

Revised typifications and nomenclatural notes in N Eurasian Cruciferae

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Source: Willdenowia, 44(3) : 351-361

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

URL: <https://doi.org/10.3372/wi.44.44305>

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Abstract

German D. A.: Revised typifications and nomenclatural notes in N Eurasian *Cruciferae*. – Willdenowia 44: 351–361. 2014. – Version of record first published online on 5 November 2014 ahead of inclusion in December 2014 issue; ISSN 1868-6397; © 2014 BGBM Berlin-Dahlem.

DOI: <http://dx.doi.org/10.3372/wi.44.44305>

Original material of 17 names applying to 14 accepted species and one accepted subspecies of predominantly N Eurasian *Cruciferae* is enumerated and briefly discussed. In most cases, previous typifications contrary to the International Code of Nomenclature for algae, fungi, and plants or erroneously believed to be effective are revised and replaced with effective typifications. Fourteen lectotypes including one narrowing of a previous choice (second-step lectotype) are designated. In addition, two neglected type designations are confirmed and recognized. Notes are provided on the nomenclature of the treated taxa.

Additional key words: *Brassicaceae*, taxonomy, Adams, Bunge, Candolle, Fischer, Ledebour, Pallas, Stephan, Willdenow

Introduction

Routine work on the taxonomy of various groups of predominantly N Eurasian *Cruciferae* is continuously revealing miscellaneous nomenclatural items requiring clarification. This is particularly true for the typification of names, especially at specific and infraspecific ranks. In a number of cases, such information differs among authors and often citations taken as typifications turn out to be contrary to the International Code of Nomenclature for algae, fungi, and plants (McNeill & al. 2012), hereafter cited as “ICN”, or when new, superfluous typifications were made when previous typifications were already effective. The present work deals with 17 names applying to 14 accepted species and one accepted subspecies of *Cruciferae*, most of which are widely distributed within temperate Eurasia, especially E Europe and N and C Asia. For each name,

original material is enumerated and, if it has been recently revised, references are provided. In all cases, the involved specimens and illustrations agree taxonomically with the current usage of the typified names so that no disruptive choice of type is possible. Lectotype designations are supplied with notes supporting a particular choice or rejection of a specimen or illustration. Further nomenclatural issues are commented on where needed. Material at B, G, GOET, HAL, KW, LE, M, MW, P, PR and TK has been examined, and specimens revised in these herbaria are indicated with an exclamation mark (!). In addition, digital images from BM, H, K, and partly B and P, available via online databases (Global Plants; Kew 2006; MNHN; Röpert 2000+) were also studied, and such specimens are not indicated with an exclamation mark. Accepted names are indicated by bold italic font and the current status of all discussed taxa is provided.

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Typifications

Alyssum lenense Adams in Mém. Soc. Imp. Naturalistes Moscou 5: 110. 1817.

Type indication: “ad ripas Lenae circa ultraque urbem Jakutzk, praesertim vero in jugo Werchojanensi, prope ostium fluvii Wiluy” (Adams 1817: 111).

Lectotype (designated here): [Russia, East Siberia, Central Sakha (Yakutia)], “*Alyssum lenense* mihi. Habitat praesertim in jugo Werchojanensi, ... [fl., fr. immat.], No. 104 [Herb. Adams]” (MW 129542!).

Syntypes: “*Alyssum lenense* Ad. ad Lenam infer., [fl.]” (KW!); “ad Lenam, [fl., fr.], Adams” (LE!, 3 specimens); “ad Lenam, [fl.], Ad.” (LE!); “*Alyssum lenense* Adam. ad Lenam, [fl.], comm. Steven a. 1822 [Bieberstein]” (LE!). Possible syntype: “*Alyssum lenense* Adams ..., [fr. mat.], m. Steven 1820” (G-DC: G 00205476!).

Three of five syntypes in LE are mounted on the same sheet. One of the two labelled “ad Lenam, Adams” was indicated as the lectotype by Dorofeyev (2002: 32). However, that choice was not accompanied by the statement “designated here”, or an equivalent phrase, and is therefore not effective under ICN Art. 7.10. Although that specimen is undoubtedly part of the original material (a syntype), the choice of the specimen from the private collection of M. F. Adams, with the label showing his clear intent, is preferable according to ICN Rec. 9A.3 and is therefore designated here as the lectotype.

Alyssum linifolium Stephan ex Willd., Sp. Pl. 3: 467. 1800 (≡ *Meniocus linifolius* (Stephan ex Willd.) DC.).

Type indication: “Habitat in Tauria et Armenia” (Willdenow 1800: 468).

Lectotype (designated here): [Armenia or neighbouring Turkey], “31. T[ournefort]. *Alysson armenum*, angustissimo folio, fructu ovato [fl., fr.] / Hb. Gundelsheimer” (B 10 0244893!).

The name *Alyssum linifolium* is based on at least two gatherings, by J. P. de Tournefort from Armenia and by L. B. F. Marschall von Bieberstein (and probably also by P. S. Pallas) from Crimea. There are seven specimens in Willdenow's folder B-W 11909, and four labels glued on its inner side, and it is hardly possible to say for sure which particular specimen is the original material of the name. The only label from the folder that can be connected with a concrete specimen is that referring to “*Alyssum* No. 2” because the specimen B-W 11909-7 has a similar label also bearing “*Alyssum* No. 2” and written by the same hand. I did not manage to reveal whose hand it was but it is definitely not Pallas's and very likely neither Bieberstein's nor C. F. Stephan's. No details from the description given on the label glued on the folder are mentioned in the protologue. Therefore, this specimen is most likely not part of the original material. The same conclusion is

undoubtedly true for the specimen B-W 11909-5 annotated as “*Alyssum illyricum* (W.)”. That name first appeared as nomen nudum in a later work (Willdenow 1814), and it apparently refers to the plant of Balkan origin cultivated in the Hortus Berolinensis.

Five other specimens are possible original material for *Alyssum linifolium*, although it cannot be deduced which of them corresponds to any of the other three labels from the folder. Specimens B-W 11909-1 and B-W 11909-6 have their own labels: “*A. draba* MB nec: Fl Taur-Cauc vide suppl. p. 435.” and “*Alyssum linifolium* Bib.”, respectively; the first definitely by Ch. Steven. The other three do not have their own labels. Among three folder labels, two are by Pallas and one is by Stephan. The latter contains descriptions of a number of details that appear in the protologue (although the validating description is attributed to Willdenow); it has also an indication “Marschall misit”. A specimen corresponding to this label would be an ideal candidate for lectotypification, but, as mentioned above, it seems impossible to discern it.

Regarding the gathering from Armenia, there is no such specimen in B-W, but one is available in the general herbarium (B). In agreement with this locality, it does not bear the indication “Vieweg” – the Tournefort collections from the herbarium of Gundelsheimer that came to Willdenow via Vieweg became a part of B-W (Wagenitz 1962).

Although it is still unclear how and when Vieweg passed specimens to Willdenow (Wagenitz, pers. comm.), the presence of such specimens in B-W of species described in the Species plantarum as well as direct acknowledgement of Vieweg (Willdenow 1797: IX) prove that they were used for preparing this treatment. The rest of Tournefort's collection from Gundelsheimer's herbarium at that time was still stored at the Collegium Medico-Chirurgicum in Berlin, where they were deposited after the death of Gundelsheimer in 1715 (Urban 1917: 8). Willdenow was appointed in 1798 a Professor of Natural Sciences of the Collegium (Eckardt 1972: XI) and then had easy access to this part of Gundelsheimer's herbarium. Furthermore, from an unpublished letter of 16 June 1796 by Willdenow to J. E. Smith, it is evident that he could have worked with Gundelsheimer's herbarium already at that time (Wagenitz, pers. comm.). Therefore, it is rather safe to assume that Willdenow examined the specimen from the general herbarium prior to the publication of the species description and the indication “v.s.” in the protologue refers to both the Crimean and Armenian gatherings. Because of this and because no other specimen can be definitely proven to be part of the original material of *Alyssum linifolium*, the specimen from the general herbarium is designated here as lectotype.

