

Sorbus × *latifolia* s.l. (Rosaceae) in the Balkan Peninsula and SW Asia

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Abstract. New localities of *Sorbus* × *latifolia* changing significantly the picture of its distribution range have been recorded in Bulgaria, Serbia and Turkey and presented on a map. Problems concerning the origin, variability and range of this controversial nothospecies are discussed. Data about its occurrence in SW Asia are published for the first time.

Key words: Bulgaria, hybridization, nothospecies, Serbia, *Sorbus aria* s.l., *Sorbus* × *latifolia*, *Sorbus torminalis*, taxonomy, Turkey, unidirectional introgression

Introduction

Hybridization is a frequent phenomenon among plants, but it is usually very difficult to classify the groups within which the species cross intensively. This relates to the genus *Sorbus* L. in Europe, which is represented on this continent by several sexual species and numerous taxa originating from hybridization. Hybrids between *S. torminalis* (L.) Crantz and *S. aria* sensu lato [incl. *S. umbellata* (Desf.) Fritsch and *S. graeca* (Spach) Schauer] are particularly common and are widespread from the Iberian Peninsula and Great Britain in the west, across France, Switzerland, Austria, Germany, Czech Republic, and Slovakia, to Hungary, Romania and Crimea in the east. Primary hybrids, segregates and backcrosses form a morphologically diversified group of nothomorphs which for a long time has been treated under the oldest binomial *S. latifolia* (Lam.) Pers. (Broad-leaf Whitebeam). Among these hybrids, apomixis appeared to be common (Jankun 1993) and since the second half of the last century more than 80 nothomorphs have been described as distinct species (e.g. Karpati 1960; Düll 1961; Sell 1989;

Kovanda 1996; Bernátová & Májovský 2003; Mikoláš 2004; Meyer & al. 2005; Rich & Houston 2006; Németh 2007; Rich & Proctor 2009; Velebil 2012). Generally, delimitation of these taxa is very difficult or practically impossible, so they are often recognized as *S. latifolia* agg., *S. latifolia* group, or *S. latifolia* sensu lato (Aas & al. 1994; Rudow & Aas 1997; Aldasoro & al. 1998).

The problem of origin and relationship of young European *Sorbus* microspecies is becoming increasingly an object of morphological and molecular studies (Aas & al. 1994; Rudow & Aas 1997; Aldasoro & al. 1998; Nelson-Jones & al. 2002; Chester & al. 2007; