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The Brassicaceae (Cruciferae) of Turkey, Updated

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Abstract: The nomenclature of 51 taxa in 27 genera of Turkish *Brassicaceae* has been updated to bring the account of the family in line with the current classification and nomenclature. An appendix listing the previous names, current ones, and pertinent bibliographical citations is provided, as well as another listing the taxa with relevant literature published after the second supplement of the *Flora of Turkey*. A comprehensive listing of the literature supporting the nomenclatural changes is provided. *Pseudosempervivum amanum* (Contandr. & Quézel) Al-Shehbaz, Mutlu & Dönmez and *P. gurulkani* (Yild.) Mutlu, Al-Shehbaz & Dönmez, are proposed as new combinations. *Gorkemia* Yild. is determined as a diseased specimen of *Isatis* sp. Since the publication of the second supplement of the *Flora of Turkey*, 45 taxa of *Brassicaceae* in the genera *Alyssum*, *Arabis*, *Bornmuellera*, *Clastopus*, *Draba*, *Hesperis*, *Iberis*, *Litwinowia*, *Matthiola*, *Noccaea* and *Raphanus* have been added to the flora.

Key Words: Brassicaceae, Cruciferae, new combination, Turkey

Güncellenmiş Türkiye Brassicaceae (Cruciferae) Taksonları

Özet: Türkiye'de yetişen *Brassicaceae* familyası'nın 27 cins ve 51 taksonunun adlandırılışı, günümüzde kabul edilen uluslararası ölçütlere uygun olarak güncellenmiştir. Eski isimler, güncel olanları ve bunlarla ilgili kayıt bilgileri ek halinde verilmiştir. Adlandırmadaki değişikliklerin dayandığı geniş bir literatüre yer verilmiştir. *Pseudosempervivum amanum* (Contandr. & Quézel) Al-Shehbaz, Mutlu & Dönmez ve *P. gurulkani* (Yild.) Mutlu & Al-Shehbaz & Dönmez, yeni bileşimler olarak önerilmiştir. *Gorkemia* Yild.'nin, *Isatis* L.'in türü dahi belirlenemeyen hastalıklı bir örneği olduğu farkedilmiştir. Türkiye Florası'nın ikinci ek kitabının basımından bu yana *Alyssum*, *Arabis*, *Bornmuellera*, *Clastopus*, *Draba*, *Hesperis*, *Iberis*, *Litwinowia*, *Matthiola*, *Noccaea* ve *Raphanus* cinslerine ait 45 takson Flora'ya eklenmiştir.

Anahtar Sözcükler: Brassicaceae, Cruciferae, yeni bileşim, Türkiye

Introduction

Turkey is one of the richest countries in the world in terms of the number of species of the Brassicaceae (Cruciferae), and with its 571 (corrected number) species it is second only to the United States, where there are 653 native species in 61 genera (Al-Shehbaz, I. A. Brassicaceae, *Flora of North America* Vol. 7, in press), a country nearly 10 times the size of Turkey. Although the original account of the Brassicaceae in the *Flora of Turkey* (Davis, 1965) has recently been updated (Davis et al., 1988; Güner et al., 2000), the circumscription and sequence of all genera, which followed Schulz's (1936)

artificial classification, remained unchanged to the present. In the first volume of *Flora of Turkey* (Davis, 1965) 464 species and 86 genera were given. This number was increased to 526 species and 88 genera in the tenth volume (Davis et al., 1988) and became 555 species and 91 genera in the eleventh volume (Güner et al., 2000). Since the publication of the second supplement of *Flora of Turkey*, 1 genus, 28 species, 15 subspecies and 2 varieties have been added and the total reached 583 species. Among these, 1 genus, 15 species and 2 varieties are indicated in Check-List III (Özhatay & Kültür, 2006). Eleven species and 1 subspecies are

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known only from the Aegean Islands (*Alyssum samium* T.R.Dudley & D.Christod, *Erysimum hayekii* (Jav. & Rech.f.) Polatschek, *E. horizontale* Candargy, *E. rhodium* Snog., *E. sononeri* (Heldr. & Sart.) Wettst. subsp. *icaricum* Snog., *Fibigia lunarioides* (Willd.) Sm., *Iberis runemarkii* Greuter & Burdet, *Lepidium didymium* L., *L. hirtum* (L.) Sm., *Malcolmia flexuosa* Sm. subsp. *naxensis* (Rech.f.) A.Stork, *Rorippa icarica* Rech. and *Thlaspi bulbosum* Sprun.).