Among previous citations of type of *Alyssum linifolium*, a few are treated by some authors as effective lectotypifications, although they cannot be accepted as such. Dudley (in Davis 1965: 370) designated as lectotype “Tauria, Stephan (G!)”. This citation is obviously based

on a confusion of somewhat similar names – Steven and Stephan – and can only refer to the specimen “*Alyssum draba* M. B. (*A. linifolium* Willd.). Taur. m. Steven 1820” (G 00205781). This specimen appears not to belong to the original material, in which case it is ineligible as the lectotype. According to Candolle (1821: 325), it did not originate from Willdenow’s herbarium and apparently represents Steven’s later gathering. This was later realized by Dudley, as is evident from the way he cited the type of *A. linifolium* in *Flora iranica* (Dudley in Rechinger 1968: 149): “Typus (Syntypi): “Tauria, Caucasus, Armenia”, Steph., B”. This was misinterpreted by Dorofeyev (1998: 18; 2002: 92; 2003: 100) as a lectotype designation: “Lectotypus (Rechinger, 1968): “Tauria et Armenia, Steph.” (B)”. Some recent authors (e.g. Ilyinska 2002: 10; Dorofeyev 2012: 413) have incorrectly accepted the earlier ineffective typification by Dudley (1965).

The citation by Jafri (1973: 115) “Type: Armenia, Stephan (B)”, indicating the locality of Tournefort’s plant and a purported collector of Crimean gathering(s), refers to at least two gatherings and also does not constitute effective lectotypification.

Alyssum strictum Willd., Sp. Pl. 3: 464. 1800.

Type indication: “Habitat in Armenia” (Willdenow 1800).

Lectotype (designated here): [Armenia or neighbouring Turkey], “22. T[ournefort]. *Alysson armenum*, serpillifolium, capitulis in spicam longissimam congestis [defl., fr. immat.] / Hb. Gundelsheimer” (B 10 0244951!).

Possible isoelectotypes: “[fr. immat.]” (B-W 11900-1!); “*Alysson orientale*, serpillifolio, capitulis in spicam longissimam dense digestis. Coroll. T. R. h. p. 15 [fr. immat.]” (BM000582920); “*Alysson orientale*, serpillifolio, capsulior in spicam longissimam dense digestior. Cor. T. r. h. 15 [fl., fr. immat.]” (P 00659986).

Alyssum strictum was also described by Willdenow based on Tournefort’s material, but in this case no other gatherings were mentioned in the protologue (Willdenow 1800: 464). There are two authentic specimens in B: one, without an original label, in B-W and another, with a label by Gundelsheimer, in the general herbarium. The phrase “caulibus herbaceis adscendentibus” from the validating description can hardly be based on the specimen from B-W, which is a single stem with the root missing, curved in the middle and not really ascending. On the contrary, this phrase perfectly fits the morphology of another specimen represented by a complete plant with a root and three stems, two of which are distinctly ascending at the base. This looks like additional evidence that Willdenow studied Gundelsheimer’s specimens from the Collegium Medico-Chirurgicum while working on *Species plantarum*. Furthermore, it is not excluded that the specimen B-W 11900-1 is a fragment taken from B 100244951. This assumption agrees with the absence of an indication “Vieweg” on the specimen

from B-W, meaning that it was incorporated into Willdenow’s herbarium not via Vieweg, like other Tournefort/Gundelsheimer plants, but from another source (apparently via Roestel, according to D. F. L. Schlechtendal’s annotation). Besides, there are three short but visible remnants of branches in the basal part of Gundelsheimer’s plant, and Willdenow’s specimen might represent one of those missing branches.

Assuming that Tournefort’s specimens of this species are parts of one gathering and given that there is no holotype, the duplicate in BM could be taken as the lectotype, as designated by Dudley (in Davis 1965: 479): “Type: [Turkey] in Armenia, Tournefort (BM!)”. However, that specimen was neither studied by Willdenow prior to the publication of the name nor mentioned in the protologue, and the description is apparently based on other specimens. Besides, although very probable, it is not obvious that all Tournefort’s specimens represent one gathering. Based on these considerations, B 10 0244951 is designated here as the lectotype as the one of the two specimens studied by Willdenow better fitting the original description.

Braya limoselloides Bunge ex Ledeb., Fl. Ross. 1: 194. 1841 [sero], nom. illeg. (≡ *B. limosella* Bunge [30 Nov 1841] = *B. rosea* Bunge).

Type indication: “Hab. rarissime in alpibus altaicis ad Tschujam (Bunge)” (Ledebour, 1841).

Holotype: [Russia, Altai Republic], “*Platypetalum limoselloides* m. [A. A. Bunge], [fl.], alp. ad Tschujam / Herb. Al. de Bunge / Herb. E. Cosson” (P 02141469!).

Braya limoselloides is generally accepted as a legitimate synonym of *B. rosea* (e.g. Zhou & al. 2001; Warwick & al. 2006; The Plant List; Tropicos). However, it should be treated as an illegitimate superfluous name under Art. 52.1 of the ICN because it is based on the same type as the earlier published *B. limosella*. Although the name *B. limosella* was not cited in the protologue of *B. limoselloides*, both names are based on the same holotype specimen, which was cited by Ledebour, and thus the later name, when published, definitely included the type of the earlier name, *B. limosella*, as determined by ICN Art. 52.2(a).

Although both names are based on the same type and although Ledebour (1843: 763) claimed that the epithet “*limoselloides*” should be changed to “*limosella*”, being sufficiently different (noun and adjective, respectively), they cannot be treated as orthographical variants (Art. 61.2) or confusingly similar names (Art. 61.4).

The authorship of *Braya rosea* is often cited as “(Turcz.) Bunge” (e.g. by Zhou & al. 2001; Warwick & al. 2006; The Plant List; Tropicos), which is wrong because both purported basionyms, “*Draba rosea* Turcz.” and “*Platypetalum roseum* Turcz.”, are not validly published names. The first, mentioned in the protologue of *B. rosea*,

was published as *nomen nudum* (Turczaninow 1838: 87) and the second appeared only on herbarium labels.

Cheiranthus apricus Stephan ex Willd., Sp. Pl. 3: 518. 1800 (= *Clausia aprica* (Stephan ex Willd.) Korn.-Trotzky).

Type indication: “in Sibiria ulteriori” (Willdenow 1800).

Lectotype (designated here): [Russia, ?E Siberia (most likely Baical region/Dahuria)], “*Cheiranthus apricus*!”, [fl.]” (B-W 12077-1!, left-hand plant).

Other original material: “*Cheiranthus apricus*!”, [fl.]” (B-W 12077-1!, right-hand plant); “*Cheiranthus hirtus*. Willdenow dedit, [fl.]” (HAL!).

