



<https://helda.helsinki.fi>

Helda

Atlas Florae Europaeae notes, 19–22 : Nomenclatural changes and taxonomic adjustments in some native and introduced species of Malinae (Rosaceae) in Europe

Sennikov, Alexander

Botanischer Garten und Botanisches Museum Berlin-Dahlem

2013-06

Sennikov, A & Phipps, J B 2013, 'Atlas Florae Europaeae notes, 19–22 : Nomenclatural changes and taxonomic adjustments in some native and introduced species of Malinae (Rosaceae) in Europe', *Willdenowia : Annals of the Botanic Garden and Botanical Museum Berlin*, vol. 43, no. 1, pp. 33-44. <https://doi.org/10.3372/wi.43.43104>

<http://hdl.handle.net/10138/157818>

10.3372/wi.43.43104

publishedVersion

Downloaded from Helda, University of Helsinki institutional repository.

This is an electronic reprint of the original article.

This reprint may differ from the original in pagination and typographic detail.

Please cite the original version.

ALEXANDER N. SENNIKOV^{1*} & JAMES B. PHIPPS²

Atlas Florae Europaeae notes, 19–22. Nomenclatural changes and taxonomic adjustments in some native and introduced species of *Malinae* (*Rosaceae*) in Europe

Abstract

Sennikov A. N. & Phipps J. B.: Atlas Florae Europaeae notes, 19–22. Nomenclatural changes and taxonomic adjustments in some native and introduced species of *Malinae* (*Rosaceae*) in Europe. – Willdenowia 43: 33–44. June 2013. – Online ISSN 1868-6397; © 2013 BGBM Berlin-Dahlem.

Stable URL: <http://dx.doi.org/10.3372/wi.43.43104>

Compilation of the nomenclatural checklist of *Rosaceae* for volumes 16 and 17 of Atlas Florae Europaeae resulted in nomenclatural and taxonomic adjustments presented here. The synonymy of *Cotoneaster bullatus* is verified; the name *C. tomentellus* is shown to have been validly published in 2009 instead of 1961. *Cotoneaster marianus*, an alleged endemic to Macedonia, is a synonym of *C. parnassicus* from Greece. The new combination *Sorbaronia mitschurinii* is proposed to reflect the intergeneric hybrid origin of *Aronia mitschurinii*, an apomictic species of cultigenous origin (*Aronia melanocarpa* × *Sorbus aucuparia*). The name *Crataegus chrysocarpa* var. *rotundifolia* J. B. Phipps & Sennikov is proposed to replace the illegitimate *C. chrysocarpa* var. *phoenicea* E. J. Palmer, and the illegitimate *C. horrida* Medik. ex Cinovskis 1971 is added to its synonymy. The new name *Crataegus chrysocarpa* var. *phoeniceoides* J. B. Phipps & Sennikov is proposed for *C. chrysocarpa* var. *phoenicea* J. B. Phipps, nom. illeg., non E. J. Palmer. The name *Sorbus tauricola* Zaik. ex Sennikov is validly published with a new description and type designation. The lectotype of *Cotoneaster bullatus* and the neotypes of *C. moupinensis* f. *floribundus* and *Mespilus rotundifolia* are designated.

Additional key words: apomictic taxa, *Aronia*, *Cotoneaster*, *Crataegus*, Ehrhart, *Maloideae*, new names, *Pyrinae*, *Sorbaronia*, *Sorbus*, synonymy, typifications

Introduction

Production of the forthcoming volumes 16 (*Rosaceae*: *Cydonia* to *Prunus* in the sequence of Flora Europaea, excluding *Sorbus*) and 17 (*Rosaceae*: *Sorbus*) of Atlas Florae Europaeae revealed the need for corrections in the nomenclature and synonymy of some names and in the taxonomic position of one species in subtribe *Malinae* (formerly subfamily *Maloideae* or subtribe *Pyrinae*). References to the International Code of Nomenclature (ICN) are according to the Melbourne edition (McNeill & al. 2012).

19. Nomenclature and synonymy in some native and alien species of *Cotoneaster*

The genus *Cotoneaster* Medik. is especially rich in problems because numerous minor variants were described as species on the basis of their presumably obligate apomictic mode of reproduction; the most comprehensive survey of the genus can be found in Fryer & Hylmö (2009). This monograph, although written in the full taxonomic format and including reportedly all the species described

¹ Botanical Museum, Finnish Museum of Natural History, P. O. Box 7, FI-00014 University of Helsinki, Finland; also at Herbarium, Komarov Botanical Institute of Russian Academy of Sciences, Prof. Popov Str. 2, RU-197376 St Petersburg, Russia; *e-mail: alexander.sennikov@helsinki.fi (author for correspondence).

² Department of Biology, University of Western Ontario, London, Ontario, N6A 5B7, Canada; e-mail: jphipps@uwo.ca

up to date, is peculiar in its extreme splitter's approach and numerous inaccuracies in nomenclature, descriptions, distributions, and historical background (Sennikov 2010). A series of corrections to the nomenclature, taxonomy and distribution of cotoneasters native to or alien in East Europe and the Caucasus has been published earlier (Sennikov & Somlyay 2011; Sennikov 2011); the present contribution adds nomenclatural corrections for one native species that is endemic to the Balkans and two taxa of Chinese origin that are cultivated and locally naturalized in Europe.

Cotoneaster bullatus Bois in Vilmorin & Bois, Frutic. Vilmor.: 119. 1904. – **Lectotype designated here** by Sennikov: France, cultivated in the Arboretum Vilmorin at Les Barres, 25 Sep 1902, *M. L. de Vilmorin 2123/4483 p.p.* (P).

= *Cotoneaster moupinensis* f. *floribundus* Stapf in Bot. Mag. 135: ad t. 8284. 1909 ≡ *Cotoneaster bullatus* var. *floribundus* (Stapf) Rehder in Bailey, Stand. Cycl. Hort., ed. 2, 2: 866. 1917; L. T. Lu & Brach in Novon 12: 496. 2002, isonym ≡ *Cotoneaster bullatus* f. *floribundus* (Stapf) Rehder & E. H. Wilson in Publ. Arnold Arbor. 4: 165. 1912. – **Neotype designated here** by Sennikov: France, cultivated in the Arboretum Vilmorin at Les Barres, 3 Jul 1902, *M. L. de Vilmorin 2123 (4483)* (K 000442346).

= *Cotoneaster boisianus* G. Klotz in Wiss. Z. Friedrich-Schiller-Univ. Jena, Math.-Naturwiss. Reihe 21(5–6): 987. 1972. – Holotype: France, cultivated in the Arboretum Vilmorin at Les Barres, 25 Sep 1902, *M. L. de Vilmorin 4483 p.p.*, raised from seeds collected for Vilmorin in China, “Tachien-lu” [Kangding, Sichuan] in 1897 (P).

Cotoneaster bullatus Bois is a species of *C. ser. Bullati* Flinck & B. Hylmö that is common in ornamental cultivation in Europe (Fryer & Hylmö 2009), frequently escapes from cultivation, and is found as casual or naturalized alien in several countries of Europe (Sennikov 2009; Dickoré & Kasperek 2010).