Recent substantial advances in the molecular phylogenetic studies on the Brassicaceae (Koch, 2003; Koch et al., 2003; Mitchell-Olds et al., 2005; Beilstein et al., 2006; Al-Shehbaz et al., 2006, and references therein) have led to numerous changes in generic delimitations. However, the division of the family into monophyletic tribes remained in its initial stages, although an attempt to address that has recently been made (Al-Shehbaz et al., 2006).

The present study attempts to bring the nomenclature of the family, both at generic and species ranks, in line with the current classification and nomenclature. These changes result from new discoveries in the field, from nomenclatural research and evidence from recent and on-going extensive molecular studies. In order to facilitate easy comparison with the published accounts of the Flora, the discussion below follows an alphabetical sequence by generic and species names. The listing deals only with taxa in which nomenclatural adjustments are needed.

Identification key by Al-Shehbaz for the world genera of Brassicaceae is available on the web (<http://flora.huh.harvard.edu:8080/actkey/actkey.jsp?setId=2051>).

Alyssum L.

As shown by Greuter et al. (1986), *Alyssum minus* Rothm. is illegitimate and, together with *A. micranthum* C.A.Mey. (= *A. minus* var. *micranthum* (C.A.Mey.) T.R.Dudley), should be reduced to a synonym of the earlier published *A. simplex* Rudolphi. *A. muglæi* Orcan was described as a new species by N. Orcan (2005).

Arabidopsis (DC.) Heynh.

Of the 3 species listed by Hedge (in Davis, 1965) in *Arabidopsis* from Turkey, only the generic type, *A. thaliana* (L.) Heynh., is retained in this genus. Based on extensive molecular studies (Koch et al., 1999a, 2000, 2001; O'Kane & Al-Shehbaz, 2003; Warwick et al., 2006a) and critical evaluation of morphology (Al-Shehbaz & O'Kane, 1995; O'Kane & Al-Shehbaz, 1997; Al-

Shehbaz et al., 1999; Al-Shehbaz & Warwick, 2005), both *A. parvula* (Schrenk) O.E.Schulz and *A. pumila* (Steph.) N.Busch should be excluded from this genus and be placed in *Eutrema* R.Br. and *Olimarabidopsis* Al-Shehbaz, O'Kane & R.A.Price (Table).

Arabis L.

Extensive molecular studies on *Arabis* and its closest relatives, including *Aubrieta* Adans. and *Draba* L., clearly demonstrated that *A. turrita* L. is not related to the remaining members of the genus (Koch, 2003; Koch et al., 1999a, 2000, 2001). No species of *Arabis* has fully bracteate racemes, yellow flowers, or secund, strongly falcate fruits (8-)10-15 cm long and with strongly thickened margins. For these substantial molecular and morphological differences, Al-Shehbaz (2005) placed *A. turrita* in the monotypic new genus *Pseudoturritis* Al-Shehbaz.

Barbarea R.Br.

As correctly indicated by Greuter et al. (1986), *Barbarea minor* C.Koch, listed as such by Coode & Cullen (1965), should be replaced by the earlier-published *B. brachycarpa* Boiss. However, a recent study of both taxa reconfirmed that they are conspecific (Parolly & Eren, 2006). In this study, this species, which is represented 4 subspecies, was taxonomically corrected and 2 varieties (*B. brachycarpa* Boiss. subsp. *brachycarpa* var. *ilicifolia* Parolly, Nordt & Eren; *B. brachycarpa* Boiss. subsp. *minor* (K.Koch) Parolly & Eren var. *pilicarpa* Parolly & Eren) were described as new taxa.

Cardaria Desv.

The extensive molecular studies by Mummenhoff (1995) and Mummenhoff et al. (2001) have clearly demonstrated that species of *Cardaria* are nested within and evolved from *Lepidium* L., with its nearest relative being *L. campestre* (L.) R.Br. *Cardaria* differs from *Lepidium* solely by having indehiscent instead of dehiscent fruits. Studies on *Arabidopsis thaliana* (L.) Heynhold (Ferrandiz et al., 1999, 2000; Ferrandiz, 2002; Dinneny and Yanofsky, 2004) have shown that a few genes can control major changes in fruit morphology, including dehiscence vs. indehiscence and fruit shape (silique vs. silicle). These studies have led Al-Shehbaz et al. (2002) to unite both *Cardaria* and *Coronopus* with *Lepidium*.

Turkey has 2 species of *Cardaria*, i.e. *C. draba* (L.) Desv. and *C. chalepensis* (L.) Hand.-Mazz., both of which were originally described by Linnaeus as *Lepidium draba*

L. and *L. chalepensis* L. Therefore, the union of *Cardaria* with *Lepidium* does not involve any nomenclatural novelties as far as the Turkish flora is concerned, and the 2 species of *Cardaria* should be treated as members of *Lepidium*.