As evidenced by the folder label in B-W and the label of the specimen in HAL, Willdenow’s initial intention seems to be to name this species “*Cheiranthus hirtus*”, but Stephan’s epithet was finally favoured. It is difficult to unravel both locus classicus and collector of the type material as long as no original labels are preserved on the cited specimens. There is a number of old gatherings in LE, anonymous or by P. S. Pallas, I. Bykov, J. Sievers, etc., ranging from SW (Altai) to SE (Dahuria) Siberia, demonstrating that rather considerable material of Siberian origin was accumulated by the time the species was described. Among three specimens from Stephan’s herbarium that I managed to study in LE, two (“*Cheiranthus apricus* var. Salesow, [fl.], Sibir. 802” and “*Cheiranthus apricus* Salesow. Sibir. [fl., fr.], 803”) are definitely later gatherings, of 1802 and 1803, respectively (see comment to *Sisymbrium pumilum* Stephan below), apparently from Altai, where A. M. Zalesov (Salesow) collected in those years. The third specimen (“*Hesperis sibirica*. Sibirische Nachtviole, [fl.], Sibiria”) has no indication of either locality or collector. Most likely, Willdenow’s “far Siberia” means E Siberia, which is in agreement with the indication “Im östlichen Sibirien” of Georgi (1802: 289). Based on the fact that a significant part of Stephan’s herbarium is represented by collections of Zalesov, who was also a companion of J. Sievers in his Siberian trip of 1790–1794, a considerable part of which took place in SE Siberia (Dahuria) (Borodin 1908: 39, 105–106; Litvinov 1909: 254–255), it is rather probable that the species was described based on his Dahurian gatherings.

The specimen “In apricis montosis Uralensium et Sibir. australioris, [fl.], Pallas” (LE!) was recently designated as the lectotype of *Cheiranthus apricus* by Dorofeyev (2012: 400). However, there is no evidence that this specimen belongs to the original material; it is therefore ineligible as the lectotype and Dorofeyev’s typification was ineffective.

The two plants on sheet B-W 12077 are not treated as a single gathering because they lack original labels and differ in leaf form, ratio of simple and glandular trichomes, and flower size. All specimens referred here to the original material of *Cheiranthus apricus* are repre-

sented by plants in flower, but the fruits were also described in the protologue. This assumes that the original material should include further gatherings, but I failed to locate them.

Cheiranthus siliculosus M. Bieb., Fl. Taur.-Caucas. 2: 121. 1808 (= *Erysimum siliculosum* (M. Bieb.) DC.).

Type indication: “in deserti Cumani arenâ mobili” (Bieberstein, 1808).

Lectotype (designated here): [Russia, NW vicinities of Caspian Sea: Stavropol prov. or Kalmykiya], “desertum Cumanum, [fl., fr.], 1807 [added with other ink:] *Ch. siliculosus* var. sil. longiores / (Herb. Steven)” (H1700118). Syntypes: “*Erys. siliculosum* var. e deserto Cumano, [fl., fr.], [s. dat.] [added with other ink:] siliquae majores evidentum 4-gonae / (Herb. Steven)” (H 1700119); “desertum Cumanum, [fl.], [s. dat.]” (a small branch, from Herb. Bieberstein, LE!).

Possible original material: “[fr. mat.]” (B-W 12120).

The specimen designated here as the lectotype was cited as the holotype by Polatschek (2010: 249, without providing a date “1807”). It is very unlikely that the description of *Cheiranthus siliculosus* is based on a single specimen; the contrary is evidenced by the two above-cited specimens in H with labels agreeing with the protologue. It is noteworthy that the first part of the label of the second-cited specimen in H (recognized by Polatschek as an isotype), including “*Erys. siliculosum* var.”, is written in the same hand (Steven’s) and ink as that of the lectotype. Phenological information “Floret Majo, Junio” (Bieberstein, 1808) also assumes more than a single gathering. Thus, the original material apparently includes several specimens, none of which was designated as the type in the original publication, i.e. no holotype exists and lectotypification is needed.

A syntype at LE is mounted on one herbarium sheet with a specimen “Ex deserto Cumano et Caucaso demissiore, [fl.]”, which was repeatedly cited as the lectotype by Dorofeyev (2002: 109; 2003: 120; 2012: 410). This choice is not effective, being in all cases contrary to ICN Art. 7.10. This specimen would be undesirable as the lectotype because the collection date is unknown and the distribution data exceed those given in the protologue, and it might well therefore represent a later gathering.

Chorispora exscapa Bunge ex Ledeb., Fl. Ross. 1: 169. 1841 [sero] (= *C. bungeana* Fisch. & C. A. Mey. [22 Jul 1841]).

Type indication: “Hab. in reg. orient. montium altaicorum! (Bunge)” (Ledebour, 1841).

Lectotype (designated here): [Russia, Altai Republic, Kosh-Agach distr.], “Herbar. Bunge. *Chorispora exscapa*, [fl.], Flor. orient. altaica. 1839 / Herb. Ledeb. 83.1” (LE!; isolectotypes: GOET!, LE!, M!, P!).

This name was treated as a superfluous name for *Chorispora bungeana* by German (2005). However, when Ledebour published *C. exscapa*, the taxon to which he applied that name did not include all syntypes of *C. bungeana*, nor all elements eligible as types (in fact, only some of them), nor the previously designated type, nor the previously conserved type, nor was the name *C. bungeana* cited by Ledebour, as determined by ICN Art. 52.2. Hence, *C. exscapa* is legitimate and is not an automatically typified name under ICN Art. 7.5.

There are some doubts that a single specimen was used for preparing the description of *Chorispora exscapa*. In particular, the character “siliquis prostratis” could not be observed on the specimen from Ledebour’s herbarium. Because of this ambiguity and the availability of duplicates of the gathering cited in the protologue, a lectotype is designated here.

It is most likely that the specimens reported by German (2005) and German & Chernetva (2008) as syntypes of *Chorispora bungeana* from Altai represent two or more gatherings (by D. Politow and maybe F. A. Gebler in 1837 and 1839, at least partly from Mt Iik-tu in the S Chuyski range). From this viewpoint, only the specimens with the date “1839” (GOET!, LE!, M!, P!) can be formally recognized as original material (i.e. isoelectotypes) of *C. exscapa*.

Chorispora songarica var. *tarbagataica* Schischk. in Sapozhnikov & Shishkin, Rastitel’n. Zaisansk. Uyezda Issl. 1914: 336. 1918 (= *C. macropoda* Trautv.).

Lectotype (designated here): [E Kazakhstan], “Tarbagatai. Ridge from Ketu-bulak to Sarlybai-bulak. Alpine tundra. 22 July 1904, [fl.], V. Sapozhnikov” (TK!; isoelectotype: TK!).

This variety has generally been neglected in the literature (e.g. Busch 1939; Czerepanov 1995; Pachomova 1974). Recently it was discussed by German (2006: 1204), who considered it to be a not validly published synonym (nomen nudum) of *Chorispora macropoda*. Therefore, type material of *C. songarica* var. *tarbagataica* was not included in the revision of Gureyeva & al. (2012). However, the name, being supplied with a Russian diagnosis and published before 1935, meets the requirements of ICN Art. 39.1 and is thus validly published; its typification and formal synonymization with *C. macropoda* is proposed here.

Eutrema cordifolium Turcz. ex Ledeb., Fl. Ross. 1: 198. 1841.

Type indication: “In subalpinis baikalensibus ad torrentem Zemczug! (Turcz.)” (Ledebour, 1841).

Lectotype (designated here): [Russia, Buryatia Republic, E Sayan, Tunkinsky distr.], “*Cochlearia cordifolia* m. *Eutrema* [cordifolium] Turcz. In lapidosis umbrosis ad

torrentem Zemczig 1830. Turcz.” / “*Eutrema cordifolium* Turcz. Herb. Ledeb. 95.3” (LE!; isoelectotypes: KW!, LE!).

