.2’N, 77°43.9’E, 4060–4070 m, 5 Sep 2001, code 01-38-12, *L. Klimeš* 1539 (PRA); Zhung (Leh), Kiameri La to Runtshe village along the Kyammar Lungpa, 33°35’N, 77°49’E, 4350 m, 15 Sep 1999, code 99-34-3, *L. Klimeš* 830 (H, PRA); Stot (E), Ankhung village to Puga, 33°14’N, 78°16’E, 4550 m, 8 Sep 1999, code 99-27-9, *L. Klimeš* 6627 (H, PRA); Stot (E), Sumdu Gonma to Kiagar La, 33°10.2’N, 78°21.5’E, 4690 m, 7 Sep 2003, code 03-26-3, *L. Klimeš* 3461 (PRA). Region Shyok: W & C, Wari La to confluence of Lurung Lungpa and Lazun Lungpa, 34°14.9’N, 77°51.8’E, 3840 m, 15 Sep 2001, code 01-47-40, *L. Klimeš* 1868 (PRA). Region Rupshu: Samad Rockhen, Polokongka Valley, 33°16.4’N, 78°6.1’E, 4660–4750 m, 5 Aug 2002, code 01-8-11, *L. Klimeš* 1255 (PRA); Tso Moriri, Lunlung Valley, 33°2.5’N, 78°18.0’E, 4700 m, 8 Sep 2003, code 03-27-5a, *L. Klimeš* 3476 (PRA); Samad Rockhen, Thukje village to Nyamur, 33°20.13’N, 78°1.67’E, 4560 m, 9 Sep 2005, code 01-8-8, *L. Klimeš* 6270 (PRA); Samad Rockhen, Thangmar, 33°20.4’N, 78°1.8’E, 4590 m, 5 Aug 2001, code 01-8-8, *L. Klimeš* 1271 (PRA). **CHINA: XIZANG**: Changthang S shore of Dangra Yum Tso, 30°43’N, 86°35’E, 4590 m, 9 Sep 2003, G. & S. Miehe 03-081-05 (KAS); Changthang S of Dangra Yum Tso, Targo River S of Targo Shang, 30°35’N, 86°89’E, 4765 m, 10 Sep 2003, G. & S. Miehe 03-089-01 (KAS); Saga Dzong, Upper Yarlug Tsangpo, 29°21’N, 85°14’E, 28 Aug 2003, G. & S. Miehe 03-043-23 (KAS); Tibetan Himalaya, Upper Arun Valley, N of Xegar (Tingri), ...
28°37'S, 87°10'W, 5 Oct 1989, B. Dickoré 5919 (KAS).
Nepal: Mustang Province: Chalungpa, Lower Jeula Forest, 28°54'N, 83°45'E, 3410 m, 8 Sep 2001, G. Miehe & al. 01-119-03 (KAS).


Illustrations — Mao (1995: t. 8, fig. 3–5); Uotila (1997: t. 23); Zhu & al. (2003: fig. 307, 4–5).

Description — Herbs 5–40(–80) cm tall, somewhat sticky, densely hairy, some hairs simple and eglandular, most hairs glandular, stalked; glands pale yellow, often obovoid, as long as stalk, 0.02–0.04 mm in diam., early collapsing. Stems erect, green-striped to yellow, with simple and glandular hairs, usually with several ascending branches, mainly at middle of stem, sometimes longer than main axis. Leaves dull green, somewhat glaucous, rarely reddish, usually densely pubescent on both surfaces; blade elliptic to ovate in outline, 1–7 cm, longer than petiole, base shortly attenuate to subcordate, margin pinnatifid with 2–5 broad lobes and several teeth on each side, apex obtuse; lower leaves sometimes repand. Bracts small, margin pinnatifid to dentate. Inflorescence mostly terminal and ebracteate, elongate, composed of solitary flowers in branch axils of dichotomies and of more dense small dichasial cymes; main axis to 5 cm wide. Flowers with c. 0.1 mm long stipe; receptacle somewhat swollen. Perianth segments 5, free to and often not contiguous at base, fairly persistent, often whitish in fruit, elliptic to ovate, c. 1 × 0.5 mm, herbaceous, midrib strong, back rounded to weakly keeled, densely covered with stalked glandular hairs, margin membranous, apex acuminate. Stamen 1–5. Stigma 2, 0.5–0.7 mm. Fruit falling without perianth; pericarp fairly thin, easily scratched from seed, papillae low. Seeds horizontal, some vertical especially in lower parts, black, orbicular in outline, 0.6–0.8 × c. 0.5 mm, margin rounded, often truncate in part; testa almost smooth.

Distribution and habitats — Dysphania botrys is a Mediterranean and Irano-Turanian species, spread over a wide area from Mediterranean Europe to Ukraine and S Russia, Anatolia, the Near East and the Caucasus (Uotila 2011), and to W and N Iran, Afghanistan, W and N mountainous Pakistan and NW India (Jammu and Kashmir and Himachal Pradesh) and, according to Li & Ma (1983), to SW China (Zanda County, the southwesternmost part of Xizang). In Central Asia its area consists of Turkmenistan (Kopet Dagh), E Uzbekistan, Tajikistan, Kyrgyzstan, and E Kazakhstan, and continues to NW China (Xinjiang, mostly the foothills and mountains of the Tian Shan; Grubov 1966; Mao 1994), and the southwesternmost parts of Mongolia (Mongolian Altai s.lat.; Grubov 1966; Guhanov 1996); Fig. 6. In Central Asia the growing altitude is mostly between 700 m and 2500 m. The patchy distribution in Fig. 6 is in part due to uneven collecting, but also shows that the species avoids all the driest regions of the area. Dysphania botrys is introduced and naturalized in most of C Europe and Mediterranean Africa (Uotila 2011), North America and S Africa. It is mentioned as alien from one locality in S Siberia (Lomonosova 1992, 2012) and from a few localities in the Vladivostok Region (Ignatov 1988); and as cultivated it is collected from E China (Shanghai, Gardens of Zhi-Wei, 1861, herb. Léveillé, E). Probably part of the northern finds in Central Asia also represent originally introduced occurrences.

Dysphania botrys is sympatric with D. nepalensis in a fairly limited area in the W Pamir, Karakoram and W Himalaya, in NE Afghanistan, Tajikistan, N Pakistan, N India and probably in SW China. In the Himalaya and adjacent areas it grows at altitudes between 1200 m and 4000 m, and in the sympatric area often at lower altitudes than D. nepalense. Klimeš’s specimens from Ladakh are from 3010–4000 m (D. botrys) and 2780–4700 m (D. nepalensis). Klimeš (Klimeš & Dickoré 2005) studied the flora of Lower Ladakh (c. 3000–3500 m) and found D. botrys in 24 of the 43 studied localities and D. nepalensis in only seven of the localities (in part the same localities as D. botrys). This also reflects difference in their altitudinal preferences.

The habitats of the two species are also different according to Klimeš & Dickoré (2005). Dysphania botrys was mentioned as a weed from fields, roadsides and river sands, and from more natural habitats, such as sandy grasslands, dry river-bed gravels and (as rare) deserts; whereas D. nepalensis was found as a weed in potato fields and along irrigation canals. In general, D. botrys grows in many kinds of disturbed habitats, usually open, gravelly and dry, either natural habitats such as semideserts, salt-lake shores, dry riverbeds, rock screes, grassland vegetation and sparse shrubberies, or man-made habitats such as roadsides, villages, field margins and waste lands.

Taxonomic remarks — Dysphania botrys is morphologically fairly uniform in its area. All of the chromosome counts (see Grozeva & Cvetanova 2013), including those from from Afghanistan (Podlech & Dieterle 1969; Uotila 1973) and Mongolia (Lomonosova & al. 2003), give a diploid number, 2n = 18 (as Chenopodium botrys). The identity of “C. botrys” from Kashmir, Pahalgam, reported to have 2n = 18 by Mehra & Malik (1963), has not been checked.

India: Himachal Pradesh: Simla distr., Urni-Chim, 9 Jul 1940, M. R. Abbi 2849 (G); Lahul, Gondla, 10 300 ft, 2/8 Jul 1938, N. L. Bor 12439 (E, K); British Lahul, Chandrabhaga Valley, 10 000–11 000 ft, 30 Mar 1920, L. Shiv Ram Kashyap 67 (K). — Jammu and Kashmir: Kargil, Ladakh, 27 Jul 1933, W. Koelz 6133 (G, S); Kuri and Changrezing, 11 000–12 000 ft, 1884, Stoliczka (K); Region Indus Valley, Zhung (Leh), Ganglas – upper part, springs, 34°12.3’N, 77°36.8’E, 3880–4000 m, 30 Jun 2001, L. Klimeš 1160 (PRA); Region Zanskar, S of Padum, Pibiting to Karsha, 33°30.3’N, 76°54.0’E, 800 m, 25 May 1974, V. Vašák (PR 374433); West Pamir, Bartand River near Shujand Village, 2000 m, 5 Jul 1983, G. M. Pokuária-kova & al. (MHA); West Pamir, vicinity of Horog Town, 2300 m, 18 Jul 1992, T. Konovalova & N. Shevyreva (MHA); Vakhân – Ishkishimski distr., Shitkhar, 36°51’N, 72°6.4’E, Aug 1935, P. N. Ovcznikov & K. S. Afanassjev 1650 (LE).

Kyrgyzstan: Alay Range, left side of Taldyk River between Mady and Langar, 9 Jul 1930, S. V. Juzepczuk 141 (LE); Prope Gulcza, ad fl. Gulcza, 1 Jun 1900, W. Tranzschel (LE); Toktogul Distr., northernmost end of Fergana Ala-Too, roadside along Kara-Suu River, 1050 m, 41.656°N, 72.833°E, 28 Jul 2009, P. Uotila 47702 (H 174707); Ala-Buka Distr., Chatkal Range (S slope), Kasan-Say River, west side of a nameless north-side tributary, 600 m from the main river, 1750 m, 41.4979°N, 71.0434°E, 3 Aug 2009, P. Uotila 47700 (H 1747544); Teskey Ala-Too, Tosor, shore of Ysyk-Köl Lake, 27 Aug 1969, Z. Arbabea & al. (FRU, H).

Kazakhstan: Promontorii Alatau austro-occidentalis in jugi Alatau Transiliensis, in fluxu inferiore fl. Kyzyl-Saj (systema fl. Czu), 11 Jun 1963, V. Goloskokov 1480 (BP 497406, H, LE, S); Distr. Chimkent, in vicinitate pagi Saryagach, apud rivum Keles, 49°32’N, 69°17’E, 450 m, 4 Jul 1973, V. Vašák (PR 374425); Karatau, Uch-Uzen, 1 Jun 1930, S. Lipschitz 396 (MW); Taldy-Kurgan distr., 4 km W Basshiy, plains S of Altyń Emel’ Range, 44°10’N, 78°44’E, 1000 m, 7 Sep 1992 H. Freitag & S. Rilke 26151 (KAS); Songarina, Lacum Saisang-Nor [c. 47°37’N, 84°21’E, no date or collector given] (E, UPS); Ketmen Range, between Dardamty and Shunkar, 18 Sep 1931, L. Rodin (MW); Semipalatinsk distr., S part, near
the village Taubinka by the river Tchar-Gurban, May 1914, N. Schipczinsky 1069 (S).

China: Xinjiang: Kashgar, SE Tien Shan in Karashar, near Chokur village, 28 Aug 1929, M. G.-DC, H (from Nikita Botanical Garden, Crimea, Ukraine), LE (from Tartu Botanical Garden, Estonia), NEU, OXF and PI.


Illustrations — Gupta (1989: cxlii, as Chenopodium botrys); Kung & Chu (1979: t. 15, fig. 1–3, as C. foetidum); Huang (1997: t. 49, fig. 9–13, as C. foetidum); Uotila (1997: t. 23, 24); Zhu & al. (2003: fig. 307, 1–3, as Dysphania schraderiana).

Description — Herbs 3–70 cm tall, with simple hairs and subsessile glands; glands yellow, ± globose, 0.04–0.07 mm in diam. Stems erect, green-striped to yellow, densely hairy, with few glands in younger parts; branches numerous, mainly at middle of stem, usually shorter than main axis, diffusely spreading to erect-spread. Leaves yellowish to pure green, sometimes slightly glaucous, with hairs and glands on both surfaces; blade (narrowly)elliptic to ovate, 1–7 cm, longer than petiole, margin pinnatifid with 2–5 lobes on each side; lobes broad, margin entire or with few rounded teeth, sinus as broad as or narrower than lobes, apex fairly obtuse. Bracts narrowly elliptic to narrowly obovate, margin less lobed to entire in sequence up stem. Inflorescence mostly terminal, elongate to diffuse thyrsoid, to 10(–20) cm wide, with slightly falcate main branches, lax, composed of solitary flowers in axils and of small compound dichasial to monochasial cymes. Flowers sessile; receptacle not distinctly swollen. Perianth lobes 5, free usually to halfway, sometimes more, fairly persistent, broadly ovate, 0.8–1 mm, herbaceous with ± narrow membranous margin, midvein fairly strong, back swollen in apical part, often with several c. 0.2 mm long narrow lobes, ± pubescent but glands absent or sparse, margin glandular, apex acute to acuminate. Stamens 1–5. Stigmas 2, 0.2–0.5 mm. Fruits mostly falling without perianth; pericarp thin, fairly easily removable from seed, papillae often fairly high. Seeds horizontal, brownish black, orbicular in outline, 0.6–0.8 × c. 0.5 mm; margin obtuse to truncate, irregularly notched or keeled; testa almost smooth.

Distribution and habitats — Dysphania nepalensis is widely distributed in the Himalaya and highland China. The western limit of its area is in the Pamir (Wakhan area in Afghanistan and Tajikistan) and in the NE Hindu Kush (Konar in Afghanistan). It seems to be common in N Pakistan, NW India (Himachal Pradesh, Uttarkhand and Jammu and Kashmir), Nepal and Bhutan. From China much material has been seen from Xizang and Yunnan; many specimens are also from Gansu, Shanxi and Hebei, and several from Xinjiang, Qinghai, Shaanxi and Sichuan (Fig. 7). Judging from the images in the Chinese Virtual Herbarium (Qin & Ma) it is more common and widespread in China. Herbarium specimens have been commonly collected from 2500–3300 m, in some cases down to at least 1200 m (India) and up to 4660 (Xizang) and 4700 m (Ladakh); also Klimeś collected specimens at 2780–4700 m. In Ladakh it grows with D. himalaica and D. tibetica, and less often with D. botrys. In India it seems to be more common than D. botrys. The specimen Lung Hua 789 (G-PAE!), cited as Chenopodium botrys by Walker (1941), belongs to D. nepalensis.

Habitats include subalpine juniper scrub, grasslands, river banks, canal sides, pastures, fields, ruderal places, waste places, roadsides and paths, often on loamy or alluvial soil. In general, the ecology is fairly similar to that of Dysphania botrys. Perhaps D. nepalensis prefers somewhat moister and more nutrient-rich places, but the information on labels is too scarce and superficial for proper conclusions.

There are at least two old specimens of introduced Dysphania nepalensis from Europe: Austria, Wien, Tivoli-gasse, edge of pavement, 1937, E. Korb (W; as Chenopodium botrys), and Germany, Mannheim, harbour, no date, R. Baschant (W; as C. foetidum). No recent collections of D. nepalensis from European botanical gardens have been seen, but in the 1820s plants with the same Berlin origin as the holotype specimen were apparently cultivated in several botanic gardens; specimens referring to this are at least in G-DC, H (from Nikita Botanical Garden, Crimea, Ukraine), LE (from Tartu Botanical Garden, Estonia), NEU, OXF and PI.
Taxonomic remarks — High mountain plants, for instance the material collected by Klimeš and Miehe from 2230–4530 m, are very small in size, only 1–3 cm and with one or few flowers, and without checking flower characters easily confused with *Dysphania himalaica* or *D. tibetica*. Sometimes, in particular in Qinghai and Gansu, leaves of *D. nepalensis* have numerous quite regular and entire lobes. The inflorescence varies from relatively narrow and spiciform to more than 15 cm broad dichasial panicles. Diffuse inflorescences are to some extent correlated with relatively shallowly lobed leaves and they are fairly common, especially in higher areas. Such variation exists also in *D. botrys*, and its taxonomic importance is limited. Variation in perianth characters involves both hairiness and the shape of the keel, which may be narrow with several prominent hairs, or broader with only few weak hairs. The pericarp is sometimes densely glandular. The great variation in leaf shape and inflorescence — even after *D. bhutanica* was separated — and in shape and hairiness of perianth lobes in *D. nepalensis* may indicate its heterogeneity.

The chromosome number of *Dysphania nepalensis* is not known.


India: Jammu and Kashmir: Region Indus Valley: Zhung (Leh), Sasoma, 33°38.3’N, 77°44.6’E, 4130–4150 m, 5 Sep 2001, L. Klimeš 1580 (PRA); Domkhar – Dha, 34°36’N, 76°31’E, 2780 m, 31 Aug 2002, L. Klimeš 2561 (PRA); Klimeš & Dickoré 2005); Stot (E), Tugla, 33°44.8’N, 77°59.8’E, 3900 m, 27 Sep 2003, L. Klimeš 3630 (PRA). Region Zanskar: Zara, Sorra village, 33°35’N, 77°29’E, 4310 m, 22 Aug 1998, L. Klimeš 123 (PRA). Region Rupshu: Tso Moriri, Lunglung valley, 33°2.5’N, 78°19.0’E, 4700 m, 8 Sep 2003, L. Klimeš 3477 (PRA); Tso Moriri, Karzok, NE, 32°58.23’N, 78°16.05’E, 4550 m, 14 Sep 2005, L. Klimeš 6334 (PRA). Region Shyok: central part, Diskit, 34°32.77’N, 77°33.47’E, 3170 m, 27 Sep 2004, L. Klimeš 5077 (PRA); upper Shyok, V4, 1000–1300 ft, T. Thomson (E). Kashmir, Ladakh, Marso, 10–11 Aug 1933, W. Koelz 6374 (G, S); Kashmir, Dalhousie, 5000 ft, 20 Sep 1874, C. B. Clarke 22776 (FI), 22781A (BM) & 22850A (LE); Kashmir, drained lake basin of Kashmir, environs of Srinagger, in a circle 8 miles radius, Aug–Sep 1856, Schlagintweit 4413 (BM, E); Kashmir, Kargil, NE, 4550 m, 14 Sep 2005, L. Klimeš 6334 (PRA). Region Shyok: central part, Diskit, 34°32.77’N, 77°33.47’E, 3170 m, 27 Sep 2004, L. Klimeš 5077 (PRA); upper Shyok, V4, 1000–1300 ft, T. Thomson (E). Kashmir, Ladakh, Marsho, 10–11 Aug 1933, W. Koelz 6374 (G, S); Kashmir, Dalhousie, 5000 ft, 20 Sep 1874, C. B. Clarke 22776 (FI), 22781A (BM) & 22850A (LE); Kashmir, drained lake basin of Kashmir, environs of Srinagger, in a circle 8 miles radius, Aug–Sep 1856, Schlagintweit 4413 (BM, E); Kashmir, Kargil, *Stolica* (K). — Himachal Pradesh: Lahul, Kyalong, 10 200 ft, 12 Jul 1941, N. L. Bor 15206 & 15208 (K); Simla, 6000–7000 ft, 1844, M. P. Edgeworth 57 (K, OXF); Simla, Ushan valley, 6900 ft, 9 Sep 1888, G. Watt 9376 (E); near Sinjoli, Mahasu Rd, Simla, 7300 ft, 1877, Gamble 4631A (G, K). — Punjab: Matiana, 1885, J. R. Drummond 26474 (E, G, K); Kilar Pangi, Chamba State, 8300 ft, 13 Sep 1898, J. J. Lace 1860 (B, E). — Punjab/Himachal Pradesh: Penta-potamia, Gurdaspur versus Dunera, 1880, J. R. Drummond 1420 (G, K). — Uttarkhand: Tehri-Garhwal, Jairglo in Ganges Valley [Janglot], 8000–9000 ft, 1 Aug 1883, J. F. Duthie 352 (BM); Tehri-Garhwal, near Maneri, 26 Aug 1952, P. P. Huggins A6 (BM); Garhwal, Badhernath, 10 000 ft, R. Strachey & J. E. WINTERBOTTOM 1 (BR, K, LE); Manglaur, Seorai, 5000 ft, 30 Oct 1916, R. E. Cooper 5912 (E); Kumaun, Dhauli valley, 11 000 ft, 4 Aug 1886, J. F. Duthie 5915 (K); Almora Distr., 9 Oct 1950, D. D. Arasthi 1902 (B).
NEPAL: Khumbu, Paugroche, 3900–4000 m, 9 Oct 1962, J. Poelt (M); Uthu, E of Jumla, 8000 ft, 31 Jul 1952, O. Polunin & al. 4970 (BM, E, LE); Mustang, 13 000 ft, 3 Aug 1954, Stainton & al. 2165 (BM); Tegar (N of Mustang), 13 000 ft, 6 Aug 1954, Stainton & al. 2248 (BM, G, LE); Tingri, Jul 1921, A. F. R. Wollaston 266 (K); Marsyangdi valley, the way between Pisang and OGRE, 3200 m, 25 Sep 1969, T. W. Raper 399 (BM, LJIU 36508).


Illustrations — Sukhorukov (2012: fig. 3, 4A).

Description — Dysphania bhutanica is closely related to D. nepalensis, but differs from the latter in having narrowly and deeply lobed or dissected leaves and subsessile glands, which are intermixed orange to orange-yellow (vs. yellow in D. nepalensis), and papillae on the pericarp surface, which are low (vs. high in D. nepalensis). For further description see Sukhorukov (2012).

Distribution — Bhutan and China (E Xizang), at altitudes of 2000–3500 m (Sukhorukov 2012).

Taxonomic remarks — The specimen “Chenopodium foetidum f. spicatum f. nov.” from Xizang (PE 0957618), available through the Chinese Virtual Herbarium (Qin & Ma), belongs to Dysphania bhutanica. Dysphania botrys, D. bhutanica and D. nepalensis sometimes produce more or less entire leaves especially in the upper part of the plant. In D. botrys, such leaves are longer and narrower than in other species. As to the seed anatomy, the papillae on the pericarp surface of D. bhutanica are low and resemble those of D. botrys, whereas D. nepalensis has longer papillae than the others (Sukhorukov 2012).

6. Dysphania kitiae Uotila, sp. nov.

Holotype: China, Gansu, Monastery Chortentan [c. 36°46’N, 103°27’E, see Fig. 7], on sunny slopes of
mountains on clay and rich soil, 7000 ft, 1 Sep 1901, V. F. Ladygin 596 (LE).

Illustrations — Figs. 8–10 (illustrated here for the first time).

Description — Herbs to 40 cm tall, with simple hairs and very shortly stipitate glands; glands intermixed yellowish orange and orange, globose, c. 0.1 mm in diam. Stems erect, green-striped to red, with narrow wings and ridges and fairly sparse hairs and glands; branches erect-spreading, ascending at base. Leaves shortly petiolate; blade pinnatisect to deeply interrupted pinnatifid, to 5 × 2.5 cm; leaflets and lobes narrow, abaxially lighter green, later whitish, without hairs but often fairly richly with glands (Fig. 10B), adaxially dull green, sparsely green, later whitish, without hairs but often fairly richly ridges and fairly sparse hairs and glands; Stems lowish orange and orange, globose, c. 0.1 mm in diam. 5 × 2.5 cm; blade 5, free to middle, persistent, whitish inside in fruit, 1.1–1.3 × 0.5–0.6 mm, back green-purplish, glabrous, with a slightly forward-projecting triangular tooth near apex and a narrow, gradually lowering keel toward base, margin broadly membranous, without hairs but with glands, apex acute or acuminate, membranous. Stamens 5. Stigmas 2, 0.1–0.2 mm. Fruit falling without perianth; pericarp fairly thick, firmly adherent to seed, papillate very low. Seeds horizontal, reddish black, orbicular but somewhat irregular in outline, 0.85–1 c. 0.6 mm, margin rounded to slightly acute; testa undulate, radially furrowed and irregularly pitted.

Distribution — Dysphania kitiae is known from Gansu, China, in two fairly nearby localities, and probably also from W Sichuan. The location of the holotype specimen is marked in Fig. 7.

Taxonomic remarks — The Wilson gathering of D. kitiae at BM and K was seen by P. Aellen and labelled by him “Chenopodium hillocoattae Aellen; typus”, and the fragment at G (herb. P. Aellen no. 19628) includes some sketch drawings and a very provisional description, but a formal description was never published. Aellen probably hesitated because he had not seen any other material, and Wilson’s gathering was without seeds. Two more specimens, one with seeds, have since been located at LE.

The American Dysphania graveolens has a tooth-like projection on the apical part of the perianth segments, as in D. kitiae, but in other characters the two species differ much from each other. As to the seeds, D. kitiae deviates much from D. botrys and D. nepalensis in having seeds black and apparently harder, more like the seeds of D. schraderiana. Dysphania bhutanica and D. kitiae have quite similar leaf shapes and both have intermixed orange and yellow sub sessile glands, but in other characters they are not similar.

Etymology — Dysphania kitiae is named in honour of Dr Kit Tan of Copenhagen.


Description — Herbs 5–50 cm tall, with simple hairs and almost sessile glands; glands yellow, ± globose, 0.04–0.05 mm in diam. Stems erect, green-striped to yellow, with sparse or dense short hairs and glands, sparingly branched at middle; main axis longer than branches, sometimes without leaves. Leaves green to yellowish green; blade elliptic-ovate, to 8.5 cm, pinnatifid with 3–5 lobes on each side; lobes fairly narrow, abaxially hairy and glandular, adaxially glabrous, margin with few or no teeth. Bracts small, with few lobes. Inflorescence axillary and terminal, elongate, not more than 5 cm wide, composed of dichasial cymes, with solitary flowers in branch axils and ending in denser small cymes; rachis slightly winged. Flowers sessile; receptacle swollen, hard. Perianth segments 5, free to base, often not contiguous at base, sometimes purple, elliptic to ovate, c. 1 × 0.5 mm, herbaceous with membranous margin, back cristate, without hairs and glands, margin glandular, apex acuminate. Stamens 1–5. Stigmas 2, 0.2–0.4 mm. Fruits mostly falling without perianth; pericarp very thin, easily scratched from seed. Seeds horizontal, reddish black, orbicular in outline, 0.6–0.8 c. 0.5 mm, margin rounded to slightly acute; testa somewhat undulate, shallowly radially striated and minutely pitted.

Distribution — Dysphania schraderiana is an East African species with a very limited distribution in Asia. It known from several localities in Pakistan, in Baluchistan
Fig. 8. Holotype of Dysphania kitiae – V. F. Ladygin 596 (LE). – Photo by A. Taponen.
Uotila: *Dysphania sect. Botryoides* in Asia

and Kurram districts (Uotila 2001), but there are also many recent collections from the SW mountainous areas of Saudi Arabia and Yemen, and the species is native there (Boulos 1996).