Cochlearia L.

Hedge (1965b) reported 3 species of *Cochlearia* (*C. aucheri* Boiss., *C. sempervivum* Boiss. & Bal., and *C. sintenisii* Hausskn. ex Bornm.) from Turkey, and Contandriopoulos and Quézel (1976) added a fourth one, *C. amana* Contandr. & Quézel. Pobedemova (1970) transferred the first 3 species to *Pseudosempervivum* (Boiss.) Grossh., a genus that was recently accepted by Appel & Al-Shehbaz (2003). *Cochlearia* is a circumboreal and central European genus of 17 species with biseriate seeds up to 32 per fruit, whereas *Pseudosempervivum* is exclusively a SW Asian genus of 4 species with uniseriate seeds, rarely to 4 per fruit. Molecular studies (Koch et al., 1999b) strongly support the recognition of *Pseudosempervivum* as distinct from *Cochlearia*. The fourth species, *C. amana*, and the fifth, *C. gurulkani*, are transferred herein to *Pseudosempervivum* as follows:

Pseudosempervivum amanum (Contandr. & Quézel) Al-Shehbaz, Mutlu et Dönmez, **comb. nov.** Basionym: *Cochlearia amana* Contandr. & Quézel, Bull. Soc. Bot. Fr. 123: 418. 1976. TYPE: Turkey, Amanus, 15 km SE Osmaniye, 2000 m, 30 June 1973, P. Quézel & J. Contandriopoulos 73-434 (holotype, MARS).

Pseudosempervivum gurulkani (Yıld.) Mutlu & Al-Shehbaz & Dönmez, **comb. nov.**

Basionym: *Cochlearia gurulkani* Yıld., OT Sistematiik Botanik Dergisi, 12(1): 1-8, 2005. TYPE: Turkey, C9 Şırnak: Foot of Namaz Mountain, from Yaylabaşı via limekiln to centrum, steppe, rocky quercetum (*Q. brantii* Lindley) places, 1700-1900 m, 21.06.2005, Ş. Yıldırımli 30169 (holotype, Hb. Yıldırımli; isotype, HUB).

Cardamine L.

Marhold and Ancev (1999) considered that *Cardamine uliginosa* M.Bieb. was restricted to subalpine and alpine belts at 2000-3000 m, only rarely descending along streams to c. 1000 m. Records of this species from lower altitudes were misidentifications of another species, which they name *C. penzesii* Ancev & Marhold **nom. nov.** They distinguished it from *C. pratensis* L. s.str. by its having patent hairs on the rosette leaves and by reddish-violet

petals, although the race “*ucranica*”, currently treated within *C. pratensis* L., also has entirely white petals.

Conringia Heister ex Fabricius

Conringia perfoliata (C.A.Mey.) N.Busch (Komarov, Fl. URSS 8: 497. 1939) is a later homonym of *C. perfoliata* (DC.) Link (Enum. Hort. Berol. Alt. 2: 172. 1822). The correct name of this species should be *C. clavata* Boiss. The species has recently been recognised by Dorofeyev (2002) as *Moricandia perfoliata* (C.A.Mey.) V.I.Dorof., but this transfer is unjustified because *Moricandia* has conduplicate cotyledons, as do all members of the tribe *Brassicaceae* (Al-Shehbaz et al., 2006), whereas *Conringia* has incumbent cotyledons (Appel & Al-Shehbaz, 2003).

Coronopus Zinn

The genus is represented in Turkey by 2 species, i.e. *Coronopus squamatus* (Forssk.) Aschers. and *C. didymus* (L.) Sm. (Hedge, 1965a; Yıldırımli, 2000). *Coronopus* is a polyphyletic genus the different species of which evolved independently from different lineages within *Lepidium* (Mummenhoff et al., 2001). Therefore, it is an artificial genus that should be united with *Lepidium*, and the correct name of its representatives in Turkey should be *L. coronopus* (L.) Al-Shehbaz and *L. didymum* L. (see Al-Shehbaz, 2004).

Draba L., *Erophila* DC., *Drabopsis* Koch

Despite being the largest genus in the Brassicaceae with over 370 species, *Draba* remains a well-defined monophyletic genus (Al-Shehbaz et al., 2006). A number of genera were previously segregated from *Draba*, including *Erophila*, but were separated by trivial characters. *Erophila* was said to be distinguished from *Draba* by having bifid petals, but there are several species of *Draba* in which this character evolved independently. Phylogenetic studies in *Draba* (Koch & Al-Shehbaz, 2002) clearly demonstrated that *Erophila* falls within a group of annual *Draba* that have entire petals. Therefore, *Erophila* does not merit recognition, and all of its species, including the type *E. verna* (L.) Chevall., which was originally described by Linnaeus (Sp. Pl. 2: 652. 1753) as *D. verna* L., should be maintained in *Draba*.

Except for fruit length:width ratio, *Drabopsis* is indistinguishable from *Draba verna* or any other annual scapose *Draba* in all other aspects of the plant. As indicated by Al-Shehbaz & Koch (2003), molecular data

clearly show that *Drabopsis* is most closely related to and groups together with the annual species of *Draba*. Indeed, the latter genus has many species with linear fruits. Cullen (1965a) indicated that the type of *Drabopsis* is *D. verna* C.Koch, but Léonard (1977) demonstrated that the correct name for the species is *D. nuda* (Bél.) Stapf.

Euclidium R.Br.

Euclidium tenuissimum (Pall.) B.Fedtsch. was reported by Behçet and Ünal (2002) as a new record for Turkey. However, as shown by Appel & Al-Shehbaz (2003), this species belongs to *Litwinowia* Woronow, and the type species should be known as *L. tenuissima* (Pall.) Woronow.

Hesperis L.

Duran & Ocak (2005) described *Hesperis turkmenaghensis* A.Duran & A.Ocak as a new species, closely related to *H. matronalis* subsp. *matronalis*. *Hesperis kuerschneri* Parolly & Kit Tan is described as a new species by Parolly & Tan (2006).

Hutchinsia R.Br.

The generic name *Hutchinsia* is illegitimate because when published it included *Iberis rotundifolia* L., the type species of the earlier published and legitimate generic name *Noccaea* Moench (Meyer 1982; Greuter & Raus, 1985). Hedge (1965c) reported *H. petraea* (L.) R.Br. from Turkey, but that species is the type of the genus *Hornungia* Rchb. Therefore, *Hutchinsia petraea* should be referred to as *Hornungia petraea* (L.) Rchb.

Hymenolobus Nutt.

As demonstrated by Appel and Al-Shehbaz (1998), the genera *Hutchinsia*, *Hymenolobus*, and *Pritzelago* should be united with the earliest legitimate generic name *Hornungia*. The morphological differences between these genera are trivial and rest primarily on habit, number of ovules per locule, relative length of the petals to sepals, and cotyledonary position. These characters are unreliable in generic delimitations, and molecular studies (Mummenhoff et al., 2001) strongly support the union of these genera in one. *Hymenolobus procumbens* (L.) Nutt. (erroneously listed as Nutt. ex Torr. & A.Gray in the *Flora of Turkey*) should therefore be known as *Hornungia procumbens* (L.) Hayek.

Isatis L.

Goerkemia Yild., syn. nov.

An examination of the type collection of *Goerkemia turcica* (Yıldırımli, 1999) at HUB showed that this new

genus and species was based on a diseased plant with undeveloped fruit of an *Isatis* species. When diseased, plants of the Brassicaceae show unusual morphologies that can be terribly misleading. In our opinion, *Goerkemia* is such an example.

Iberis L.

Hedge (1965d) listed *Iberis taurica* DC. (Syst. Nat. 2: 402.1821) from Turkey, but this name is illegitimate because it listed as a synonym of the earlier published *I. simplex* DC. (in Lam. & DC., Fl. France 3, 5: 597. 1815). Furthermore, as pointed out in Greuter & Raus (1985), *I. arbuscula* Runemark (Bot. Not. 116: 323. 1963) is a later homonym to that of Spach (Hist. Vég. Phan. 6: 562. 1838), and the correct name for the species is *I. runemarkii* Greuter & Burdet. One species, *Iberis saxatilis* L., has recently been recorded (Dirmenci et al., 2005) for Turkey.

Malcolmia R.Br.

As listed by Cullen (1965b), *Malcolmia* is so heterogeneously delimited that its species belong to 3 unrelated genera substantially different from each other in terms of molecular (Warwick et al., 2006b) and morphological data. Of the 6 species listed by Cullen, 4 (*M. chia* (L.) DC., *M. flexuosa* (Sibth. & Sm.) Sibth. & Sm., *M. graeca* Boiss., and *M. micrantha* Boiss.) should be retained in the genus and all are characterised by having sessile, stellate and/or malpighiaceae (medifixed, 2-rayed) trichomes. *Malcolmia africana* (L.) R.Br. should be placed in *Strigosella* Boiss. (Botschantsev, 1972.), whereas *M. crenulata* (DC.) Boiss. should be assigned to *Zuvanda* (Dvorák) Askerova. *Strigosella* differs from *Malcolmia* by having dendritic trichomes and non-saccate lateral sepals, whereas *Malcolmia* has sessile, stellate or malpighiaceae trichomes and strongly saccate lateral sepals. By contrast, *Zuvanda* includes glabrous plants with auriculate or amplexicaul cauline leaves, whereas *Malcolmia* includes plants pubescent with stellate and malpighiaceae trichomes and petiolate cauline leaves (Askerova, 1985). Dorofeyev (2002) erroneously placed species of *Zuvanda* in *Moricandia* (e.g., *M. crenulata* (DC.) Dorof.) but the latter genus has conduplicate cotyledons, which are characteristics of the tribe *Brassicaceae* to which it belongs, and all species of *Zuvanda* have incumbent cotyledons.

Matthiola R.Br.

One species, *Matthiola trojana* T.Dirmenci, F.Satıl & G.Tümen has recently been published as a new species (Dirmenci et al., 2006) for science.

***Moricandia* DC.**

Moricandia is a genus of 7 species centred in S Europe, N Africa, and the Middle East (Israel, Saudi Arabia, Iran, and Pakistan). The transfer by Dorofeyev (2002) to *Moricandia* of species recognised herein in *Conringia* and *Zuvanda* is unjustified for the reasons discussed above.

***Noccaea* Moench**

As discussed in some detail under *Thlaspi* (see below), most of the species assigned to this genus should be removed to *Noccaea* and perhaps a few other genera. *Thlaspi* is represented in Turkey by only 5 species (see below), all of which are annuals with very strongly reticulate or concentrically striate seeds. By contrast, *Noccaea* consists primarily of perennials with smooth seeds. Our current knowledge of the Middle Eastern *Noccaea* is far from adequate, although it would seem that most of the *Thlaspi* segregates by Meyer (1973, 1979) might well rest in *Noccaea*. Aytaç et al. (2006) have recently described the new species *N. camlikensis* Aytaç, Nordt and Parolly from Turkey, and we think that their generic assignment is correct.

***Tchihatchewia* Boiss.**

Rauschert (1982) indicated that *Tchihatchewia* is a later homonym of a genus of fossils published 3 years earlier, and he proposed the generic name *Neotchihatchewia* Rauschert to replace it (Mutlu & Dönmez, 2003). However, as correctly indicated by Stafleu and Cowan (1986), the original publication of the cruciferous genus dates back to Oct.-Nov. 1860, instead of 1866 as Rauschert indicated. Therefore, *Neotchihatewia* is illegitimate and should be reduced to synonymy of *Tchihatchewia*, with the fossil genus a later homonym.

***Texiera* Jaub. & Spach**

The monotypic *Glastaria* Boiss. (Ann. Sc. Nat. Ser. II, 16: 382. 1841) was published a year before *Texiera* (Ill. Or. 1: t. 1. 1842) and, therefore, its type species should be known as *G. glastifolia* (DC.) Kuntze, and *G. reflexa* Boiss. and *T. glastifolia* (DC.) Jaub. & Spach should be treated as its synonyms.

***Thlaspi* L.**

Meyer (1973, 1979) divided *Thlaspi* into 13 segregate genera based primarily on differences in seed-coat anatomy, and he (Meyer, 1973, 2001) retained *Thlaspi* s.str. to include only 6 species. Several authors

(e.g., Hedge, 1976; Al-Shehbaz, 1986; Appel & Al-Shehbaz, 2003) did not accept that splitting of *Thlaspi*. However, the extensive molecular data (Mummenhoff et al., 1997a, 1997b; Koch et al., 1998; Zunk et al., 1999; Koch & Mummenhoff, 2001; Koch & Bernhardt, 2004) strongly support the division of the genus into more than one segregate, of which *Thlaspi* s.str., which has striate or strongly reticulate seeds, is clearly unrelated to the rest, which have smooth seeds. Indeed, Al-Shehbaz et al. (2006) placed *Thlaspi* s.str. in the tribe *Thlaspideae* and kept the other 13 segregates of Meyer in the tribe *Nocceae*. Of these segregates, perhaps only *Microthlaspi* and *Noccaea* merit recognition. Turkey has the following 5 species of *Thlaspi* s.str.: *T. alliaceum* L., *T. arvense* L., *T. ceratocarpum* (Pall.) Murray, *T. heurtii* Boiss., and *T. kochianum* F.K.Mey.

Meyer (1973) described the following new species from Turkey: *Callothlaspi antitauricum* F.K.Mey., *Masmenia crassicaula* F.K.Mey., *Thlaspiceras bovis* F.K.Mey., *T. capricornutum* F.K.Mey., *T. crassifolium* F.K.Mey., *T. huber-morathii* F.K.Mey., *T. rechingeri* F.K.Mey., *T. triangulare* F.K.Mey., *Vania campylophylla* F.K.Mey. and *V. pulvinata* F.K.Mey. They were transferred by Greuter & Burdet (in Greuter & Raus, 1983) to *Thlaspi* and were listed in this genus by Davis et al. (1988). In addition, Meyer (1973) transferred the following species of *Thlaspi* sensu Davis (1965) as follows: *Callothlaspi lilacinum* (Boiss. & Huet) F.K.Mey., *Kotschyella cilicica* (Schott & Kotschy ex Boiss.) F.K.Mey., *Masmenia rosularis* (Boiss. & Bal.) F.K.Mey., *Neurotropis orbiculata* (Steven ex DC.) F.K.Mey., *Raparia bulbosa* (Spruner) F.K. Mey., *Thlaspiceras elegans* (Boiss.) F.K.Mey., *T. oxyceras* (Boiss.) F.K.Mey., and *Vania kurdica* (Hedge) F.K.Mey. It is likely that most if not all species listed in this paragraph belong to *Noccaea*. However, without a thorough study of the entire complex, it is better to exclude them from *Thlaspi* s.str. Meyer's (1973) synoptic account of *Thlaspi* s.l. is not comprehensive, and many names accepted in *Flora of Turkey* (Davis, 1965) were left out.

***Torulularia* O.E.Schulz**

As shown by Léonard (1986), this cruciferous generic name is a later homonym for a genus of the red algae (*Rhodophyta*). The 2 Turkish species of this genus should be known as members of *Neotorulularia torulosa* (Desf.) Hedge & J.Léonard and *N. contortuplicata* (Steph.) Hedge & J.Léonard.

Table. Updated Nomenclature of Turkish Brassicaceae.