The specimen designated here as the lectotype was previously recognized as the holotype because “just one collection was cited and the single specimen from Ledebour’s private herbarium is available, [so] it is obvious that the name is based on this specimen” (German 2011: 50). However, additional checking has revealed that the specimen lacks basal and lower cauline leaves, which are described in the protologue. The same is true for the plant height: “vel altior” [than 1.5 feet] is not applicable for this specimen but can be observed (as well as the morphology of the lower leaves) on some other duplicates of the same gathering (the only ones known by the time of valid publication of *Eutrema cordifolium*). Two explanations of this discrepancy are possible: either Ledebour himself studied other duplicate(s), or he took data from the manuscript of Turczaninow’s then unpublished “Flora baicalensi-dahurica” (or he did both). The first case directly excludes the possibility of recognition of a holotype. The second option assumes that Ledebour used the information Turczaninow had gleaned from the specimens, which Ledebour did not study himself. So, it can be argued that these specimens were used by Ledebour indirectly, which means they are part of original material not only under ICN Art. 9.3(c) but, more importantly, under Art. 9.3(a). Such an interpretation also prevents recognition of a holotype as defined by ICN Art. 9.1. Finally, and most importantly, Ledebour’s indication of the type was by citation of the relevant gathering without specifying a particular single specimen. Based on these considerations, lectotypification of *E. cordifolium* is required and is proposed here.

“*Eutrema intermedium*” (Turczaninow in Bull. Soc. Imp. Naturalistes Moscou 15: 283. 1842) – “*E. edwardsii* var. *intermedium*” (Ebel in Turczaninowia 3, 3: 30. 2000).

As the designation “*Eutrema intermedium*” was not validly published under ICN Art. 36.1(c), the intended new combination “*E. edwardsii* var. *intermedium*” (Ebel 2000) was not validly published either, nor was the intended typification of German (2011) effective. One could argue in favour of validation by Turczaninow (1842) of the name “*Eutrema parviflorum* [var.] β *Eutrema intermedium* Turcz. pl. ess.” correctable under Art. 21.4 or 35.2 to “*Eutrema parviflorum* var. *intermedium* Turcz.” but from Turczaninow’s text it is clear that he had no intention to name any of his two variants (α and β) of *E. parviflorum* Turcz. ex Ledeb. It is obvious that the name “*E. intermedium*” was only applied by Turczaninow as a reference to specimens annotated like this. Hence, the name was not accepted by Turczaninow in the original publication and can be treated as not validly published under Art. 36.1(a).

Eutrema septigerum Bunge in Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savans 2: 577. 1835; Verz. Altai Pfl. [Fl. Altaic., Suppl. 1]: 55. 1836 (= *E. edwardsii* R. Br.). Type indication: “Hab. in humidis subalpinis et alpinis ad fontes fluvii Jailaguschi, in latere boreali alpium aigulacensium; florentem legimus ultimis diebus Junii, fructiferam sub finem Julii mensis” (Bunge 1835).

Lectotype (selected by Jafri 1973: 87, first step; **second step, designated here**): [Russia, Altai Republic, Aigulak range], “*Eutrema septigerum* m. fl. alt. suppl. Bunge, [fl., fr. prim.] / Herb. Hookerianum” (K 000693901; isolecotypes: B 10 0249569!, K 000693902, K 000693903, KW!, LE!, M!, P!).

As clearly indicated in the protologue, this taxon was described based on two gatherings. However, only one of them (in flower) has been preserved. Specimens in fruit had been lost already by the time the name was published, and the description of the silicles and seeds was based on field notes (Bunge 1835: 579). It cannot be excluded that a part of the second gathering (a single plant with mature fruits) was passed on to C. A. Meyer in 1833 as an admixture to part of the first gathering (which is in flower and early fruit). It is mounted among the plants representing the first gathering labelled as “Ad fontes fluvii Jeilagusch in amnem Tschuja influentis legit Dr. Bunge. Acc. a Dr. Bunge 1833 (Hb. Meyer)” (LE!). Except for this questionable plant, available original material of *Eutrema septigerum* is restricted to a single gathering, which agrees with the fact that all the specimens look very similar and are composed of plants with flowers and the very first fruits. Three parts of this gathering stored at K are mounted on one herbarium sheet. Two of them are supplied with the printed label “*Eutrema septigerum* Bge. Altai”, and one has a label handwritten by Bunge “*Eutrema septigerum* m. fl. alt. suppl. Bunge”. Jafri cited the type of *E. septigerum* twice, as “Type: C. Asia, Altai, Bunge (L[E], K!)” (Jafri 1956: 118) and “Type: Altai, Bunge (K)” (Jafri 1973: 87). The second citation represents typification in compliance with ICN Art. 9.12 and is equally applicable to any of these three elements (the collector is explicitly mentioned on the handwritten label and the locality on the printed ones). Of these, the specimen supplied with author’s handwritten label is chosen as the second-step lectotype as permitted by ICN Art. 9.17. My previous choice of lectotype in LE (German 2005: 260) did not take into account Jafri’s typification and should be treated as superfluous.

Hutchinsia pectinata Bunge ex Ledeb., Fl. Ross. 1: 201. 1841 (≡ *Smelowskia calycina* subsp. *pectinata* (Bunge ex Ledeb.) D. A. German).

Type indication: “Hab. in alpinis altaicis ad Tschujam, ad torrentem Boro-burgasyn! (Bunge)” (Ledebour 1841). Lectotype (German 2005: 263): [Russia, Altai Republic, Kosh-Agach distr.], “Herbar. Bung. *Hutchinsia pectinata*

mihi, [fl., fr. immat.], Flor. orient. altaica. 1839 [two labels, one with indication “Herb. Fischer!”] (LE!; isolecotypes B!, GOET!, HAL!, KW!, LE!, M!). – Syntypes (LE!).

While typifying this name, German (2005) accepted it with the authorship “Bunge in Ledeb.,” which assumed that all Bunge’s relevant material would be equally appropriate for typification. Based on this consideration, the above specimen in LE was designated as the lectotype following the anonymous label “Typus” (most likely by E. M. Veliczkin or V. P. Botschantzev).

However, only the species name is attributed by Ledebour to Bunge in the protologue, whereas the author of the description is Ledebour. Hence, Ledebour’s material should be first of all evaluated in order to reveal whether lectotypification is needed or a holotype can be recognized. Ledebour’s material is represented by two specimens mounted on one sheet with a shared label “*Hutchinsia pectinata* Bnge. Ledeb. 99.3” (LE!). These are: “Herbar. Bung. *Hutchinsia pectinata* var., [fl., fr. immat.], Flor. orient. altaica. 1839” (two upper plants) and “Herbar. Bung. *Hutchinsia pectinata* m., [almost destroyed], Flor. orient. altaica. 1839” (the lower plant). If these two elements were a part of one gathering, they could be treated as one specimen, which would be the holotype. However, they represent two morphologically different entities discerned by Bunge and mentioned by Ledebour as unnamed varieties. This means that the original material of *H. pectinata* most likely includes two gatherings. The first Ledebour specimen corresponds to his var. “β. viridis, robustior” and the almost destroyed second one to “α. canescens, tenerior”. These unnamed varieties of Ledebour correspond to Bunge’s identifications “*Hutchinsia pectinata* m.” and “*Hutchinsia pectinata* var.,” respectively. As evidenced by the rest of the original material of this name (details in German 2005), Ledebour changed Bunge’s order of varieties: in all other cases, the green robust plants (var. β) are supplied with Bunge’s labels “*Hutchinsia pectinata* m.” (i.e. the typical variety in his sense). In agreement with this fact, the single (apart from that cited above) specimen with Bunge’s label “*Hutchinsia pectinata* var.” (LE!, in good condition) represents Ledebour’s var. α. Therefore, the earlier proposed lectotypification has to be retained, but a syntype (the second Ledebour specimen) and isosyntype (the latter specimen indicated as “*Hutchinsia pectinata* var.”) should be recognized; the other specimens, much more numerous and available in a number of herbaria, are isolecotypes.