The lectotypification of *Cotoneaster bullatus* was attempted by Fryer & Hylmö (2009) who, however, missed the word “here” in the expression of intention “designated here” as required by Art. 7.10. This typification is confirmed and formally effected in the present note.

The specimen *Vilmorin 2123 (4483)* (K 000442346), taken from a plant cultivated in the Arboretum Vilmorin at Les Barres, France, preserved on 3 Jul 1902 and received by Kew on 14 Jul 1902, was indicated as the holotype of *Cotoneaster moupinensis* f. *floribundus* Stapf by Lu & Brach (2002). However, this is not an element on which the original description of this taxon was based (Art. 9.3); neither is this type designation correctable to an effectively published neotypification under Art. 7.10 and Art. 9.23. As explained by Prain (1909) in the com-

ment to Plate 8284 alongside which Stapf's *Cotoneaster* name was published, the original description (Stapf 1909) was based on the material taken from a bush cultivated at the Royal Botanic Gardens, Kew, and originated from living material given by Maurice de Vilmorin in 1905. As evident from identifications, Stapf examined the Kew specimen and treated it as *C. moupinensis* Franch., but at the later date of 10 Jan 1910. Since this specimen is of the same origin as the plant that was cultivated at Kew, its designation as neotype is reasonable and is formally effected here.

Klotz (1972) described *Cotoneaster boisianus* G. Klotz as different from *C. bullatus* s.str. in its smaller leaves 2–5 cm long (vs. 5–8 cm long), a smaller inflorescence with 10–20 flowers (vs. 20–30 flowers), and smaller fruits 5–8 mm in diam. (vs. 8–10 mm in diam.). This taxon was recognized among the plants that were cultivated in the Arboretum Vilmorin under the same accession number that was the basis of *C. boisianus* (Klotz 1972), and its type was part of the material subsequently used for lectotypification of the latter name (Fryer & Hylmö 2009). The complexity of the type citation of *C. boisianus* that included two mentions of the collection date and accession number, one for the original seed material (no. 2123) and the other for the preserved specimen (no. 4483), misled Lu & Brach (2002) to conclude that this name was not validly published because of two types having been simultaneously designated.

The present typifications fix the current recognition of two variants of *Cotoneaster bullatus*, one with smaller dimensions of plant parts (Klotz 1972) and the other with larger ones (Bois 1906; Stapf 1909; Rehder & Wilson 1912; Lu & Brach 2003). As this difference reflects the variability in a limited area from which the species was originally collected, even though the plants are tetraploid and presumably apomictic because of producing uniform progeny from seeds (Fryer & Hylmö 2009), we refrain from accepting these morphotypes as separate taxa at any rank. The species rank is preferred for the third variant included by Lu & Brach (2003), *C. bullatus* var. *macrophyllus* Rehder & E. H. Wilson = *C. rehderi* Pojark., because of much larger leaves and the pubescent hypanthium (Rehder & Wilson 1912).

Cotoneaster parnassicus Boiss. & Heldr. in Boissier, Diagn. Pl. Orient. Nov., ser. 2, 2: 48. 1856 ≡ *Cotoneaster tomentosus* var. *parnassicus* (Boiss. & Heldr.) Wenz. in Linnaea 38: 186. 1874. – Type: not designated. Described from Greece: “In regione abietina et alpina montis Parnassi Heldr.! Ad eandem stirpem spectare videtur specimen a cl. Prof. Orphanides in monte *Gymnovouno* prope *Trikala* lectum.”

– *Cotoneaster marianus* Andonoski & Andonovski in Anonymous, Balkan conference “National parks and their role in biodiversity protection on Balkan peninsula”: 101. 1996, nom. inval. (Art. 39.1 & 40.1), **syn. nov.**

After many years of oblivion, *Cotoneaster parnassicus* Boiss. was accepted as a member of *C. sect. Racemiflori* (Pojark.) G. Klotz by Hylmö & Fryer (1999). This species was described from Greece (Boissier 1856), and also erroneously reported from Crete in place of *C. nummularius* (Hylmö & Fryer 1999).

Andonoski & Andonovski (1996) reported a new species of *Cotoneaster*, *C. marianus* Andonoski & Andonovski from Mt Galičica in Macedonia. When originally described, the new species was compared only with the two species previously known from Galičica, *C. integerrimus* Medik. and *C. tomentosus* (Aiton) Lindl. Micevski (1999) took no notice of this report. Recently Teofilovski & al. (2012) accepted *C. marianus* and inventoried its distribution in Macedonia, with one of the records at the border with Greece.

The original description of *Cotoneaster marianus* is very incomplete, stating that the hypanthium of the species is hairy, the fruits have two nutlets, the flowers are solitary or in pairs on very short pedicels, and the leaves are small and slightly hairy above. These characters are at odds with *C. integerrimus* and *C. tomentosus* but fit those of *C. parnassicus*. Good photographs of the Macedonian plants, kindly offered by Aco Teofilovski, provide clear evidence that *C. marianus* is indistinguishable from *C. parnassicus*, which is very widely distributed in Greece. The new synonymy established here makes a new country record of *C. parnassicus*.

Fryer & Hylmö (2009: 75) attempted to lectotypify *Cotoneaster parnassicus* by *Orphanides 420*, but that gathering is not part of the original material of the name. Two syntypes cited in the protologue are available for lectotypification.

Cotoneaster tomentellus Pojark. in Fryer & Hylmö, *Cotoneasters*: 106. 2009; Pojark. in *Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR* 21: 200. 1961, nom. inval. (Art. 40.1 & 40.2). – Holotype: China, Sichuan, “Tatsien-lu” [Kangding], Oct 1908 [fr.], *E. H. Wilson 1317* (A 00026294; isotypes: E 00010948, LE).

In Europe *Cotoneaster tomentellus* Pojark. is reported as possibly a naturalized alien in the United Kingdom (Stace 2010) and as possibly a casual alien in Sweden (Karlsson 2002). This species is native to China (Sichuan) and belongs to a complex group of *C. racemiflorus* (Desf.) Bosse s.l. (Fryer & Hylmö 2009).

Pojarkova (1961) explicitly cited two gatherings (“Jun 1908, fl., Oct 1908, fr.”, both under *Wilson 1317*) as types of *Cotoneaster tomentellus*, consequently making it impossible for the name to be validly published as a name in its own right (Art. 6.9). Moreover, her citation of “*C. racemiflora* var. *soongorica* Rehd. et Wils. in Sarg., *Pl. Wilson*. 1 (1912) 168, quoad descript. sed excl. basion. et syn.” in synonymy does not qualify as a replaced synonym because it refers to a misapplication, not to a

name (Art. 41, Note 3). The species name was consequently not validly published in 1961 (Art. 40.1 & 40.2).

Buzunova (2005) attempted to lectotypify the name *Cotoneaster tomentellus* with *Wilson 1317* in flower at LE, but she failed to fulfill the conditions of valid publication because certain provisions of the ICN were not met: Art. 36.1(c), i.e. the name was not accepted by her but treated as synonym of *C. soongoricus* (Regel & Herder) Popov, and Art. 40.6, i.e. the word “lectotypus” was used. These conditions were first fulfilled by Fryer & Hylmö (2009), who accepted the name, provided a full and direct reference to the Latin description in Pojarkova (1961), and indicated *Wilson 1317* in fruit at A as holotype.

Lu & Brach (2003) returned *Cotoneaster tomentellus* to the synonymy of *C. soongoricus*. The latter is a Central Asian species described from Kazakhstan that readily differs in its larger and broader leaves, which are totally glabrous above (vs. rather densely hairy in *C. tomentellus*). *Cotoneaster tomentellus* occurs in Central China, whereas the distribution area of *C. soongoricus* embraces mountainous areas of E Central Asia.

20. A new species transfer in *Sorbaronia*

Sorbaronia mitschurinii (A. Skvortsov & Maitul.) Sennikov, **comb. nov.** ≡ *Aronia mitschurinii* A. Skvortsov & Maitul. in *Byull. Glavn. Bot. Sada* 126: 40. 1982. – Holotype: Russia, Moscow, Main Botanic Garden, cultivated, 10 Sep 1980, *Yu. K. Maitulina* (MHA) – Fig. 1, 2.

Skvortsov & Maitulina (1982) compared the cultivar of chokeberries that was very common in Russian orchards with the wild species *Aronia melanocarpa* (Michx.) Elliott native to North America. The cultivated plants were demonstrably monomorphic and obviously differed in their fruit, which is at least twice as large, fleshy, depressed-globose, and dull black because of pubescence (vs. pyriform, shiny black, and completely glabrous), and in their leaves, which are elliptic (vs. lanceolate) with a subrounded (vs. acute) apex. The cultivated plants were also much hardier (Rehder’s hardiness zone II vs. IV), and their fruits had a different taste and were much more juicy. The change of fruit dimensions may be ascribed to artificial selection, whereas the fruit shape and hairiness and the leaf shape are obviously novelties of the cultivar.

In its native area the black-fruited *Aronia melanocarpa* is predominantly diploid in New England and tetraploid outside (Brand 2010), reproducing sexually with production of highly heterogeneous offspring, whereas the cultivated plants are tetraploid, with the offspring being identical, thus indicating apomixis (Skvortsov & al. 1983; Persson-Hovmalm & al. 2004; Leonard 2011). Most of researchers who discussed the origin of cultivated chokeberries (Skvortsov & al. 1983; Persson-Hovmalm & al. 2004) inferred that this cultivar is most

likely an infraspecific hybrid derived from *A. melanocarpa*.

The early proof of hybrid origin of the cultivated chokeberries came from Ivan Michurin, who created the cultivar and introduced it to the Russian market. Michurin (1948) stated that in 1905, in order to produce sweet-fruited cultivars of “rowans” (*Sorbus* s.l.) that may be suitable to the Russian North and Siberia, he pollinated the native Russian *S. aucuparia* L. with the introduced *Aronia melanocarpa*. The resulting hybrid was named “Likernaya” (Liquor Rowan); after Michurin’s death in the 1940s it was distributed nameless to the Soviet market (Skvortsov & al. 1983).

Leonard (2011) studied the relationships of *Aronia mitschurinii* to the wild *Aronia* species and several other genera of *Malinae* Reveal (*Pyrinae* Dumort., formerly *Maloi-deae* C. Weber) using amplified fragment length polymorphism (AFLP) analysis. In this study Leonard confirmed that *A. mitschurinii* was clearly distinct from the wild species of *Aronia* and its first parent was most likely *A. melanocarpa* (less likely *A. prunifolia* (Marshall) Rehder, which is a hybrid between the black-fruited species and the red-fruited *A. arbutifolia* (L.) Pers.). The second parent was confirmed to be *Sorbus aucuparia*, and the genetic proximity to the *Aronia* parent indicated one or more acts of backcrossing with it. Again, Michurin’s memoirs agree with these genetic studies: Michurin (1948) reported that he selected the new cultivar from three generations of crosses.

The intergeneric hybrids between *Aronia* Medik. and *Sorbus* L. are known under the name *Sorbaronia* C. K. Schneid. *Sorbaronia* embraces highly variable morphotypes that are mostly intermediate between the parents. The hybrids of *A. melanocarpa* and *S. aucuparia* are called *Sorbaronia fallax* (C. K. Schneid.) C. K. Schneid.; they are small trees with compound leaves and purple-black fruit (Rehder 1940; Mezhenky 2005) that have never been considered taxonomically identical with *A. mitschurinii*. Because of its distinctive morphology and stable characters caused by predominantly apomictic reproduction, *A. mitschurinii* should be treated as an apomictic microspecies of cultigenous origin that is taxonomically distinct from *S. fallax*.

In spite of the intergeneric origin, Leonard (2011) decided to maintain *Aronia mitschurinii* in *Aronia* because of its greater similarity to the species of the latter. However, an analogous case when variable intergeneric hybrids with *Sorbus* as one of the parents are accommodated in a single



Fig. 1. *Sorbaronia mitschurinii*, flowering branch. – Cultivation, 29 May 2011. – Photo by Yu. Vinogradova.

hybridogenous genus is *Sorbocotoneaster* Pojark. The natural hybrid between *Sorbus aucuparia* L. and *Cotoneaster laxiflorus* Lindl. (syn. *C. melanocarpus* (Bunge) Loudon), *Sorbocotoneaster pozdnjakovii* Pojark., was studied morphologically (Pojarkova 1953) and cytologically (Krügel 1992). Three distinct, yet sympatric, morphotypes were discovered: the primary hybrid (triploid) closely approaching *S. aucuparia*, the putative backcross with *S. aucuparia* (tetraploid) intermediate between the parents, and the putative backcross with *C. laxiflorus* (pentaploid) closely approaching *C. laxiflorus*. If it were not for the apomictic reproduction, *A. mitschurinii* would have been taxonomically included in *S. fallax*; as far as its taxonomic separation is maintained, its transfer to *Sorbaronia* is justified and is consequently effected here.



Fig. 2. *Sorbaronia mitschurinii*, fruiting branch. – Cultivation, 11 Sep 2004. – Photo by Yu. Vinogradova.



Fig. 3. Neotype of *Mespilus rotundifolia* – Ehrhart (1792), *Plantae selectae hortuli proprii* 3: No. 26 (M 0213350).

