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×*Sorbaronia fallax* (C.K.Schneid.) C.K.Schneid. nothosubsp. *mitschurinii*
 (A.K.Skvortsov & Maitul.) nothosubsp. *nov.*, with taxonomical notes on *Aronia*
 ×*prunifolia* ‘Floribunda’ *sensu* Cinovskis (Maleae, Amygdaloideae, Rosaceae)

ARTURS STALAZŠ^{1*} & AIGA BĀDERE²

¹Institute of Horticulture, Graudu iela 1, Ceriņi, Krimūnu pagasts, Dobeles novads, LV-3701, Latvia.

✉ arturs.stalazs@llu.lv; <https://orcid.org/0000-0002-3971-6255>

²Ventspils University of Applied Sciences, Inženieru iela 101, Ventspils, LV-3601, Latvia.

✉ aiga.badere@venta.lv; <https://orcid.org/0009-0007-6300-4219>

Abstract

For a while, two species were known—*Aronia mitschurinii* [known also under the names *Aronia melanocarpa* auctt., *Aronia* ×*prunifolia* auctt., and *Aronia* ×*prunifolia* ‘Floribunda’ *sensu* Cinovskis] and ×*Sorbaronia fallax*. Discoveries over the past 20 years led to the inclusion of *A. mitschurinii* in the genus ×*Sorbaronia* as ×*S. mitschurinii* in 2013, still recognizing it as a separate species. Since ×*S. mitschurinii* is a backcross between true *Aronia melanocarpa* and ×*S. fallax*, in 2021, the name ×*S. mitschurinii* was synonymized with ×*S. fallax* to follow the provisions of the *International Code of Nomenclature for algae, fungi, and plants* (Shenzhen Code). Unfortunately, ×*Sorbaronia fallax* s. str. and ×*S. mitschurinii* s. str. are morphologically very different taxa. Furthermore, ×*S. mitschurinii* s. str. is the first artificially created species that has for some time already become invasive in Europe. In order to ensure practical needs in horticulture and nature conservation, where both of these taxa have been separated as two different species for a long time, this paper makes a nomenclatural act to raise ×*S. mitschurinii* from synonyms to nothosubspecies status—×*Sorbaronia fallax* nothosubsp. *mitschurinii* **nothosubsp. nov.** The new taxonomic approach will make it possible to distinguish two morphologically different taxa in the future, henceforth invasive plants will respectively be called ×*Sorbaronia fallax* nothosubsp. *mitschurinii* and those cultivated only in gardens will be called ×*Sorbaronia fallax* nothosubsp. *fallax*. The name *Aronia* ×*prunifolia* ‘Floribunda’ *sensu* Cinovskis used by Latvian authors is nothing more than ×*Sorbaronia fallax* nothosubsp. *mitschurinii*.

Kopsavilkums [abstract in Latvian]

Ilgāku laiku divas sugas bija zināmas—*Aronia mitschurinii* [zināma arī ar nosaukumiem *Aronia melanocarpa* auctt., *Aronia* ×*prunifolia* auctt., un *Aronia* ×*prunifolia* ‘Floribunda’ *sensu* Cinovskis] un ×*Sorbaronia fallax*. Pēdējo 20 gad atklājumi noveda pie *A. mitschurinii* iekļaušanas ģintī ×*Sorbaronia* kā ×*S. mitschurinii* 2013. gadā, tomēr to vēl atpazīstot kā atsevišķu sugu. Ņemot vērā, ka ×*S. mitschurinii* ir bekkross starp īsto *Aronia melanocarpa* un ×*S. fallax*, 2021. gadā nosaukums ×*S. mitschurinii* tika sinonimizēts ar ×*S. fallax*, lai ievērotu *Aļģu, sēņu un augu starptautiskās nomenklatūras kodeksa* (Shenzhen Code) prasības. Diemžēl ×*Sorbaronia fallax* s. str. un ×*S. mitschurinii* s. str. ir morfoloģiski stipri atšķirīgi taksoni. Turklāt, ×*S. mitschurinii* s. str. ir pirmā mākslīgi radītā suga, kas jau kādu laiku Eiropā ir invazīva. Lai nodrošinātu praktiskās vajadzības dārzkopībā un dabas aizsardzībā, kur ilgu laiku abi šie taksoni ir nodalīti kā divas dažādas sugas, šajā rakstā veikts nomenklatūras akts, paceļot nosaukumu ×*S. mitschurinii* no sinonīmiem notopasugas statusā—×*Sorbaronia fallax* nothosubsp. *mitschurinii* **nothosubsp. nov.** Jaunā taksonomiskā pieeja nākotnē dos iespēju nošķirt divus morfoloģiski atšķirīgus taksonus, un turpmāk invazīvie augi attiecīgi tiks saukti kā ×*Sorbaronia fallax* nothosubsp. *mitschurinii* un tikai dārzos kultivētie augi tiks saukti kā ×*Sorbaronia fallax* nothosubsp. *fallax*. Nosaukums *Aronia* ×*prunifolia* ‘Floribunda’ *sensu* Cinovskis, ko lieto Latvijas autori, nav nekas cits kā ×*Sorbaronia fallax* nothosubsp. *mitschurinii*.