Raphanus tenellus Pall., Reise Russ. Reich. 3: t. L, fig. 3. 1776 (≡ *Chorispora tenella* (Pall.) DC.).

Type indication: [Middle/Low Volga and N Caspian region], “Culta solo succulenta planta... In palustri aequae ac siccissimo loco minima provenit... In deserto Caspio ubique provenit, locis praesertim praeruptis et nitrosis”

(Pallas 1776: 742); “Copiosa et laete crescit ad ripas inundatas Volgae” (Pallas, 1771: 497).

Lectotype (designated here): “*Cheiranthus chius*, [Russia, Samara prov., Volzhskiy distr., Askuly near Shelekhmet], circa Asculy locis [se?]. . . mentibus ab 23 Maji [1769, Pallas] [fl., fr.]” (LE!).

Other original material: “*Raphanus tenellus* Pall. it. III. an *Sinapis laevigata* Lin., [fl., fr.], hortens., [P. S. Pallas]” (BM 000522124); “*Cheiranthus an chius?*, [fl., fr.; most likely, Samara prov., Volzhskiy distr., Pustilnoi Buerak, 5 May 1769; added later:], manus Pallasii!” (LE!); “*Sinapis laevigata?*, [fl., fr. prim.], Pallas” (LE!); “Яик. По тракту в Гурьев [Yaik. On the road to Gur’ev = Ural, on the road to Atyrau] [N. P. Sokolov, spring 1770]” (LE!); “*Raphanus tenellus*, [fl.], ad mare Caspienne planta spontanea digitalis, culta simillima *Hesp. africana*” (PR!). Possible original material: “[fl., fr. immat.], Hb. Pallas. Herb. Fischer” (LE!).

Chorispora tenella was collected multiple times during the expedition of P. S. Pallas in 1768–1774 and it is repeatedly mentioned in the 1st and 3rd volumes of his “Reise”. Multiple habitats were also mentioned in the protologue (Pallas 1776: 741–742) including a reference to the description of “*Cheiranthus an chius?*” (Pallas 1771: 497), and obviously because the plant was very common further localities were not given in the work of 1776. Except for the assumed gathering of Sokolov and the specimen from Fischer’s herbarium, the labels are written by Pallas. Unfortunately, the unmounted gathering, presumably of 5 May 1769, is difficult to separate from a later gathering from the same folder.

Another specimen from LE (“M. Caucasi”) was repeatedly cited as lectotype by Dorofeyev (1998: 51; 2002: 54; 2003: 61; 2012: 445). The complete label of this specimen is: “154. *Raphanus tenellus* Pall. M. Caucasi. *Chorispora tenella* DC. Caucasus. Wilhelms”. Christian Wilhelms, a pharmacopoeist who worked at the beginning of the 19th century in Tbilisi (Tiflis), made numerous collections of Caucasian plants during that time (Lipsky 1899: 139–140). Among others, he is thanked by Bieberstein (1819: ii) for providing new collections used by Bieberstein for preparing the third (additional) volume of his “Flora taurico-caucasica”. Thus, Wilhelms’s specimen was collected c. 40 years after the species was described, cannot be original material for *R. tenellus*, and is ineligible as the lectotype. Therefore, Dorofeyev’s typification was ineffective.

The type of *Chorispora tenella* was indicated also in some floras, e.g. “Typus: Rossia europaea austro-orientalis, LE” (Rechinger 1968: 242); “Type: Trans-Caspian region, lower Volga, Pallas (LE, BM)” (Jafri 1973: 206); “Type: [Russia/Kazakhstan] “in deserto Caspio, locis praesertim praeruptis et nitrosis”, Pallas (LE)” (Tan 2002: 170). All these indications include multiple gatherings and thus none of them resulted in effective typification.

A considerable part of the original material of *Chorispora tenella* is also stored in Willdenow’s herbarium in B. Among seven specimens from the folder B-W 12251, four were apparently collected by Pallas, as evidenced by four labels indicating the locality and/or habit and habitat and one general label without such indication but with taxonomic notes, all written by Pallas. Unfortunately, there seems to be no way to separate Pallas’s specimens from another three specimens kept in the same folder, because all labels, as is usual for B-W, are glued onto the folder but not onto the herbarium sheets. The labels referring to the material of Pallas are the following:

“*Hesperis salina*. In australibus nitroso-salsis versus Astrachaniam et ad *Nitrariam officinam*. Majo (Pallas)”;
“*Raphanus tenellus* Pall. it. III. an *Sinapis laevig.* Lin. Minuta specimina solo uliginoso ... suffocata”;
“*Raphanus tenellus* Pall. it. III. an *Sinapis laevigata* Lin. Specimina fera, vario solo lecta inter Syzran et Samara. Minuta in aridis (Pallas)”;
“*Raphanus tenellus* Pall. it. III. an *Sinapis laevigata* Lin. Specimina fera circa Zarizyn lecta (Pallas)”.

There are some additional specimens viewable via Global Plants and mentioned as (potential) types of *Raphanus tenellus*, but none of them belongs to the original material.

Sisymbrium pumilum Stephan in Willdenow, Sp. Pl. 3: 507. 1800, nom. illeg. [non Lam., Fl. Franç. 2: 516. 1779] (= *Stenophragma pumilum* Čelak. in Flora 55: 442. 1872 = *Olimarabidopsis pumila* (Čelak.) Al-Shehbaz & al. in Novon 9: 303. 1999).

Type indication: [NE foothills of Caucasus], “in Persia boreali” (Willdenow 1800).

Lectotype (designated here): [Russia, Daghestan], “Stephan [ded., Bieberstein] leg. Persia, [Kizliar], [fl., fr.]. Ex reliq. Willd.” (B 100272093!).

The type of this species is traditionally assumed to be located in LE (e.g. Busch 1939: 79). There are two specimens stored as type material in the Caucasian department of LE, both in one folder (Stephan’s): “Herbarium Stephanianum ... No. 5296 et 5297. *Sisymbrium pumilum* et var. Lin. Spec. plant. Ed. Willd. Gen. 1238. Spec. 49. 806. Marsch. Kisljar”. The first specimen (presumably No. 5296) has no label and the second is supplied with its own label “*Sisymbrium pumilum* Steph. in Willd. III p. 507 – Marsch. Fl. II. P. 115. Suppl. 440 Steven dedit Januario 1821, lectum circa Kisljar ad mare Caspium”.

The first citation of type that could be treated as a lectotype designation is that by Al-Shehbaz & al. (1999: 303): “Type: N. Persia. [Kizliar], *Stephan s.n.* (holotype, LE; isotype, W)”. On the one hand, one could argue that this designation should refer to the first (unlabelled) specimen and is thus effective. On the other hand, the designation does not coincide with any actual label (neither of the folder nor of the second specimen) and both concrete

details (Stephan's name, indicating only the herbarium but not the collector, and the locality Kizliar) are equally applicable to either of the two specimens. Following this consideration, the above choice would be acceptable only if the specimens represented the same gathering but, as evidenced by the label of the second specimen, this is apparently not the case.

Therefore, one could argue that the choice of Dorofeyev (2012: 426) should be followed. Dorofeyev provided a much more precise citation: "Lectotypus (Dorofeyev, hoc loco): "Herbarium Stephanianum. 8[0]6. Marsch, Kislar" (LE!)", unambiguously referring to the specimen without its own label (i.e. No. 5296) and annotated by him as lectotype also in the herbarium. However, this designation also cannot be accepted as effective lectotypification because the specimen is a later gathering, as evidenced by the indication "806", meaning the year 1806. Irrespective of being collected by Bieberstein or obtained from him by Stephan in 1806, this specimen cannot be part of original material, which Willdenow had to have in his possession via Stephan prior to publishing the name in 1800. Such a way of indication of the dates omitting the first "1" seems to be typical for Stephan and can be widely observed throughout his herbarium in LE. Busch (1910: 465), citing the discussed specimen, directly mentioned the date 1806. As for the second specimen, which was not cited by Busch (1910), it was likely later placed into Stephan's folder, probably replacing the original one corresponding to Stephan's "var.", which I did not manage to locate.

Similarly, neither of the two specimens in W, both collected by Steven from Kizliar, can be considered as original material for this name because all his collections were made after *Sisymbrium pumilum* was published. The same is true for the single specimen of this species stored in Willdenow's herbarium under the designation "*S. humile*" (Willd., nom. nud.), which is a cultivated plant and obviously later: "Hort. Bot Berol. / Habitat in Sibiria" (B-W 12025!).

Thus, the specimen designated here as the lectotype is apparently the only available element of original material, as evidenced by the label information and morphology corresponding to the protologue as well as by the previous attribution to Willdenow. This specimen is not considered as the holotype based on the assumption that it was not the only element of original material. First, the specimen consists of two plants, and it is very unlikely that the species author, Stephan, passed to Willdenow at least two (not one) plants and left nothing for himself. Second, the absence of original material in B-W suggests that material formerly there could have been used by Willdenow for exchange (and the lectotype specimen seems to be just this case).

Sisymbrium volgense M. Bieb. ex E. Fourn., *Recherches Anat. Taxon. Fam. Crucif.*: 97. 1865.

Type indication: "Crescit ad margines fruticetorum circa

Sarepta in Rossia meridionali (Eichwald, Becker pl. Volgae inferioris n. 103) – v. sp. in herb. Coss." (Fournier 1865).

Lectotype (designated here): [Russia, Volgograd prov.], "*Sisymbrium volgense*. Sarepta. Eichwald. Plantes de Sarepta, [defl., fr.] / Herb. E. Cosson" (P 05424516).

Possible syntypes: "*Sisymbrium volgense*. Sarepta, [defl., fr.] / Herb. Al. de Bunge / Herb. E. Cosson" (P 05424515); "*Sisymbrium wolgense* M. B. In faucibus montium Sarepta, [defl., fr.], 15 Junii. A. Becker / Herb. E. Cosson" (P 05424514); "A. Becker pl. Wolga infer. Ed. R. F. Hohenacker. 103. *Sisymbrium wolgense* M. B. – Beck. (Cf. Ledeb. Fl. Ross. 1. 178. A *S. austriaco* Jacqu. differre videtur). Ad margines fruticetorum pr. Sarepta. Jun. m., [alab., effl. + fr. prim.] / Herbarium E. Drake" (P); "A. Becker pl. Wolga infer. Ed. R. F. Hohenacker. 103. *Sisymbrium wolgense* M. B. – Beck. (Cf. Ledeb. Fl. Ross. 1. 178. A *S. austriaco* Jacqu. differre videtur). Ad margines fruticetorum pr. Sarepta. Jun. m., [alab., effl.] / Russie merid. Collect. Becker. 1855" (P).

The specimen designated as the lectotype is supplied with a note by Fournier: "à exclure du genre *Sisymbrium* à cause de son calice bigibbeur. E. F.". Apparently, this statement that the species is to be excluded from *Sisymbrium* L. on account of its having a (slightly) bisaccate calyx reflects Fournier's initial viewpoint and intention (changed afterwards) and proves that this specimen was studied by him before publishing the description of *S. volgense*. Indeed, only two species (also *S. dahuricum* Turcz. ex E. Fourn.) with such a character are included in Fournier's monograph. Both are described there as new and placed in a group "B. Sepalis basi gibbis". This character is also mentioned in the description of *S. volgense* (Fournier 1865: 97).

Although there is a single specimen that, as shown above, is definitely part of original material, it can hardly be taken as the holotype. Analysis of the protologue and relevant gatherings in P leads to the conclusion that the original material comprises several (up to five) specimens that were combined by Fournier under a single "hybrid" citation given above. On the one hand, the description is definitely based on the lectotype designated here and probably one more specimen from the herbarium of Cosson (P 05424515), which corresponds to the whole description and in particular to the characters "caulis ... crassus, ... ramosissimus". The latter character does not agree with the morphology of the two remaining specimens (not from Cosson's herbarium) which, furthermore, lack the developed fruits and seeds described by Fournier. However, only these two specimens bear on their labels the number "103" and further information given in the original citation (e.g. "ad margines fruticetorum"), although the name "Eichwald" is present only on the label of the lectotype. A reference to several gatherings through one combined citation appears to be the most plausible explanation of this minor

inconsistency between the protologue and each individual label (but not the cited material as a whole).

Tauscheria desertorum Ledeb., Icon. Pl. Fl. Ross. 2: 14, t. 139. 1830, nom. illeg. superfl. (≡ *T. lasiocarpa* Fisch. ex DC. = *Isatis gymnocarpa* (Fisch. ex DC.) Al-Shehbaz & al.).

Lectotype (designated here): [Kazakhstan, Atyrau prov.], “*Tauscheria lasiocarpa* m. ..., [fl., fr.], mr. Fischer 1819” (G-DC: G 00206184!).

This illegitimate superfluous name was erroneously treated as automatically typified (under ICN Art. 7.5) by German (2005: 235). In fact, its typification is not automatic for two reasons. First, it has more than one earlier published name cited as a synonym. Second, the types of both those names (*Tauscheria gymnocarpa* Fisch. ex DC. and *T. lasiocarpa* Fisch. ex DC.) were included in subordinate taxa (varieties) that did not include the evidently intended type of the illegitimate name, as specified by ICN Art. 7.5. Through the present lectotypification, the name *T. desertorum* becomes homotypic with one of those included taxa, *T. lasiocarpa*.

Tauscheria gymnocarpa Fisch. ex DC., Syst. Nat. 2: 564. 1821 (≡ *Isatis gymnocarpa* (Fisch. ex DC.) Al-Shehbaz & al.).

Type indication: “Hab. cum priore ... [= ad lacum Inderiskoe deserti Kirghisorum] (Tausch. et Herm. ex Fisch.)” (Candolle 1821).

Lectotype (designated here): [NW Kazakhstan, Atyrau prov.], “*Tauscheria gymnocarpa* m. legerunt Tauscher et Hermann m. Majo ad lacum Inderiskoe deserti Kirghisorum, [fr.], mr. Fischer 1819” (G-DC: G 00206183!). Other original material: [icon] “Utraque habitat ad lacum Inderiensem deserti Kirghisorum mr. Fischer 1819. *Tauscheria gymnocarpa*” (G-DC: G 00206488!).

Candolle, in the protologue of *Tauscheria* Fisch. ex DC., mentioned that both specimens and illustrations of the two simultaneously published species, *T. gymnocarpa* and *T. lasiocarpa*, were obtained by him from F. E. L. Fischer, and he referred to these figures in the protologues of the two species names (Candolle 1821: 563–564). So long as the descriptions were prepared by Candolle, these analytical figures (drawn on a single sheet of paper) should be regarded as part of original material of both species names, and this is further evidenced by reference to Fischer’s illustration in the description of *T. lasiocarpa*. Therefore, the single herbarium specimen of *T. gymnocarpa* that Candolle had at his possession cannot be accepted as the holotype, as was done by Al-Shehbaz & al. in Al-Shehbaz (2012: 948), and it is designated here as the lectotype. For the same reason, the lectotype designation by (Jafri 1973: 102) is followed for *T. lasiocarpa*.

Tauscheria lasiocarpa Fisch. ex DC., Syst. Nat. 2: 563. 1821 (= *Isatis gymnocarpa* (Fisch. ex DC.) Al-Shehbaz & al.).

Type indication: “ad lacum Inderiskoe deserti Kirghisorum (Tausch. ex Fisch.)” (Candolle 1821: 564).

Lectotype (Jafri 1973: 102, “type”): [NW Kazakhstan, Atyrau prov.], “*Tauscheria lasiocarpa* m. ..., [fl., fr.], mr. Fischer 1819” (G-DC: G 00206184!).

Isolectotypes: “*Tauscheria lasiocarpa* m. Ad lacum Inderiensem deserti Kirghisorum [fl., fr.], Tauscher (Fischer)” (B 10 0277035!); “*Tauscheria lasiocarpa* Fisch. Ad lacum Inderiensem (Inderiskoie osero) in deserto Kirghisorum primo vere, [fl., fr.], Fischer” (P 00741542!).

Other original material: [icon] “Utraque ... Fischer 1819. *Tauscheria lasiocarpa*” (G-DC: G 00206488!).

Jafri (1973) cited the type as: “Type: C. Asia, Kirghis, Tauscher (G)”. Among two elements in G, the specimen and the figure, this citation unambiguously refers to the specimen and thus represents effective lectotypification.

Acknowledgements

I am deeply grateful to Marc Appelhans, Sergey A. Balandin, Tatyana P. Balandina, Sarah Bollendorff, Benoît Carré, Thierry Deroin, Vladimir I. Dorofeyev, Hans-Joachim Esser, Nicolas Fumeaux, Dmitry V. Geltman, Irina I. Gureyeva, Matthias H. Hoffmann, Antonina P. Ilyinska, Rudolph V. Kamelin, Natalia V. Kurbatskaya, Sergey L. Mosyakin, Eckhard von Raab-Straube, Alexey P. Seregin, Natalia M. Shiyen, Otakar Šida, Ulrike Starck, Fred M. Stauffer, Ivan V. Tatanov, Nicolai N. Tzvelev and Robert Vogt for various kinds of help with specimens including online loans; to Florian Michling and Roswitha Schmickl for translation of German and French texts; and to Ihsan A. Al-Shehbaz for sending literature and for fruitful discussion. Nomenclatural advice from Alexander N. Sennikov and John H. Wiersema and valuable information from Gerhard Wagenitz regarding certain historical collections at B is especially highly appreciated. Finally, I sincerely thank Ihsan A. Al-Shehbaz and an anonymous reviewer for their comments on an earlier version of this paper and Nicholas Turland for editorial help.

References

- Adams M. F. 1817: Descriptiones plantarum minus cognitarum Sibiriae praesertim orientalis, quas in itinere ann. 1805 et 1806 observavit. – *Mém. Soc. Imp. Naturalistes Moscou* **5**: 89–16.
- Al-Shehbaz I. A. 2012: A generic and tribal synopsis of the *Brassicaceae* (*Cruciferae*). – *Taxon* **61**: 931–954.
- Al-Shehbaz I. A., O’Kane S. L., Jr. & Price R. A. 1999: Generic placement of species excluded from *Arabidopsis* (*Brassicaceae*). – *Novon* **9**: 296–307.

- Bieberstein Marschall von L. B. F. 1808: Flora taurico-caucasica exhibens stirpes phaenogamas, in Chersoneso Taurica et regionibus Caucasicis sponte crescentes **1**. – Charkoviae: Typis Academicis.
- Bieberstein Marschall von L. B. F. 1819: Flora taurico-caucasica **3**. Supplementum. – Charkoviae: Typis Academicis
- Borodin I. 1908: Коллекторы и коллекции по флоре Сибири [Collectors and collections on the flora of Siberia]. – St Petersburg: Imperial Academy of Sciences Typography.
- Bunge A. von 1835: Verzeichniss der im Jahre 1832, im östlichen Theile des Altai-Gebirges gesammelten Pflanzen. Ein Supplement zur Flora altaica. – Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans **2**: 523–608.
- Busch N. 1910: *Cruciferae*. – Pp. 74–706 in: Kuznetsov N., Busch N., Fomin A. (ed.), Flora caucasica critica. **3(4)**. – Yur'ev: Typography of K. Mattisen.
- Busch N. A. 1939: *Cruciferae* B. Juss. – Pp. 14–606 in: Komarov V. L. (ed.), Flora SSSR **8**. – Moskva / Leningrad: Publishers of Academy of Sciences of USSR.
- Candolle A. P. de 1821: Regni vegetabilis systema naturale, sive ordines, genera et species plantarum secundum methodi naturalis normas digestarum et descriptarum **2**. – Parisiis: sumptibus sociorum Treuttel et Würtz.
- Čelakovský L. J. 1872: Bemerkungen über Cruciferen. – Flora **55**: 433–446.
- Czerepanov S. K. 1995: Vascular plants of Russia and adjacent states (the former USSR). – Cambridge: Cambridge University Press.
- Dorofeyev V. I. 1998: Family *Cruciferae* (*Brassicaceae*) of middle zone of European part of Russian Federation. – Turczaninowia **1**, **3**: 5–91.
- Dorofeyev V. I. 2002: *Cruciferae* of European Russia. – Turczaninowia **5**, **3**: 5–114.
- Dorofeyev V. I. 2003: *Cruciferae* of Russian Caucasus. – Turczaninowia **6**, **3**: 5–137.
- Dorofeyev V. I. 2012: *Brassicaceae* Burnett, nom. cons., nom. alt. (*Cruciferae* Juss., nom. cons.). – Pp. 371–469 in: Takhtajan A. L. (ed.), Conspectus florae Caucasi **3(2)**. – St Petersburg & Moskva: KMK Scientific Press.
- Dudley T. R. 1965: *Alyssum* L. – Pp. 362–409 in: Davis P. H. (ed.), Flora of Turkey and the East Aegean Islands **1**. – Edinburgh: Edinburgh University Press.
- Dudley T. R. 1968: [*Alyssum*] Sect. *Meniocus* (Desv.) Hook. – Pp. 149–152 in: Hedge J. & Rechinger K. H. (ed.), Flora Iranica **57**. – Graz: Akademische Druck-u. Verlagsanstalt.
- Ebel A. L. 2000: Notes on taxonomy and geography of *Brassicaceae* of Altai flora. – Turczaninowia **3**, **3**: 18–43.
- Eckardt T. 1972: Carl Ludwig Willdenow (1765–1812). – Pp. XI–XIII in: Hiepko P. (ed.), Herbarium Willdenow. Alphabetical index. – Zug: Inter Documentation Company AG.
- Fournier E. 1865: Recherches anatomiques et taxonomiques sur la famille des crucifères, et sur le genre *Sisymbrium* en particulier. – Paris: J. Rothschild.
- Georgi J. G. 1802: Nachträge für dessen geographisch-physikalische und naturhistorische Beschreibung der russischen Reichs. – Königsberg: Friedrich Nicolovius.
- German D. A. 2005: Specimina typica taxorum Cruciferorum altaicorum ab auctoribus C. A. Meyer, A. A. Bunge et K. F. Ledebour annis 1829–1841 descriptorum in herbario instituti botanici nomine V. L. Komarovii (LE) conservata [Type specimens of Altai *Cruciferae* taxa described in 1829–1841 by C. A. Meyer, A. A. Bunge and C. F. Ledebour deposited in the Herbarium of the Komarov Botanical Institute (LE)]. – Novosti Sist. Vyssh. Rast. **37**: 233–267.
- German D. A. 2006: Additions to *Cruciferae* of flora of Kazakhstan. – Bot. Zhurn. **91(8)**: 1198–1211.
- German D. A. 2011: Typification of selected names of *Cruciferae* Juss. taxa from Siberia and some neighboring regions. – Turczaninowia **14**, **1**: 45–54.
- German D. A. & Cherneva O. V. 2008: Typification of *Cruciferae* taxa described by A. G. Schrenk. – Novosti Sist. Vyssh. Rast. **40**: 287–314.
- Global Plants [continuously updated]: Global Plants. – JSTOR: published at <http://plants.jstor.org> [last accessed 18 Feb 2014].
- Gureyeva I. I., Balashova V. F., German D. A. & Ebel A. L. 2012: Type specimens of *Brassicaceae* Burnett in the Krylov Herbarium (TK). – Sist. Zametki Mater. Gerb. Krylova Tomsk. Gosud. Univ. **106**: 3–23.
- Ilyinska A. P. 2002: Typification of vascular plants described from the territory of Ukraine: family *Brassicaceae* (genera *Alyssum* L. – *Erucastrum* C. Presl). – Ukranjinsk. Bot. Zhurn. **59(1)**: 9–16.
- Jafri S. M. H. 1956: Some *Cruciferae* of W. Pakistan, Afghanistan and N.W. Himalaya. – Notes Roy. Bot. Gard. Edinburgh **22**: 95–119.
- Jafri S. M. H. 1973: *Brassicaceae*. – Pp. 1–308 in: Nasir E. & Ali S. I. (ed.), Flora of West Pakistan **55**. – Karachi: Ferozsons.
- Kew 2006: Herbarium Catalogue. – Royal Botanic Gardens, Kew: published at <http://www.kew.org/herbcat> [last accessed 14 Jan 2014].
- Lamarck J.-B. P. A. de M. de 1779 [“1778”]: Flore française ou description succincte de toutes les plantes qui croissent naturellement en France **2**. – Paris: Imprimerie Royale.
- Ledebour C. F. 1841: Flora rossica sive enumeratio plantarum in totius imperii rossici provinciis europaeis, asiaticis et americanis hucusque observatarum **1(1)**. – Stuttgartiae: Sumptibus librariae E. Schweizerbart.
- Ledebour C. F. 1843: Flora rossica sive enumeratio plantarum in totius imperii rossici provinciis europaeis,