No.	Name in Fl. Turkey (vols. 1, 10, or 11) or additional references	Present name	Literature of present name
1	<i>Alyssum minus</i> Rothm.	<i>Alyssum simplex</i> Rudolphi	J. Bot. (Schrader) 2: 290. 1799.
2	<i>Arabidopsis parvula</i> (Schrenk) O.E.Schulz	<i>Eutrema parvulum</i> (Schrenk) Al-Shehbaz & Warwick	Harvard Pap. Bot. 10(2): 133.2005.
3	<i>Arabidopsis pumila</i> (Willd.) N.Busch	<i>Olimarabidopsis pumila</i> (Schrenk) Al-Shehbaz, O'Kane & R.A.Price	Novon 9: 303. 1999.
4	<i>Arabis turrita</i> L.	<i>Pseudoturritis turrita</i> (L.) Al-Shehbaz	Novon 15: 522. 2005.
5	<i>Barbarea alpina</i> K.Koch	<i>Barbarea brachycarpa</i> Boiss. subsp. <i>minor</i> (K.Koch) Parolly & Eren var. <i>minor</i>	Willdenowia 36: 823-844, 2006.
6	<i>Barbarea minor</i> K.Koch	<i>Barbarea brachycarpa</i> Boiss. subsp. <i>minor</i> (K.Koch) Parolly & Eren	Willdenowia 36: 823-844, 2006.
7	<i>Barbarea minor</i> K.Koch var. <i>libanotica</i> Bornm.	<i>Barbarea brachycarpa</i> Boiss. subsp. <i>brachycarpa</i> var. <i>brachycarpa</i>	Willdenowia 36: 823-844, 2006.
8	<i>Barbarea minor</i> K.Koch var. <i>anfractuosa</i> Hartvig & Strid	<i>Barbarea brachycarpa</i> Boiss. subsp. <i>anfractuosa</i> (Hartvig & Strid) Hartvig & Strid	Willdenowia 36: 823-844, 2006.
9	<i>Barbarea minor</i> K.Koch var. <i>robusta</i> Coode & Cullen	<i>Barbarea brachycarpa</i> Boiss. subsp. <i>robusta</i> (Coode & Cullen) Parolly & Eren	Willdenowia 36: 823-844, 2006.
10	<i>Barbarea hedgeana</i> Kit Tan & Gemici	<i>Barbarea brachycarpa</i> Boiss. subsp. <i>brachycarpa</i> var. <i>brachycarpa</i>	Willdenowia 36: 823-844, 2006.
11	<i>Barbarea intermedia</i> sensu Fl. Turkey, non Bor.	<i>B. sicula</i> C.Presl	Willdenowia 36: 823-844, 2006.
12	<i>Cardamine uliginosa</i> auct. non M.Bieb.	<i>Cardamine penzesii</i> Ancev & Marhold	Ann. Bot. Fennici 36: 171-180. 1999.
13	<i>Cardaria chalepensis</i> (L.) Hand.-Mazz.	<i>Lepidium chalepensis</i> L.	Cent. Pl. II, 23. 1756.
14	<i>Cardaria draba</i> (L.) Desv.	<i>Lepidium draba</i> L.	Sp. Pl. 2: 645. 1753.
15	<i>Cheiranthus cheiri</i> L.	<i>Erysimum cheiri</i> (L.) Crantz	Cl. Crucif. Emend. 116. 1769.
16	<i>Cochlearia amana</i> Contandr. & Quézel	<i>Pseudosempervivum amanum</i> (Contrandr. & Quézel) Al-Shehbaz, Mutlu & Dönmez	In this publication
17	<i>Cochlearia aucheri</i> Boiss.	<i>Pseudosempervivum aucheri</i> (Boiss.) Pobed.	Novosti Sist. Vyssh. Rast.7: 194. 1970.
18	<i>Cochlearia gurulkanii</i> Yild.	<i>Pseudosempervivum gurulkanii</i> (Yild.) Mutlu, Al-Shehbaz & Dönmez	In this publication
19	<i>Cochlearia sempervivum</i> Boiss. & Bal.	<i>Pseudosempervivum sempervivum</i> (Boiss. & Bal.) Pobed.	Novosti Sist. Vyssh. Rast.7: 195. 1970.
20	<i>Cochlearia sintenisii</i> Hausskn. & Bornm.	<i>Pseudosempervivum sintenisii</i> (Hausskn. & Bornm.) Pobed.	Novosti Sist. Vyssh. Rast.7: 195. 1970.
21	<i>Conringia perfoliata</i> (C.A.Mey.) N.Busch	<i>Conringia clavata</i> Boiss.	Ann. Sci. Nat. 17: 84. 1842.
22	<i>Coronopus didymus</i> (L.) Sm.	<i>Lepidium didymum</i> L.	Syst. Nat. ed. 12, 2:433. 1767.
23	<i>Coronopus squamatus</i> (Forssk.) Aschers.	<i>Lepidium coronopus</i> (L.) Al-Shehbaz	Novon 14: 156. 2004.
24	<i>Erophila minima</i> C.A.Mey.	<i>Draba minima</i> (C.A.Mey.) Steudel	Nomend. Bot. Ed. 2, 1: 528. 1840.
25	<i>Erophila verna</i> (L.) Chevall.	<i>Draba verna</i> L.	Sp. Pl. 2: 642. 1753.
26	<i>Drabopsis verna</i> C.Koch	<i>Draba nuda</i> (Bél.) Al-Shehbaz & M.Koch	Novon 13: 173. 2003.
27	<i>Euclidium tenuissimum</i> (Pall.) B.Fedtsch.	<i>Litwinowia tenuissima</i> (Pall.) Woronow	The Fam. and Gen. of Vasc. Pl., 75-114, 2003.
28	<i>Goerkemia turcica</i> Yild.	<i>A diseased plant of Isatis</i> sp.	In this article
29	<i>Hutchinsia petraea</i> (L.) R.Br.	<i>Hornungia petraea</i> (L.) Rchb.	Deutschl. Fl. 1: 33. 1837.
30	<i>Hymenolobos procumbens</i> (L.) Nutt.	<i>Hornungia procumbens</i> (L.) Hayek	Repert. Sp. Nov. Regni Veg. Beih. 30(1): 480. 1925.