Key words: *Aronia melanocarpa*, artificial hybrids, backcross, invasive taxa, taxonomy problems

Introduction

For a long time in Europe, especially in the former USSR countries, the fruit-plant at that time widely known under the name ‘*Aronia melanocarpa*’ was very extensively cultivated. Everyone was convinced that this widely cultivated plant species originated in North America, while many people still believe the same.

As a result of an international expedition in North America in 1976, it was established that the *Aronia melanocarpa* (Michaux 1803: 292) Elliott (1821: 557) found in the wild in North America are not the same plants that were already widely cultivated in the USSR at that time (Skvortsov & Maitulina 1982). In-depth studies of biology and morphology of North American and cultivated plants led to the new scientific name—*Aronia mitschurinii* Skvortsov & Maitulina (1982: 40) being given to cultivated plants in Europe. Already at that time, it was established that there are well-visible morphological differences between the North American *A. melanocarpa* and the European *A. mitschurinii* (Skvortsov & Maitulina 1982; Skvortsov *et al.* 1983). One of the essential characteristics is the size and structure of the fruit (reviewed by Stalažs 2021), which explains why the European *A. mitschurinii* was so widely cultivated. Already in the 1980s, it was assumed that European plants are of hybrid origin, with possible parentage of *A. melanocarpa* × *Sorbaronia fallax* (reviewed by Stalažs 2021).

Modern genetic methods gave the opportunity to confirm that indeed the plants cultivated in Europe are of hybrid origin (Persson Hovmalm *et al.* 2004; Leonard *et al.* 2013; Sennikov & Phipps 2013). Leonard *et al.* (2013) found that *A. mitschurinii* is closer to ×*Sorbaronia* than *Aronia*. Based on the results of molecular studies, Sennikov included *A. mitschurinii* in the genus ×*Sorbaronia* (Sennikov & Phipps 2013).

In recent studies, Shipunov *et al.* (2019) partially question the hybrid origin of *A. mitschurinii*, at the same time pointing out two important aspects: 1) there were not enough specific markers used in their analyses to mark hybridization boundary lines; and 2) *A. mitschurinii* is a ×*Sorbaronia* backcross with *Aronia*, which explains the great similarity of these plants to *Aronia* caused by loss of the genome of *Sorbus aucuparia*. At the same time, Shipunov *et al.* (2019) find that European *A. mitschurinii* is well distinguishable from North American *Aronia* taxa.

The originator of *A. mitschurinii* was Ivan Vladimirovich Michurin [1855–1935], after whom the species was named in 1982 by Skvortsov & Maitulina (1982). It is known that Michurin was a breeder who intentionally crossed plants and experimented with interspecies hybridization (Skvortsov *et al.* 1983). Skvortsov *et al.* (1983) point out that although there is no direct evidence that the plants were created by Michurin, it has been confirmed that large-fruited ‘*Aronia*’ were not known in other parts of Europe until the 1940s. This confirms that the plants originated in Michurin’s orchards in Michurinsk. The first verifiable information about the appearance of this species dates back to 1935 when plant cuttings were obtained from Michurinsk (Skvortsov *et al.* 1983). Then, already in the 1940s, these plants were rapidly distributed throughout the USSR (Skvortsov *et al.* 1983), and the first documented introduction thereof in Latvia dates back to 1950 (Rokjānis 1959, 1961).