When established in the wild, in East Europe *Sorbaronia mitschurinii* shares the ecological preferences of its *Aronia* parent. In their native area the species of *Aronia* occur in bogs, swamps and wet woods, but can be found also on dry soils (Gleason & Cronquist 1991). In European Russia a few instances of naturalization of *S. mitschurinii* were noted, e.g. in pine forests with *Polytrichum* spp. around peat bogs or in secondary dry pine forests in the Vladimir Region (Seregin 2010; A. Seregin pers. comm.), in moist pine forests along margins of bogs in the Leningrad Region (pers. obs.), and along margins of peat bogs in Bashkiria (A. Muldashev pers. comm.). All these records are no less than 20 years old (e.g. Seregin 2010); although the active and very rapid migration of this species into natural habitats has just started, it seems to be the beginning of a large future expansion because the species is very common in crop and ornamental cultivation and is very much liked by birds who actively disperse it. In some areas of the Vladimir Region the occurrence of this species in natural habitats is already regular (A. Seregin pers. comm.).

21. The identity of “*Crataegus horrida*” and changes in the infraspecific taxonomy of *C. chrysoarpa*

Crataegus chrysoarpa var. *rotundifolia* (Ehrh.) J. B. Phipps & Sennikov, **comb. nov.** = *Mespilus rotundifolia* Ehrh. in Hirschfeld, Gartenkalender 3: 285. 1784 = *Crataegus rotundifolia* (Ehrh.) Borkh. in Arch. Bot. (Leipzig) 1(3): 87. 1798 [non Lam. 1783, nec Moench 1785] = *Crataegus coccinea* var. *rotundifolia* (Ehrh.) Sarg. in Bot. Gaz. 31(1): 14. 1901 = *Crataegus chrysoarpa* var. *phoenicea* E. J. Palmer in Dole, Fl. Vermont, ed. 3: 152. 1937, nom. illeg. superfl. = *Crataegus horrida* Medik. ex Cinovskis, Boyaryshniki Pribaltiki: 250. 1971, nom. illeg. superfl.; Medik., Gesch. Bot.: 84. 1793, nom. inval. (Art. 38.1(a)). – **Neotype designated here** by Sennikov & Phipps: “*Mespilus rotundifolia* Ehrh. Americana sept.” in Ehrhart (1792), *Plantae selectae hortuli proprii* 3: No. 26 (M 0213350; isoneotypes: GOET 011798, MW) – Fig. 3.

A species of American origin cultivated in Europe, “*Crataegus horrida* Medik.” was reportedly escaped from ornamental cultivation in East Europe (Tzvelev 2001) and occasionally naturalized in the Kaluga Region of European Russia (Reshetnikova & Krylov 2006).

The name *Crataegus horrida* was interpreted by Cinovskis (1971), who resurrected it for *C. chrysoarpa* Ashe, which is the second most wide-ranging species of North American *Crataegus* (Phipps & O’Kennon 2004) currently classified as a member of *C.* sect. *Coccineae* Loudon (Tzvelev 2001) and *C.* ser. *Rotundifoliae* Rehder (Phipps 1983). Nevertheless, this name has never been accepted for this species in its native distribution range; neither it is even listed in synonymy (e.g. Gleason & Cronquist 1991; Phipps & O’Kennon 2004).

In the place of its original publication, Medikus (1793) introduced *Crataegus horrida* without any descriptive matter but with two references: to *Mespilus rotundifolia* Ehrh. (Ehrhart 1784, 1788, 1789) as a doubtful synonym, and to *C. rotundifolia* Moench (Moench 1785) as a plant different from that of Medikus. Except for these citations, Medikus included no references to previously published names on which *C. horrida* might be based and no reference to a previously published description that was applicable to the species. Consequently, *C. horrida* was not validly published in 1793.

As far as we are aware, Cinovskis (1971) was the first to accept the name *Crataegus horrida* after Medikus. In doing so, he did not fulfill the conditions for valid publication of a new name, as he provided no validating description or reference thereto, and no type designation, but he did include full and direct references to many synonyms, of which three, *C. calyciglabra* Schuette, *C. chrysoarpa* var. *phoenicea* E. J. Palmer, and *Mespilus rotundifolia* Ehrh., are validly published names that may serve as replaced synonyms. The earliest synonym, *M. rotundifolia* Ehrh., is considered type-providing here. Because Cinovskis included in synonymy legitimate species names the epithets of which were not then occupied in *Crataegus*, the name *C. horrida* Moench ex Cinovskis was nomenclaturally superfluous when published and is therefore illegitimate (Art. 52.1). Since the earliest legitimate species name the epithet of which should have been accepted by Cinovskis, i.e. *C. chrysoarpa* Ashe, was included in a subordinate taxon (as *C. horrida* var. *chrysoarpa* (Ashe) Cinovskis, nom. non rite publ.), *C. chrysoarpa* does not automatically provide the type for *C. horrida* (Art. 7.5).

Mespilus rotundifolia was described by Ehrhart (1784, 1788, 1789) from cultivation in German gardens, most likely on the basis of living plants because no specimen of *M. rotundifolia* was preserved in Ehrhart’s main herbarium, which is currently housed at MW (Karavaev & Barsukova 1968; Balandin 2004). As is evident from his *Exsiccatae* (Britten 1922; Gubanov & Balandina 2000; Balandin 2006), Ehrhart cultivated the plant in his own garden in Hannover. A later gathering from this cultivation was distributed by Ehrhart (1792), and its specimen at M (best preserved with the most characteristic shape of leaves: Fig. 3) is designated here as the neotype of *M. rotundifolia*.

As is evident from examination of Ehrhart’s collections housed in three Herbaria (GOET, M, MW), the original *Mespilus rotundifolia* has nearly glabrous leaves that are hairy only along the main veins, and its inflorescence is glabrous as correctly assumed by Sargent (1901) and Palmer (1937). Several varieties are formally recognized within the variable *Crataegus chrysoarpa*, the glabrous one being currently known as “*C. chrysoarpa* Ashe var. *phoenicea* E. J. Palmer” (Phipps 2012). However, the leaves of Ehrhart’s plant clearly deviate from those described in Phipps (2012) in having much longer

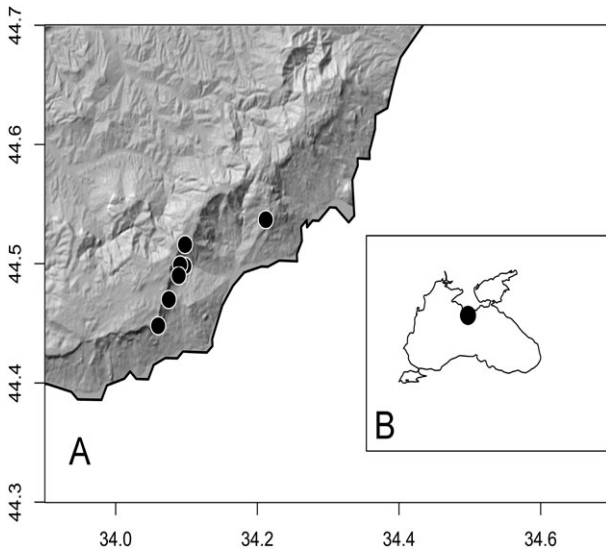


Fig. 4. Distribution of *Sorbus tauricola* – A: location of the known populations in the mountains of S Crimea, Ukraine; B: distribution showing Crimea in the context of the Black Sea.

and acuminate lobes. A new combination at the rank of variety is proposed here to accommodate this morphology; the new varietal name is necessarily based on *M. rotundifolia* because Sargent (1901) already legitimately used that epithet at varietal rank (Art. 11.4).

***Crataegus chrysocarpa* var. *phoeniceoides* J. B. Phipps & Sennikov, var. nov.**

Holotype: U.S.A., Rhode Island, Kent Co., Bristol, 28 May 1939 [fl.], *E. J. Palmer 44757* (A). – Paratypes: U.S.A., Vermont, Addison Co., Ferrisburg, 22 Aug 1941 [fr.], *R. C. Bean C6* (A [two specimens]).

Validating description: that of *Crataegus chrysocarpa* var. *phoenicea* J. B. Phipps (see below).

= *Crataegus chrysocarpa* var. *phoenicea* J. B. Phipps in *Phytoneuron* 2012-30: 1. 2012, nom. illeg. [non *E. J. Palmer 1937*]. – Holotype: U.S.A., Vermont, Addison Co., Ferrisburg, 22 Aug 1941 [fr.], *R. C. Bean C6* (A; isotype: A). – Epitype (designated by Phipps 2012: 1): U.S.A., Rhode Island, Kent Co., Bristol, 28 May 1939 [fl.], *E. J. Palmer 44757* (A).

Phipps (2012) inadvertently published a later homonym of *Crataegus chrysocarpa* var. *phoenicea* *E. J. Palmer* for the glabrous variant of *C. chrysocarpa* with shorter leaf lobes. This illegitimate name is changed here with a new combination based on the validating description of *C. chrysocarpa* var. *phoenicea* J. B. Phipps and the specimen that was designated as the epitype of this name. In the type designation, the flowering specimen from Rhode Island is preferred over the fruiting specimen from Vermont because it unambiguously demonstrates the glabrous inflorescence that is typical of the taxon. The fruiting specimen designated as the holotype by Phipps

(2012) is inadequate as it does not unambiguously prove that the inflorescence, which was glabrous in fruit, was not hairy in flower.

22. Validation of the name *Sorbus tauricola*

***Sorbus tauricola* Zaik. ex Sennikov, sp. nov.**

Holotype: Ukraine, Crimea, Ai-Petri Mt, NE of weather station, 960 m, gravelly slope, 22 Jun 1956, *K. Popov* (LE [flowering specimen]); isotypes: KW, SIMF) – Fig. 7.

– *Sorbus tauricola* Zaik. in *Novosti Sist. Vyssh. Rast.* 22: 137. 1985, nom. inval. (Art. 40.1).

– *Sorbus pseudolatifolia* *K. Popov* in *Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR* 19: 188. 1959, nom. inval. (Art. 40.1) [non *Boros 1937*].

Illustrations — Fig. 5 & 6; Popov (1959a: fig. 1, photo of a fruiting branch), Popov (1959a: fig. 2v, ž, line drawing of a leaf and dissected flower).

Latin description — Popov (1959a: 188).

Description — *Trees or shrubs* up to 4–5 m high. *Bark* grey, with scattered lenticels. *Twigs* brownish grey; *young shoots* brown, loosely tomentose when young, almost glabrous at maturity, with numerous ochraceous lenticels. *Buds* narrowly ovoid, 3–4 mm long, 2–3 mm wide; *bud scales* brown, margin and apex tomentose. *Leaves* (of abbreviated fertile shoots) simple; *petiole* 1.5–2.2 mm long, tomentose; *leaf blade* slightly glossy, dark green (becoming red in autumn) above, grey-green beneath, ovate-elliptic, ± flat, regularly and prominently lobed, 7–9 cm long, 5.5–7 cm wide, widest at 53 %–68 % of lamina length (from apex), lower surface evenly tomentose, upper surface almost glabrous, base broadly cuneate, straight or very slightly arcuate, margin ± flat, apex broadly triangular and acuminate; *veins* 6(or 7) on each side; *lobes* 4 or 5 on each side, sides slightly arcuate, margin serrate with 2 or 3 teeth along shorter side and 6–10 teeth along longer side, apex acuminate; lowermost lobe slightly bent downwards, 1.2–1.5 cm wide; incision between 2 lowermost lobes 1–1.5 cm long. *Inflorescence* with 12–20 flowers, racemose-corymbose, compact, 4–6 cm in diam.; *branchlets* tomentose. *Flowers* 15–18 mm in diam.; *hypanthium* turbinate, tomentose in flower, subglabrous in fruit; *sepals* erect, persistent, triangular, 1.3–1.8 mm long, 1.7–2 mm wide, densely tomentose on both surfaces, apex acuminate; *petals* white, elliptic to broadly elliptic, 6–7 mm long, c. 4 mm wide; *stamens* c. 20; *filaments* white; *anthers* pale lilac, 1.7–1.8 mm long; *styles* 2. *Fruits* 3–10 per inflorescence (fertility low), when ripe bright orange, ellipsoid, 10–11 × 8–9 mm, without lenticels. *Seeds* 1 or 2 per fruit, 4–5 mm long.

Chromosome number — $2n = 4x = 68$ (Zaikonnikova & Kipiani 1980).

Etymology — The species epithet is derived from Chersonesus Taurica (the Latin version of the original Greek name for the Crimean Peninsula) and the Latin word element *-cola* (“inhabitant”), thus meaning “inhabiting the Crimea”.

Distribution and ecology — Ukraine, endemic to the Crimea (Fig. 4). The distribution area stretches as a narrow stripe for c. 15 km along the main range of the Crimean mountains, mostly on the southern side of the range (Popov 1959a, b: fig. 3 [map]). The species grows as scattered individuals on open rocks and in underwood up to the upper limit of the forest belt, at altitudes of 700–1150 m.

Conservation — Assessment (IUCN Species Survival Commission 2001): VU (criterion D2). Measures: Protected in the Crimean Nature Reserve (Rudenko 2010).

Possible origin — *Sorbus aria* (L.) Crantz s.l. × *Sorbus torminalis* (L.) Crantz (Zaikonnikova & Kipiani 1980; Zaikonnikova 1985).

Other specimens examined (paratypes) — Ukraine, Crimea, Ai-Petri Mt, NE of weather station, 960 m, gravelly slope, 19 Sep 1956, K. Popov (KW, LE, SIMF); Ai-Petri Mt, beech forest, 12 Jul 1919, S. Stankov (LE, YALT). An extensive list of other specimens is provided in Popov (1959a).

The Crimean whitebeams that belong to the apomictic complex of *Sorbus latifolia* (Lam.) Pers. s.l. were first discovered by Zelenetzky (1906), who identified them as “*S. scandica* Fries”. Stankov (1927) reported the plant as *S. latifolia*. Popov (1959a) acknowledged the isolated occurrence of the Crimean plants and their difference from Central European whitebeams and described the Crimean populations as *S. pseudolatifolia* K. Popov. Popov provided an extensive description in Latin but designated two gatherings as types, one in flower and the other in fruit, making the new name not validly published under Art. 40.1. Zaikonnikova (1985) renamed the species because of homonymy but omitted the type designation, and this issue was also neglected in a recent list of Ukrainian type specimens (Fedoronchuk 2006). The name suggested by Zaikonnikova is in current use (Czerepanov 1995; Mosyakin & Fedoronchuk 1999; Zaikonnikova 2001; Yena 2012) and is validly published here. Under Art. 46.5 and 46.10 its authorship is “Zaik.



Fig. 5. *Sorbus tauricola*, fruiting branch showing the glossy upper side of the leaves. — Crimea, Ai-Petri Mt, 25 Sep 2010. — Photo by P. Evseenkov.

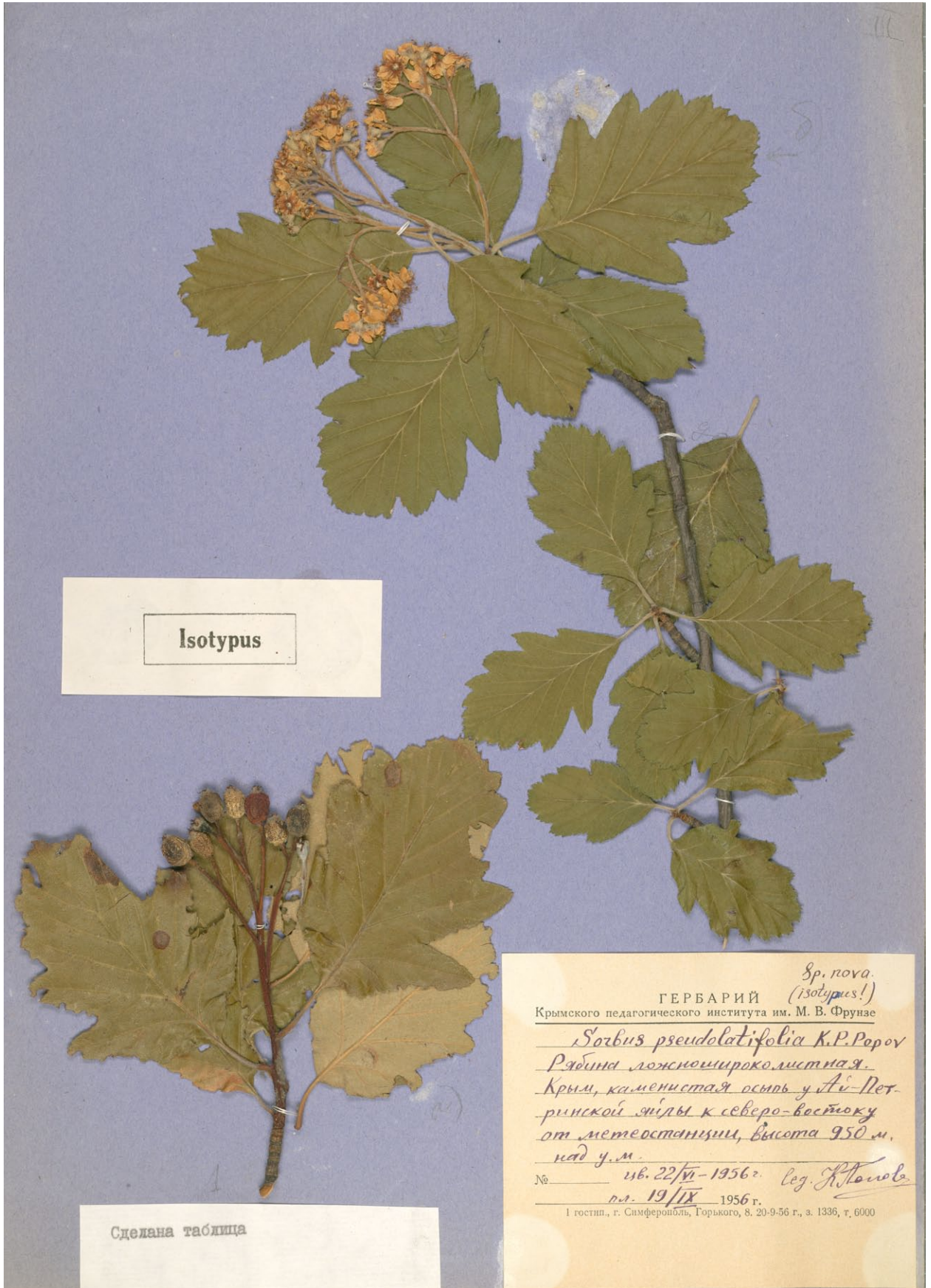


Fig. 6. *Sorbus tauricola*, fruiting branch showing the grey-green tomentose lower side of the leaves. — Crimea, Ai-Petri Mt, 25 Sep 2010. — Photo by P. Evseenkov.

ex Sennikov”; the name may not be attributed to Zaikonnikova alone under Art. 46.2.

Acknowledgements

Alexander Sennikov is grateful to Alexei Seregin (Moscow) and Albert Muldashev (Ufa) for communications on the status of the cultivated chokeberries in East Europe. Aco Teofilovski (Skopje) kindly provided Macedonian literature and photographs of *Cotoneaster marianus*. Yulia Vinogradova (Maitulina) (Moscow) and Pavel Evseenkov (Sevastopol) generously shared their nice photo-



Isotypus

Зр. нова.
(isotypus!)

ГЕРБАРИЙ
Крымского педагогического института им. М. В. Фрунзе

Sorbus pseudolatifolia K.P. Popov
Рябина ложношироколистная.
Крым, каменная осыпь у Ай-Петринской ямды к северо-востоку от метеостанции, высота 950 м, над у.м.

№ 46.22/II - 1956 г. leg. K. Popov
дд. 19/IX 1956 г.

Гостин., г. Симферополь, Горького, 8. 20-9-56 г., з. 1336, т. 6000

Сделана таблица

Fig. 7. Holotype of *Sorbus tauricola* – Flowering (right-hand) specimen, K. Popov (LE).

graphs of *Sorbaronia mitschurinii* and *Sorbus tauricola*. Sampsa Lommi (Helsinki) produced the map of *S. tauricola*. Special thanks go to Mikhail Kozhin (Moscow), Marc Appelhans (Göttingen), Franz Schuhwerk and Christian Bräuchler (München) for locating and scanning specimens of the type collection of *Mespilus rotundifolia*. Ivan Tatanov (St Petersburg) scanned the type of *S. tauricola*. An image of the neotype of *M. rotundifolia* is reproduced with permission from the Botanische Staatssammlung München; an image of the holotype of *S. tauricola* is reproduced with permission from the Komarov Botanical Institute. Arto Kurtto (Helsinki) is warmly thanked for continuous encouragement. The text has benefited from critical comments of Hugh McAllister (Liverpool) and an anonymous reviewer, and from meticulous editing of Nicholas Turland (Berlin).