31	<i>Iberis arbuscula</i> Runemark	<i>Iberis runemarkii</i> Greuter & Burdet	Willdenowia 15: 68. 1985.
32	<i>Iberis taurica</i> DC.	<i>Iberis simplex</i> DC.	Fl. Franc. Ed. 3, 5: 597. 1815.
33	<i>Malcolmia africana</i> (L.) R.Br.	<i>Strigosella africana</i> (L.) Botsch.	Bot. Zhurn. (Moscow & Leningrad) 57: 1038. 1972.
34	<i>Malcolmia crenulata</i> (DC.) Boiss.	<i>Zuvanda crenulata</i> (DC.) Askerova	Bot. Zhurn. (Moscow & Leningrad) 70: 523. 1985.
35	<i>Texiera glastifolia</i> (DC.) Jaub. & Spach	<i>Glastaria glastifolia</i> (DC.) Kuntze	Revis. Gen. Pl. 1: 30. 1891.
36	<i>Thlaspi angustifolium</i> (F.K. Mey.) Greuter & Burdet	<i>Noccaea angustifolia</i> F.K.Mey.	Feddes Repert. 84: 465. 1973.
37	<i>Thlaspi annuum</i> K.Koch	<i>Noccaea annua</i> (K.Koch) F.K.Mey.	Feddes Repert. 84: 465. 1973.
38	<i>Thlaspi crassum</i> P.H.Davis	<i>Noccaea sintenisii</i> (Hausskn. ex Bornm.) F.K.Mey. subsp. <i>crassum</i> (P.H.Davis) Parolly	Willdenowia 36: 823-844, 2006.
39	<i>Thlaspi densiflorum</i> Boiss. & Kotschy	<i>Noccaea densiflora</i> (Boiss. & Kotschy) F.K.Mey.	Feddes Repert. 84: 465. 1973.
40	<i>Thlaspi edinensium</i> (F.K.Mey.) Greuter & Burdet	<i>Noccaea edinensium</i> F.K.Mey.	Feddes Repert. 84: 460. 1973.
41	<i>Thlaspi microstylum</i> Boiss.	<i>Noccaea microstyla</i> (Boiss.) F.K.Mey.	Feddes Repert. 84: 463. 1973.
42	<i>Thlaspi ochroleucum</i> Boiss. & Heldr.	<i>Noccaea ochroleuca</i> (Boiss. & Heldr.) F.K.Mey.	Feddes Repert. 84: 461. 1973.
43	<i>Thlaspi papillosum</i> Boiss.	<i>Noccaea papillosa</i> (Boiss.) F.K.Mey.	Feddes Repert. 84: 460. 1973.
44	<i>Thlaspi perfoliatum</i> L.	<i>Microthlaspi perfoliatum</i> (L.) F.K.Mey.	Feddes Repert. 84: 453. 1973.
45	<i>Thlaspi praecox</i> Wulfen	<i>Noccaea praecox</i> (Wulfen) F.K.Mey.	Feddes Repert. 84: 462. 1973.
46	<i>Thlaspi sintenisii</i> Hausskn. ex Bornm.	<i>Noccaea sintenisii</i> (Hausskn. ex Bornm.) F.K.Mey.	Feddes Repert. 84: 458. 1973, Willdenowia 36: 823-844, 2006.
47	<i>Thlaspi tatianae</i> E.Bordzilovski	<i>Noccaea tatianae</i> (E. Bordzilovski) F.K.Mey.	Feddes Repert. 84: 465. 1973.
48	<i>Thlaspi valerianoides</i> Rech.f.	<i>Noccaea valerianoides</i> (Rech.f.) F.K.Mey.	Feddes Repert. 84: 460. 1973.
49	<i>Thlaspi violascens</i> Schott & Kotschy	<i>Noccaea violascens</i> (Schott & Kotschy) F.K.Mey.	Feddes Repert. 84: 465. 1973.
50	<i>Torularia contortuplicata</i> (Steph.) O.E.Schulz	<i>Neotorularia contortuplicata</i> (Steph.) Hedge & J.Léonard	Bull. Jard. Bot. Natl. Belg. 56: 393. 1986.
51	<i>Torularia torulosa</i> (Desf.) O.E.Schulz	<i>Neotorularia torulosa</i> (Desf.) Hedge & J.Léonard	Bull. Jard. Bot. Natl. Belg. 56: 395. 1986.

Results and Discussion

The family Brassicaceae is now known to be represented by 555 species, 51 subspecies, 22 varieties and 621 taxa belonging to 91 genera in the *Flora of Turkey* (Davis, 1965; Davis et al., 1988; Güner et al., 2000). Fourteen new or different generic names (*Clastopus*, *Eutrema*, *Glastaria*, *Goerkemia*, *Hornungia*, *Litwinowia*, *Microthlaspi*, *Neotorularia*, *Noccaea*, *Olimarabidopsis*, *Pseudosempervivum*, *Pseudoturritis*, *Strigosella*, and *Zuvanda*) have been added to the Flora since the publication of the eleventh volume. In contrast, 14 genera (*Coronopus*, *Cardaria*, *Goerkemia*, *Hymenolobus*, *Hutchinsia*, *Cochlearia*, *Texiera*,

Schivereckia, *Erophila*, *Drabopsis*, *Meresia*, *Cheiranthus*, *Torularia*, and *Vania*) are now excluded either because they are illegitimate names (e.g., *Hutchinsia*, *Texiera*, *Torularia*), insufficient and diseased specimens (*Goerkemia*) or their species (the remaining 10 genera) have recently been shown to belong to other genera.

Due to various species concepts of authors and ongoing taxonomic treatments, the stability of the names of Turkish Brassicaceae has not yet been finalised. Therefore, our present count of 571 species 65 subspecies, 24 varieties and 660 taxa belonging to 91 genera is approximate. The plants of the east Aegean Islands are excluded from the total of Turkey.

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