All available evidence for the origin of *A. mitschurinii* in the USSR contradicts the recent assumption made by Shipunov *et al.* (2019). There is no doubt, that the species is of hybrid origin, especially because *A. mitschurinii* is very close to ×*Sorbaronia fallax* as for its pomological characteristics. Nevertheless, this only confirms the hypothesis of Shipunov *et al.* (2019) that *A. mitschurinii* is a backcross of ×*S. fallax* with *Aronia*, which corresponds to previous assumptions (reviewed by Stalažs 2021). The hybrid origin of *A. mitschurinii* containing *Aronia* and *Sorbus* genes has been proven in the most recent study, which sheds light on the fact that this is indeed a hybrid between *A. melanocarpa* and *Sorbus aucuparia* Linnaeus (1753: 477) (Brand *et al.* 2022). It is impossible for the species to emerge by itself just from nowhere and still be very close to ×*S. fallax* (Schneider 1906a: 676) Schneider (1906b: 134) in terms of pomological characteristics. This again confirms the hypothesis of Shipunov *et al.* (2019) and others that *A. mitschurinii* is a backcross of ×*S. fallax* with *Aronia*.

All *A. mitschurinii* are apomictic tetraploid plants with chromosome number $2n=68$ (Skvortsov *et al.* 1983), and tetraploidy has also been confirmed in most recent studies (Brand *et al.* 2022). Ploidy reversal and apomixis can be explained by hybridization, but apomixis itself is not uncommon in this group of plants (Skvortsov *et al.* 1983). Cinovskis (1986) reviews that Michurin had only *A. melanocarpa* at his disposal and not the other *Aronia* species to be used in his crosses. This leads to the fact that this species is used as a backcross parent.

Recently, Ukrainian colleagues, reviewing the findings of ×*Sorbaronia mitschurinii* on the territory of Ukraine, emphasized that the use of the name ×*S. mitschurinii* contradicts the provisions of the *International Code of Nomenclature for algae, fungi, and plants* (hereinafter—Shenzhen Code) and that the correct name is ×*S. fallax* (Olshanskyi & Shnyder 2021), as this is a backcross of ×*S. fallax* with *A. melanocarpa*. The use of the name ×*S. fallax* instead of ×*S. mitschurinii* is also supported by Mordovia’s colleagues (Khapugin *et al.* 2023) and the World Checklist of Vascular Plants (WCVP) database (Govaerts *et al.* 2021). Hence, the name ×*S. mitschurinii* is listed as a synonym of ×*S. fallax*.

Sennikov (Sennikov & Phipps 2013) provided a well-reasoned justification of why he considers ×*S. mitschurinii* as a separate species. One of the arguments used was the strong morphological differences between ×*S. mitschurinii* and ×*S. fallax*. For a long time, the morphologically very different plants were distinguished by horticulturists into two species, strictly separating ×*S. fallax* from ×*S. mitschurinii*, the latter being the most often recognized in the literature

under the scientific names such as *A. melanocarpa*, *A. mitschurinii* and since 1989—under the name ‘*A. ×prunifolia* ‘Floribunda’’. Now, when both names (*×S. fallax* and *×S. mitschurinii*) are formally synonymous according to the provisions of the Shenzhen Code, the possibility to practically distinguish the plants that escaped into the wild and became invasive from the plants, which are much less cultivated, is lost. It has already been indicated in the literature that it would be better to call the plants that are invasive in Europe *×S. mitschurinii* (like a microspecies) if it is not against the Shenzhen Code. In order to address the need to separate the two groups of plants, which according to the Shenzhen Code refer to one species but in fact are morphologically different, it was necessary to make a nomenclatural act, by raising the name *×S. mitschurinii* from synonyms to the level of a nothosubspecies, thus ensuring more convenient communication between society and science. This has been done in this paper.

However, recent observations show that some authors (e. g. Evarte-Bundere *et al.* 2022) still use the incorrect name ‘*A. ×prunifolia* ‘Floribunda’’ to denote the invasive *×S. mitschurinii* in Europe. In the recent review (Stalažs 2021), the reason for the tradition of the use of this incorrect name in Latvia was indicated, but apparently a broader review of the nature of the nomenclature is needed, which is included in this paper with the origin and meaning of this name explained below.

Material and methods

The present paper addresses two questions. First, a nomenclatural act was carried out, raising the name *×Sorbaronia mitschurinii* from synonymy to the status of a nothosubspecies of *×Sorbaronia fallax*. The paper explains the necessity thereof and provides synonymous names of the new nothosubspecies, which are used in the literature.

The second question concerns the use and meaning of the name ‘*Aronia ×prunifolia* ‘Floribunda’ *sensu* Cinovskis’. Considering that this name has entered international communication by Latvian authors and its use may lead to misunderstandings, a more extensive analysis of the use of names was necessary. Therefore, the present paper examines the history of the use of names in Latvian special literature, in which the applicability of each name can be very explicit.