References

- Andonoski A. & Andonovski V. 1996: *Cotoneaster mariana* Andonoski A. & Andonoski V. A new species discovered in Galičica mountain. – Pp. 99–104 in: Anonymous (ed.), Balkan conference “National parks and their role in biodiversity protection on Balkan peninsula”. – Ohrid: Macedonian ecological society and Republic of Macedonia national parks union. [In Macedonian].
- Balandin S. A. 2004: Ehrhart General Herbarium in the Moscow State University Herbarium. Guide to the microform collection. – IDC number **BT-346**. – Leiden: IDC Publishers.
- Balandin S. A. 2006: Collections of Friedrich Ehrhart. – Pp. 168–179 in: Balandin S. A. (ed.), Herbarium of the Moscow University (MW): History, present state and prospects of development. – Moscow: Department of Plant Ecology, Moscow State University. [In Russian].
- Bois D. 1906: Description de plantes nouvelles cultivées dans le Fruticetum de M. Maurice Lévêque de Vilmorin, aux Barres, par Nogent-sur-Vernisson (Loiret). – Bull. Soc. Bot. France **51**: CXLVI–CLVIII.
- Boissier E. 1856: Diagnoses plantarum novarum praesertim orientalium nonnullis europaeis boreali-africanisque additis, ser. 2, **2**. – Lipsia [Leipzig]: B. Herrmann.
- Brand M. H. 2010: *Aronia*: Native shrubs with untapped potential. – *Arnoldia* **67**(3): 14–25.
- Britten J. 1922: Friedrich Ehrhart and his Exsiccatae. – *J. Bot.* **60**: 318–327.
- Buzunova I. O. 2005: Type specimens of taxa of the family *Rosaceae* described from China that are kept at the Herbarium of the Komarov Botanical Institute (LE), II. Subfamily *Maloideae* Weber. – *Novosti Sist. Vyssh. Rast.* **37**: 200–207. [In Russian].
- Cinovskis R. 1971: Hawthorns of the Baltic countries. – Rīga: Zinātne. [In Russian].
- Czerepanov S. K. 1995: Vascular plants of Russia and adjacent states (the former USSR). – Cambridge: University Press.
- Dickoré W. B. & Kasperek G. 2010: Species of *Cotoneaster* (*Rosaceae*, *Maloideae*) indigenous to, naturalising or commonly cultivated in Central Europe. – *Willdenowia* **40**: 13–45.
- Ehrhart F. 1784: Bestimmung einiger Bäume und Sträucher aus unsern Lustgebüschchen. – Pp. 283–290 in: Hirschfeld C. C. L. (ed.), *Gartenkalender* **3**. – Kiel: Herausgeber [Hirschfeld].
- Ehrhart F. 1788: Beiträge zur Naturkunde, und den damit verwandten Wissenschaften **3**. – Hannover & Osnabrück: Im Verlage der Schmidtischen Buchhandlung.
- Ehrhart F. 1789: Beiträge zur Naturkunde, und den damit verwandten Wissenschaften **4**. – Hannover & Osnabrück: Im Verlage der Schmidtischen Buchhandlung.
- Ehrhart F. 1792: *Plantae selectae hortuli proprii quas in usum botanophilorum exsicavit Fredericus Ehrhart, Helveto-Bernas* **1–8**. – Hannover [Exsiccata].
- Fedoronchuk M. M. 2006: Species of vascular plants described from the territory of Ukraine, their typification and critical taxonomic analysis: the family *Rosaceae* Juss. (the genera *Amygdalus* L., *Cerasus* Hill, *Cotoneaster* Medik., *Prunus* L., *Pyrus* L., *Sorbus* L., *Spiraea* L.). – *Ukr. Bot. Žurn.* **63**(2): 153–158. [In Ukrainian].
- Fryer J. & Hylmö B. 2009: *Cotoneasters: a comprehensive guide to shrubs for flowers, fruit, and foliage*. – Portland & London: Timber Press.
- Gleason H. A. & Cronquist A. 1991: *Manual of vascular plants of Northeastern United States and adjacent Canada*, ed. 2. – New York: New York Botanical Garden.
- Gubanov I. A. & Balandina T. P. 2000: *Exsiccatae of F. Ehrhart in the Moscow State University Herbarium (MW)*. – *Bull. Moscow Soc. Naturalists, ser. biol.* **105**(6): 42–53. [In Russian].
- IUCN Species Survival Commission 2001: *IUCN Red List Categories: Version 3.1*. – Gland and Cambridge: IUCN.
- Karavaev M. N. & Barsukova A. V. 1968: Botanical collections of Friedrich Ehrhart kept at the Moscow University. – *Bull. Moscow Soc. Naturalists, ser. biol.* **88**(4): 142–144. [In Russian].
- Karlsson T. 2002: Nyheter i den svenska kärlväxtfloran II. Korsblommiga – flockblommiga. [Additions and corrections to the checklist of Swedish vascular plants II. *Brassicaceae* – *Apiaceae*]. – *Svensk Bot. Tidskr.* **96**: 186–206.
- Klotz G. 1972: Neue oder kritische *Cotoneaster*-Arten, VII. – *Wiss. Zeitschr. Friedrich-Schiller-Universität Jena, Math.-Nat.* **21**(5–6): 979–1021.
- Krügel T. 1992: Zur zytologischen Struktur von \times *Sorbo-cotoneaster pozdnjakovii* Pojark. (*Rosaceae*, *Maloideae*). – Pp. 87–92 in: Lepper, L. (ed.), *Beiträge zur Phytotaxonomie* **15**. – Jena: Universitätsverlag Jena.