- asiaticis et americanis hucusque observatarum **1(3)**. – Stuttgartiae: Sumptibus librariae E. Schweizerbart.
- Lipsky V. I. 1899: Flora Kavkaza [Flora of Caucasus]. – St Petersburg: Gerold.
- Litvinov D. I. 1909: Библиография флоры Сибири [Bibliography of the flora of Siberia]. – Trudy Bot. Muz. Imp. Acad. Nauk **5**.
- McNeill J., Barrie F. R., Buck W. R., Demoulin V., Greuter W., Hawksworth D. L., Herendeen P. S., Knapp S., Marhold K., Prado J., Prud'homme van Reine W. F., Smith G. F., Wiersema J. H. & Turland N. J. 2012: International Code of Nomenclature for algae, fungi and plants (Melbourne Code) adopted by the Eighteenth International Botanical Congress Melbourne, Australia, July 2011. – Regnum Veg. **154**.
- MNHN [continuously updated]: Collection: Botany: Vascular plants. – Muséum national d'Histoire naturelle [Paris]: published at <http://science.mnhn.fr/institution/mnhn/search> [last accessed 14 Feb 2014].
- Pachomova M. G. 1974: *Chorispora* R. Br. – Pp. 146–151 in: Vvedensky A. I. & Pachomova M. G. (ed.), *Conspetus florum Asiae Mediae* **4**. – Tashkent: FAN.
- Pallas P. S. 1771: Reise durch verschiedene Provinzen des Rußischen Reichs **1**. – St Petersburg: Imp. Acad. Wiss.
- Pallas P. S. 1776: Reise durch verschiedene Provinzen des Rußischen Reichs **3**. – St Petersburg: Imp. Acad. Wiss.
- Rechinger K. H. 1968: Tribus *Matthioleae*. – Pp. 219–250 in: Hedge J. & Rechinger K. H. (ed.), *Flora iranica* **57**. – Graz: Akademische Druck- u. Verlagsanstalt.
- Röpert D. (ed.) 2000+ [continuously updated]: Digital specimen images at the Herbarium Berolinense. – Published at <http://www2.bgbm.org/herbarium/default.cfm> [last accessed 18 Feb 2014].
- Sapozhnikov V. V. & Shishkin B. K. 1918: Растительность Зайсанского уезда. Исследования 1914-го года [Vegetation of Zaissan district. Investigations of 1914]. – Tomsk: Typo-lithography of Siberian Press Company.
- Sytin A. K. 1997: Peter Simon Pallas. Botanicus. – St Petersburg: KMK Ltd.
- Tan K. 2002: *Chorispora* DC., nom. cons. – P. 170 in: Tan K. & Strid A. (ed.), *Flora hellenica* **2**. – A. R. G. Gantner Verlag K. G.
- The Plant List 2013: The Plant List. Version 1.1. – Published at <http://www.theplantlist.org> [last accessed 15 Feb 2014].
- Tropicos [continuously updated]: Missouri Botanical Garden: published at <http://www.tropicos.org> [last accessed 12 Feb 2014].
- Turczaninow N. S. 1838: Catalogus plantarum in regionibus Baicalensibus et in Dahuria sponte crescentium. – Bull. Soc. Imp. Naturalistes Moscou **11**: [85]–107.
- Urban I. 1917: Geschichte des Königlichen Botanischen Museums zu Berlin-Dahlem (1815–1913) nebst Aufzählung seiner Sammlungen. – Beih. Bot. Centralbl., Abt. 1, **34**: 1–457.
- Wagenitz G. 1962: Pflanzen von der Orientreise Tourneforts im Herbar Willdenow in Berlin. – Willdenowia **3**: 109–136.
- Warwick S. I., Francis A. & Al-Shehbaz I. A. 2006: *Brassicaceae*: Species checklist and database on CD-Rom. – *Plant Syst. Evol.* **259**: 249–258.
- Willdenow C. L. 1797: Caroli a Linné Species plantarum exhibentes plantas rite cognitatas ad genera relatas, cum differentiis specificis, nominibus trivialibus, synonymis selectis, locis natalibus, secundum systema sexuale digestas **1**. – Berolini: Impensis G. C. Nauk.
- Willdenow C. L. 1800: Caroli a Linné Species plantarum exhibentes plantas rite cognitatas ad genera relatas, cum differentiis specificis, nominibus trivialibus, synonymis selectis, locis natalibus, secundum systema sexuale digestas **3**. – Berolini: Impensis G. C. Nauk.
- Willdenow C. L. 1814 [“1813”]: Enumeratio plantarum horti regii Berolinensis. Supplementum. – Berolini: In Taberna Libraria Scholae Realis.
- Zhou T.-Y., Lu L.-L., Yang G. & Al-Shehbaz I. A. 2001: *Brassicaceae (Cruciferae)* – Pp. 1–193 in: Wu Z.-G. & Raven P. H. (ed.), *Flora of China* **8 (Brassicaceae through Saxifragaceae)**. – Beijing: Science Press; St Louis: Missouri Botanical Garden Press.