Results

By analysing the situation in nature, as well as the earlier traditions of distinguishing two different taxa in real life, this study concluded that there is a relevant basis to change the status for the name *×Sorbaronia mitschurinii*. It was recently synonymized with the name *×Sorbaronia fallax* by Olshanskyi & Shynder (2021). However, there are several biological and practical questions about why *×S. mitschurinii s. str.* should be separated from *×S. fallax*, so that the latter would preserve its former meaning. Since *×S. mitschurinii* is a backcross, this name cannot be used as a separate species according to the provisions of Shenzhen Code, as argued by Olshanskyi & Shynder (2021). Since *×S. fallax s. str.* and *×S. mitschurinii s. str.* highly differs morphologically, Sennikov (Sennikov & Phipps 2013) decided to support *×S. mitschurinii s. str.* as a separate species.

The latter is consistent with the practice of recognizing both taxa as separate species. It has been a decades-long tradition when *×S. fallax s. str.* is considered a separate species from *×S. mitschurinii s. str.* The species *×S. fallax s. str.* is practically an artificially propagated taxon that is distributed in the plant market globally under the names of different cultivars, and it has so far been distinguished by the following main two characteristics: 1) escape of this taxon into the wild has never been recorded (as opposed to the case of *×S. mitschurinii s. str.*); and 2) morphologically this taxon differs from *×S. mitschurinii s. str.* Therefore, *×S. mitschurinii s. str.* is in a different situation—this taxon is not only morphologically different from *×S. fallax s. str.*, but it has also become invasive in several European countries (reviewed by Stalažs 2021) and recently confirmed also in Ukraine (Olshanskyi & Shynder 2021).

Considering that the two taxa, *×S. fallax* and *×S. mitschurinii s. str.*, have enough differences, as well as considering the practical importance of them being considered as two different species for many decades, without violating the requirements of the Shenzhen Code, the decision was made to recognize *×S. mitschurinii s. str.* as a separate taxon (nothosubspecies) within the *×S. fallax s. l.* boundaries.

Taxonomic notes

×*Sorbaronia fallax* (Schneider 1906a: 676) C.K.Schneider (1906b: 134)

Sorbaronia fallax nothosubsp. *fallax*

[=*Aronia melanocarpa* × *Sorbus aucuparia*]

Pyrus ×*fallax* (C.K.Schneid.) Ascherson & Graebner (1906: 109)

Pyrus ×*fallax* (C.K.Schneid.) Fernald (1947: 233), repeated combination

Sorbus ×*fallax* Schneider (1906a: 676)

×*Sorbaronia fallax* nothosubsp. *mitschurinii* (A.K.Skvortsov & Maitul.) A.Stalažs *nothovar. nov.*

[=*Aronia melanocarpa* × ×*Sorbaronia fallax* nothosubsp. *fallax*]

Aronia melanocarpa *auctt.*—see next chapters for details

Aronia mitschurinii Skvortsov & Maitulina (1982: 40)

Aronia mitschurinii—Olshanskyi & Shnyder 2021: 123; Khapugin *et al.* 2023: 203, as synonym of ×*Sorbaronia fallax*

Aronia ×*prunifolia* *auctt.*—see next chapters for details

Aronia ×*prunifolia* ‘Floribunda’ *sensu* Cinovskis—see next chapters for details

Pyrus mitschurinii (A.K.Skvortsov & Maitul.) M.F.Fay & Christenh. in Christenhusz *et al.* (2018: 112)

Pyrus mitschurinii—Olshanskyi & Shnyder 2021: 123, as synonym of ×*Sorbaronia fallax*

×*Sorbaronia mitschurinii* (A.K.Skvortsov & Maitul.) Sennikov in Sennikov & Phipps (2013: 35)

×*Sorbaronia mitschurinii*—Olshanskyi & Shnyder 2021: 123, as synonym of ×*Sorbaronia fallax*

×*Sorbaronia* ‘Mitschurinii’—Gudžinskas *et al.* 2023: 12; Jagodziński *et al.* 2023: 1—contradicts the rules of Cultivated Plant Code, see next chapters for details

Considering that in the case of ×*S. fallax* nothosubsp. *mitschurinii* there have been long-term problems with the use of scientific names since the nothosubspecies was not recognized as a separate taxon but identified as North American *Aronia* species for a long time, the problematic cases of the use of homonymic scientific names are reviewed below.