- Leonard P. J. 2011: *Aronia mitschurinii*: Solving a horticultural enigma. – Master's theses, paper 183. – University of Connecticut Graduate School. – Published at http://digitalcommons.uconn.edu/gs_theses/183 [accessed 5 Dec 2011].
- Lu L. D. & Brach A. R. 2002: New combinations in Chinese *Cotoneaster* (*Rosaceae*). – *Novon* **12**: 495–496.
- Lu L. D. & Brach A. R. 2003: *Cotoneaster* Medikus. – Pp. 85–108 in: Wu Z. Y., Raven P. H. & Hong D. Y. (ed.), *Flora of China* **9**. – Beijing: Science Press & St Louis: Missouri Botanical Garden.
- 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. (ed.) 2012: International Code of Nomenclature for algae, fungi, and plants (Melbourne Code) adopted by the Eighteenth International Botanical Congress, Melbourne, Australia, July 2011. – Koeltz Scientific Books, Königstein [Regnum Veg. **154**].
- Medikus F. C. 1793: *Geschichte der Botanik unserer Zeiten*. – Mannheim: Schwan und Götz.
- Mezhensky V. 2005: *Chokeberry and Sorbaronia*. – Moscow: AST & Donetsk: Stalker. [In Russian].
- Micevski K. 1999 (“1998”): The flora of the Republic of Macedonia **1(4)**: 778–1114. – Skopje: Macedonian Academy of Sciences and Arts. [In Macedonian].
- Michurin I. V. 1948: *Collected works*, ed. 2, **1–4**. – Moscow: State Publishers of Agricultural Literature. [In Russian].
- Moench C. 1785: *Verzeichniß ausländischer Bäume und Stauden des Lustschlosses Weissenstein bey Cassel*. – Frankfurt & Leipzig: J. G. Fleischerische Buchhandlung.
- Mosyakin S. L. & Fedoronchuk M. M. 1999: *Vascular plants of Ukraine: A nomenclatural checklist*. – Kiev: Kholodny Institute of Botany.
- Palmer E. J. 1937: *Crataegus* L. Hawthorn, Red haw. – Pp. 151–155 in: Dole E. J. (ed.), *The Flora of Vermont*, ed. 3. – Burlington: A Committee of the Vermont Botanical Club.
- Persson-Hovmalm H. A., Jeppsson N., Bartish I. V. & Nybom H. 2004: RAPD analysis of diploid and tetraploid populations of *Aronia* points to different reproductive strategies within the genus. – *Hereditas* **141**: 301–312.
- Phipps J. B. 1983: Biogeographic, taxonomic, and cladistic relationships between East Asiatic and North American *Crataegus*. – *Ann. Missouri Bot. Gard.* **70**: 667–700.
- Phipps J. B. 2012: *Crataegus chrysocarpa* Ashe var. *phoenicea* (ser. *Rotundifoliae*; *Rosaceae*). – *Phytoneuron* **2012–30**: 1–5.
- Phipps J. B. & O'Kennon R. J. 2004: A review of *Crataegus* series *Rotundifoliae* (*Rosaceae*) in Western Canada. – *Sida* **21(1)**: 65–77.
- Pojarkova A. I. 1953: × *Sorbocotoneaster* Pojark. – a new natural intergeneric hybrid. – *Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR* **15**: 92–108. [In Russian].
- Pojarkova A. I. 1961: New species of cotoneasters in the flora of the USSR and China. – *Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR* **21**: 161–205. [In Russian].
- Popov K. P. 1959a: A new species of whitebeams from the Crimea. – *Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR* **19**: 188–196. [In Russian].
- Popov K. P. 1959b: Some results of critical studies in the Crimean rowans and whitebeams. – *Izvestiya Krymskogo Pedagogicheskogo Instituta* **34**: 65–76. [In Russian].
- Prain D. 1909: [Notes on *Cotoneaster moupinensis*, forma *floribunda*.] – *Bot. Mag.* **135(1473)**: ad t. 8284.
- Rehder A. 1940: *Manual of cultivated trees and shrubs hardy in North America: exclusive of the subtropical and warmer temperate regions*, ed. 2. – New York: Macmillan.
- Rehder A. & Wilson E. H. 1912: *Cotoneaster* Med. – Pp. 154–177 in: Sargent C. S. (ed.), *Plantae Wilsonianae* **1(2)**. – Cambridge: Cambridge University Press. [Publications of the Arnold Arboretum, **4**].
- Reshetnikova N. M. & Krylov A. V. 2006: New data on the flora of Kaluga Province. – *Bull. Moscow Soc. Naturalists, ser. biol.* **111(6)**: 68–71. [In Russian].
- Rudenko M. I. 2010: Analysis of the flora of higher vascular plants of the Crimean Nature Reserve. – *Optimization and Protection of Ecosystems* **3**: 3–20. [In Russian].
- Sargent C. S. 1901: New or little known North American trees, **II**. – *Bot. Gaz.* **31(1)**: 1–16.
- Sennikov A. N. 2009: *Cotoneaster*. – In: Greuter W. & Raab-Straube E. von (ed.), *Euro+Med Plantbase – the information resource for Euro-Mediterranean plant diversity*. Published at <http://ww2.bgbm.org/Euro-PlusMed/PTaxonDetail.asp?NameCache=Cotoneaster&PTRefFk=7300000> [accessed 5 Dec 2011].
- Sennikov A. N. 2010: [book review] Fryer, J. and Hylmö, B. *Cotoneasters: a comprehensive guide to shrubs for flowers, fruit, and foliage*. – *Nordic J. Bot.* **28**: 509–512.
- Sennikov A. N. 2011: *Atlas Florae Europaeae* notes 18. Synonymy and distribution of some native and alien species of *Cotoneaster* (*Rosaceae*) in Eastern Europe and the Caucasus. – *Ann. Bot. Fenn.* **48**: 325–336.
- Sennikov A. N. & Somlyay L. 2011: *Atlas Florae Europaeae* notes 17. Typification of *Cotoneaster tomentosus* (*Rosaceae*) and its synonyms. – *Taxon* **60**: 579–584.
- Seregin A. P. 2010: Invasions of plant species to the flora of the Vladimir Region in the last ten years. – *Bot. Zhurn.* **95(9)**: 1254–1268. [In Russian].
- Skvortsov A. K. & Maitulina Yu. K. 1982: On the differences between the domestic chokeberry and its wild

- relatives. – Byull. Glavn. Bot. Sada **126**: 35–40. [In Russian].
- Skvortsov A. K., Maitulina Yu. K. & Gorbunov Yu. N. 1983: On time, place and possible mechanism of origin of the cultivated black-fruited aronia. – Bull. Moscow Soc. Naturalists, ser. biol. **88(3)**: 88–96. [In Russian].
- Stace C. A. 2010: New flora of the British Isles, ed. 3. – Cambridge: Cambridge University Press.
- Stankov S. S. 1927: Two hybridogenous forms from the Crimea. – Izv. Glavn. Bot. Sada **26(5)**: 526–527. [In Russian].
- Stapf O. 1909: *Cotoneaster moupinensis*, forma *floribunda*. – Bot. Mag. **135(1473)**: ad t. 8284.
- Teofilovski A., Mandzukovski D., Simovski B. & Acevski J. 2012: Chorology and habitats of some plants in the Republic of Macedonia. – For. Review **43**: 24–32.
- Tzvelev N. N. 2001: *Crataegus* L. – Pp. 557–586 in: Tzvelev N. N. (ed.), Flora of East Europe **10**. – St Petersburg: World & Family Publishers & St Petersburg State Chemical-Pharmaceutical Academy. [In Russian].
- Yena A. A. 2012: Spontaneous flora of the Crimean Peninsula. – Simferopol: New Orianda. [In Russian].
- Zaikonnikova T. I. 1985: Renaming the Crimean species *Sorbus pseudolatifolia* K. Pop. (*Rosaceae*). – Novosti Sist. Vyssh. Rast. **22**: 136–138. [In Russian].
- Zaikonnikova T. I. 2001: *Sorbus* L. – Pp. 535–543 in: Tzvelev N. N. (ed.), Flora of East Europe **10**. – St Petersburg: World & Family Publishers & St Petersburg State Chemical-Pharmaceutical Academy. [In Russian].
- Zaikonnikova T. I. & Kipiani V. V. 1980: Chromosome counts in some species of *Sorbus* (*Rosaceae*) in the flora of the USSR. – Bot. Žurn. **65(9)**: 1326–1330. [In Russian].
- Zelenetzky N. 1906: Prodrromus florum Tauriae. – Odessa: “Ekonomičeskaja” tipografija. [In Russian].