*Dysphania schraderiana*, earlier commonly grown especially in botanic gardens, has become a weed and has been reported as naturalized in most of the territories in C and E Europe (Uotila 2011). It has been found as alien (probably casual) also in Asia: a specimen has been seen from Russia, Far East, Khabarovsk, 15 Nov 1982, V. D. Nebalokin (MHA), as *Chenopodium botrys*; also reported as *C. botrys* by Ignatov (1988).

**Taxonomic remarks** — As to seed size, shape and surface characters, *Dysphania schraderiana* differs from Asiatic *Dysphania* and resembles more the East African *D. procera*. Leaf shape in *D. schraderiana* is less variable than in *D. botrys* and *D. nepalensis*.

The specimens from Pakistan are old and interpreted as native by Uotila (1997, 2001). However, they may also represent introduced plants even though they are more than hundred years old. Lace, in the field notes of his specimen, mentioned that the plant was eaten as a vegetable by Pathans, and Aitchison added on his specimen No. 750 (*Dysphania schraderiana*) and 899 (*D. botrys*): “A field-weed much collected and eaten as a vegetable, cooked.” The strongly aromatic *D. schraderiana*, as well as other members of the group, have long been used as pot herbs, and immigration either by accident or design may have occurred along the ancient trade routes between Africa and China.

**Specimens seen** — **Pakistan**: Kurram, Harsukh 15474 (K); Kurram [Khamyot], Shalozan, c. 2000 m, 1879, J. E. T. Aitchison 750 (G, LE); [Baluchistan, Sibi distr.] Ziarat, 2440 m, 18 Aug 1887, Lace 4015 (E); two further specimens from Kurram cited in Uotila (2001).

**Acknowledgements**

I am grateful to Mr Ian Hedge (Edinburgh) for comments on an early version of the manuscript, Dr Alexander Sukhorukov (Moscow) for useful discussions on *Dysphania* and his review of the manuscript and Dr Alexander Sennikov (Helsinki) for valuable help in nomenclature and a great role in translating Russian labels and locating Russian and Central Asiatic specimens on maps. I also thank Dr H. Heklau (Halle) for his review of the manuscript, Ms Nijole Kalinauskaite (Helsinki) for the interpretation of some Russian labels, Dr Xiaolan He (Helsinki) for translating Chinese and locating Chinese specimens on maps, Dr Elena Glazkova (St Petersburg) for photographs of Schrader’s specimens and Mr Pertti Rantiala (Helsinki) for help in searching for coordinates of collecting localities. I am also obliged to Dr Zdenek Kaplan (Pruhonice) for making available to me the *Chenopodium* (s.lat.) material from herb. Klimeš, Prof. Mingli Zhang (Beijing and Urumqi) for help in locating some Chinese specimens and Dr Eckhard von Raab-Straube (Berlin) for help with Chinese literature. Best thanks also to Ms Marja Koistinen (Helsinki) for her skilful drawings and photographs, Mr A. Taponen (Helsinki) for scanning the type specimens and Mr Sampsa Lommi (Helsinki) for preparing the maps. The curators of the herbaria listed above are cordially thanked for loans of specimens and the provision of working facilities during my visits.

Fig. 9. *Dysphania kitiae* – A: whole plant; B: leaf; C: detail of inflorescence; D: detail of flower. A, C, D from the holotype; B from *N. M. Przewalski* 704 (LE). – Drawings by M. Koistinen.
Fig. 10. Dysphania kitaiei – A: inflorescence from the holotype; B: lower leaf surface from N. M. Przewalski 704 (LE). – Photos by M. Koistinen.

References


Colla A. 1836: Herbarium Pedemontanum 5. – Taurini ex regio typographeo.


Grubov V. I. 1982: Key to the vascular plants of Mongolia. – Leningrad: Nauka.