Use of name ‘*Aronia melanocarpa*’

The name ‘*A. melanocarpa*’ was widely used for ×*S. fallax* nothosubsp. *mitschurinii* in Europe for about 40–50 years until a new taxon, *A. mitschurinii*, in 1982 was described by Skvortsov & Maitulina (1982) to separate plants cultivated in Europe, especially in the former USSR, from the plants found in the wild in North America. However, even after 1982, the name ‘*A. melanocarpa*’ was associated with ×*S. fallax* nothosubsp. *mitschurinii* and was used in parallel with *A. mitschurinii* and other names (Stalažs 2021). Therefore, most publications on the cultivation, physiology, biochemistry, and pests of plants under the name ‘*Aronia melanocarpa*’ in Europe in fact refer to ×*S. fallax* nothosubsp. *mitschurinii*.

Use of name ‘*Aronia* ×*prunifolia*’

In connection with ×*S. fallax* nothosubsp. *mitschurinii*, the name ‘*Aronia* ×*prunifolia*’ began to be used more widely in the beginning of the 21st century. This name was initially used by Latvian authors who based on the viewpoint of Raimonds Cinovskis [1930–1998], but discarded the cultivar epithet ‘Floribunda’, which was the original combination (see also Table 1).

Use of name ‘*Aronia* ×*prunifolia* ‘Floribunda’ *sensu* Cinovskis’

The use of the name ‘*A. ×prunifolia* ‘Floribunda’’, associating it with ×*S. fallax* nothosubsp. *mitschurinii*, was introduced by Cinovskis in 1989 (Table 1). Although this name has already been used in 1989, an explanation of its meaning can only be found in a publication by Cinovskis (1994) five years later (see also Stalažs 2021). To understand how this name entered special literature and later found its way to international circulation in Europe due to plant invasion, two groups of information sources are analysed below.

Tables 1 and 2 thoroughly show the change to the ×*S. fallax* nothosubsp. *mitschurinii* names that have been used in Latvia—initially as ‘*A. melanocarpa*’, later as *A. mitschurinii*, and finally as ‘*A. ×prunifolia* ‘Floribunda’’ or just ‘*A. ×prunifolia*’.

TABLE 1. Scientific names attributed to \times *Sorbaronia fallax* nothosubsp. *mitschurinii* in Latvian floristic and dendrological literature from 1974 to 2022

Time period	Name used	References
1974–1984	' <i>Aronia melanocarpa</i> '	Cinovskis <i>et al.</i> 1974; Lange <i>et al.</i> 1978; Cinovskis 1979, 1983
1985–1988	<i>Aronia mitschurinii</i>	Cinovskis <i>et al.</i> 1985a, 1985b, 1987, 1988a, 1988b, 1988c, 1988d; Bandere & Igaunis 1987; Galeniece 1987; Janitēns 1987; Lepsis 1987; Mednis 1987; Ramats 1987; Šmaukstelis & Igaunis 1987; Zvaigznīte 1987
1989–2022	<i>Aronia mitschurinii</i> ' <i>Aronia prunifolia</i> ' or ' <i>Aronia</i> \times <i>prunifolia</i> ' ' <i>Aronia</i> \times <i>prunifolia</i> 'Floribunda''	Cinovskis <i>et al.</i> 1989a, 1989b, 1989c; Mauriņš & Zvirgzds 2006 Gavrilova & Šulcs 1999; Priede 2008, 2010; Rutkovska <i>et al.</i> 2017 Cinovskis <i>et al.</i> 1989d, 1991; Bice <i>et al.</i> 2003, 2004a, 2004b, 2004c, 2005a, 2005b, 2005c, 2005d, 2006a, 2006b, 2006c, 2007a, 2007b, 2007c, 2007d; Laiviņš <i>et al.</i> 2009

To understand that the particular names used in publications are the same taxon (\times *S. fallax* nothosubsp. *mitschurinii* accordingly) and not in fact different plant species, we looked at the seed exchange catalogues published by the National Botanic Gardens of Latvia, which provide both the scientific name and the original information on plant origin (Table 2). By analysing the historical information in the seed exchange catalogues, as well as in the index cards, we concluded that until Skvortsov & Maitulina (1982) and Skvortsov *et al.* (1983) made their publications, the plants grown in the garden collection were only of Latvian origin, as well as from Uzbekistan. It was only after 1982 when the Botanic Gardens ordered seeds of different *Aronia* species, including *A. melanocarpa*, directly from North America (see Table 2).

The use of the name *A. mitschurinii* instead of '*A. melanocarpa*' for naming \times *S. fallax* nothosubsp. *mitschurinii* coincides with Skvortsov & Maitulina's (1982) publication and was included for the first time in the seed exchange catalogue of 1983, which was printed in 1984 (Bice *et al.* 1984). The name *A. mitschurinii* is also widely used in the special literature authored, co-authored, or edited by Raimonds Cinovskis (see Tables 1 and 2). Something changed around 1989, when Cinovskis, for unknown reasons, decided that the correct name for \times *S. fallax* nothosubsp. *mitschurinii* is '*A.* \times *prunifolia* 'Floribunda''. At the beginning, as can be seen in Tables 1 and 2, two names, *A. mitschurinii* and '*A.* \times *prunifolia* 'Floribunda'', were used in parallel in the same year (most likely, it was related to the time of handing over the manuscripts to a printing house), but later '*A.* \times *prunifolia* 'Floribunda'', that was used by Cinovskis and his colleagues who worked at the National Botanic Gardens of Latvia, dominates.

All information reaffirms that the name '*A.* \times *prunifolia* 'Floribunda' *sensu* Cinovskis' refers to \times *S. fallax* nothosubsp. *mitschurinii*. The only published information that directly states that the name '*A.* \times *prunifolia* 'Floribunda'' has been attributed to *A. mitschurinii* is found in an entry by Cinovskis (1994) in a local encyclopaedia, which is not available to a wider international audience. However, in this publication, Cinovskis does not provide any reasoning to justify his assumption.

All the plant origin information given in the seed exchange catalogues clearly shows that these data did not change, but only the added scientific names did. This information further confirms that plants originated in Latvia and later mentioned under the names of '*A. melanocarpa*', *A. mitschurinii*, and '*A.* \times *prunifolia* 'Floribunda'', clearly refer to \times *S. fallax* nothosubsp. *mitschurinii*. This also coincides with the fact that the plants obtained in the collection of the National Botanic Gardens of Latvia at first came from the research centres in Kalsnava (Jaunkalsnava) and Rāmava, where the \times *S. fallax* nothosubsp. *mitschurinii* was introduced into Latvia, also by conducting various experimental studies (reviewed by Stalažs 2021).

Use of name \times *Sorbaronia* 'Mitschurinii'

The use of combination \times *Sorbaronia* 'Mitschurinii' contradicts roles of the International Code of Nomenclature for Cultivated Plants (Brickell *et al.* 2016), since such cultivar 'Mitschurinii' does not exist. Primarily the plants in the wild and many gardens have propagated by seeds that have descended from the original form, and they are very similar to each other (e.g. Sennikov & Phipps 2013). Since several cultivars have been selected in some countries, respectively: 'Agrostanciya', 'Amit', 'Aron', 'Chernookaya', 'Eastland', 'Karhumäki', 'Nadzeya', 'Nero', 'Venisa', 'Viking' and 'Mulatka' (e.g. Mezhenkyj & Mezhenka 2023), the scientific name, rather than the name of another cultivar, is required for the epithets of these cultivars to be denominated. In order to comply with the provisions of the Cultivated Plant Code, the scientific name that complies with the provisions of the Shenzhen Code must be

used. Therefore, to denominate the listed 11 cultivars, epithets must be used in combination with the name $\times S. fallax$ nothosubsp. *mitschurinii*.

TABLE 2. Plant origin as indicated in seed exchange catalogues issued by the National Botanic Gardens of Latvia (formerly the Botanical Garden of the Latvian SSR Academy of Sciences). Names in single quotation marks refer to $\times Sorbaronia fallax$ nothosubsp. *mitschurinii*; names in double quotation marks refer to unclear applicability, possibly $\times S. fallax$ nothosubsp. *mitschurinii*.

Year	Originally used name	Originally indicated origin of the plants planted in the collection	Reference
1958	' <i>Aronia melanocarpa</i> '	[not indicated]	Zunde 1958
1960	' <i>Aronia melanocarpa</i> '	[not indicated]	Zunde 1960a, 1960b
1962	' <i>Aronia melanocarpa</i> '	Kalsnava [Latvia]	Zunde 1962a, 1962b
1964	' <i>Aronia melanocarpa</i> '	[not indicated], Alūksne [Latvia] & Rāmava [Latvia]	Zaļkalne 1964a, 1964b
1966	' <i>Aronia melanocarpa</i> '	Kalsnava [Latvia]	Cinovskis & Riekstiņa 1966
1967	' <i>Aronia melanocarpa</i> '	Āraiši (Jurģukalns) & Rāmava [Latvia]	Cinovskis & Knape 1967
1968, 1969	' <i>Aronia melanocarpa</i> '	Brenči (Dārznieki) & Rāmava [Latvia]	Avena & Cinovskis 1968, 1969
1970	' <i>Aronia melanocarpa</i> '	Kalsnava & Rāmava [Latvia]	Avena & Cinovskis 1970
1971–1974	' <i>Aronia melanocarpa</i> '	Rāmava [Latvia]	Avena & Cinovskis 1971; Cinovskis & Matisone 1972; Cinovskis & Kalniņa 1973; Cinovskis <i>et al.</i> 1974
1975	' <i>Aronia melanocarpa</i> '	Jaunkalsnava [=Kalsnava], Rāmava & Salaspils [Latvia]	Bice <i>et al.</i> 1975
1976	' <i>Aronia melanocarpa</i> '	Rāmava & Salaspils [Latvia]	Bice <i>et al.</i> 1976
1977, 1978	' <i>Aronia melanocarpa</i> '	Rāmava [Latvia]	Bice <i>et al.</i> 1977, 1978
1979, 1980	' <i>Aronia melanocarpa</i> '	Jaunkalsnava [Latvia]	Bice <i>et al.</i> 1979, 1980
1981, 1982	' <i>Aronia melanocarpa</i> '	Rāmava [Latvia]	Bice <i>et al.</i> 1981, 1982
1983	' <i>Aronia melanocarpa</i> '	Rāmava [Latvia] & Tashkent [Uzbekistan]	Bice <i>et al.</i> 1983
1984–1987	<i>Aronia mitschurinii</i>	Rāmava [Latvia] & Tashkent [Uzbekistan]	Bice <i>et al.</i> 1984, 1985, 1986, 1987
1988	<i>Aronia mitschurinii</i>	Tashkent [Uzbekistan]	Bice <i>et al.</i> 1988
1989	<i>Aronia mitschurinii</i>	Rāmava [Latvia] & Tashkent [Uzbekistan]	Bice <i>et al.</i> 1989
1990	<i>Aronia melanocarpa</i> <i>Aronia mitschurinii</i>	Guelph (1985) [Canada] Rāmava [Latvia] & Tashkent [Uzbekistan]	Bice <i>et al.</i> 1990
1991	<i>Aronia melanocarpa</i> <i>Aronia</i> \times <i>prunifolia</i> ' <i>Aronia</i> \times <i>prunifolia</i> 'Floribunda''	Guelph (1985) & Montreal (1985) [Canada]; Lisle (Morton Arboretum; 1980) [United States] Washington (1981) [United States] Lilaste (on forest edge) & Rāmava [Latvia]	Bice <i>et al.</i> 1991a, 1991b
2002	" <i>Aronia melanocarpa</i> "	Alūksne (<i>in viridario</i>) [Latvia]	Bice <i>et al.</i> 2002
2007	<i>Aronia melanocarpa</i> <i>Aronia</i> \times <i>prunifolia</i>	Chanhassen (2002) [United States] East Lansing (2000) [United States]	Bice <i>et al.</i> 2007e
2008	<i>Aronia</i> \times <i>prunifolia</i>	East Lansing (2000) [United States]	Bice <i>et al.</i> 2008
2014–2016	<i>Aronia melanocarpa</i>	Chanhassen (2002) [United States]	Knape <i>et al.</i> 2014, 2015, 2016
2019	" <i>Aronia prunifolia</i> "	Egham Hill (1987) [United Kingdom]	Anonymous 2019

Discussion

In Europe since the 1940s, the widely cultivated *×S. fallax* nothosubsp. *mitschurinii* plants have been known by the following scientific names: ‘*Aronia melanocarpa*’, *Aronia mitschurinii*, ‘*Aronia ×prunifolia*’, and ‘*Aronia ×prunifolia* ‘Floribunda’ *sensu* Cinovskis’. With the relevant nomenclatural act in 2013, *×S. fallax* nothosubsp. *mitschurinii* were included in the *×Sorbaronia* genus as *×S. mitschurinii* by Sennikov (Sennikov & Phipps 2013). However, this name is not much preferred in horticultural literature. Overall, until nowadays two names are more often used internationally to identify the widely cultivated plants—‘*Aronia melanocarpa*’ and *Aronia mitschurinii*. The names ‘*Aronia ×prunifolia*’ and ‘*Aronia ×prunifolia* ‘Floribunda’ *sensu* Cinovskis’ are more widely used in Latvia, as well as internationally in connection with bioinvasion. For example, the European Network on Invasive Alien Species NOBANIS (<https://www.nobanis.org/species-info/?taxaId=1476>) prefers the name ‘*A. ×prunifolia*’ instead of *×Sorbaronia fallax* or *×S. mitschurinii*. In recent articles, the name ‘*A. ×prunifolia*’ has been used by other European authors, for example, when examining alien species in Norway (Sandercock *et al.* 2023) or in Europe in general (Müller & Sukopp 2016). Given the situation known in Europe, there is no doubt that *×S. fallax* nothosubsp. *mitschurinii* rather than true *A. ×prunifolia* is meant by the name ‘*A. ×prunifolia*’.

It has been a long tradition in Europe to distinguish between the two artificially created taxa. The first taxon is *×S. fallax* nothosubsp. *fallax*, which is generally and globally known just as *×S. fallax* without use-related problems of the scientific name of this taxon in horticultural literature. The second important taxon is *×S. fallax* nothosubsp. *mitschurinii*, which is much more widely cultivated in Europe than *×S. fallax* nothosubsp. *fallax*.

Regarding *×S. fallax* nothosubsp. *mitschurinii*, Olshanskyi & Shynder (2021) write—‘In our opinion, it would be appropriate to use the name *×Sorbaronia mitschurinii* for this nothotaxon, but this would contradict the *International Code of Nomenclature for algae, fungi, and plants*’. With this sentence, the mentioned authors emphasize the problem—the Shenzhen Code formally requires the use of one name—*×S. fallax* accordingly, while the authors would like to have two names. Despite the name changes of the *×S. fallax* nothosubsp. *mitschurinii* that have taken place since 2013, in practical communication each taxon has been considered as two species until now, as evidenced by information found on the internet.

To solve both practical and formal taxonomic problems, nomenclatural changes were made in this paper, separating two morphologically different nothosubspecies within the boundaries of species *×S. fallax s. l.* This nomenclatural act was implemented to ensure that both in horticulture and in nature conservation sectors it would be possible to much more easily differentiate plants that were previously known as two separate species. This is especially true for *×S. fallax* nothosubsp. *mitschurinii*, which is the first artificially created plant genotype known worldwide as the first artificially created invasive species (Stalažs 2021). Furthermore, these plants self-propagate in wild habitats and all their progeny are very similar in appearance provided by apomixis (Sennikov & Phipps 2013). Further spread of *×S. fallax* nothosubsp. *mitschurinii* into the wild habitats is provided by birds.

Regarding the use of the name ‘*Aronia ×prunifolia* ‘Floribunda’ *sensu* Cinovskis’, a very recent publication shows (Evarte-Bundere *et al.* 2022) that this incorrect name has been used for the identification of *×S. fallax* nothosubsp. *mitschurinii* despite most recent scientific publications clarifying the status of *×S. fallax* nothosubsp. *mitschurinii* in Europe (Sennikov & Phipps 2013; Stalažs 2021) or locally in particular countries (e. g. Gudžinskas 2018; Olshanskyi & Shynder 2021; Khapugin *et al.* 2023). We hope that this paper will help to clarify the use of scientific names in relation to the invasive nothosubspecies *×S. fallax* nothosubsp. *mitschurinii* (formerly *A. mitschurinii* and *×S. mitschurinii*).

Conclusion

We hope that the separation of *×S. fallax* nothosubsp. *fallax* and *×S. fallax* nothosubsp. *mitschurinii s. str.* as two different taxa will be a good practical solution to further distinguish between these two morphologically distinct taxa. This is especially important as for *×S. fallax* nothosubsp. *mitschurinii* since these plants are both more widely cultivated in Europe and also invasive in the wild. Regarding the use of names ‘*Aronia melanocarpa*’, ‘*Aronia ×prunifolia*’, and ‘*Aronia ×prunifolia* ‘Floribunda’ for *×S. fallax* nothosubsp. *mitschurinii* in Europe, we invite our European colleagues to verify which plants are they dealing with in their studies. Certainly, in several European countries, it will be necessary to correct the information about the plants, if by mistake *×S. fallax* nothosubsp. *mitschurinii* is named by one of the mentioned names, without actually thinking of the true *Aronia* species that is natural to North America.

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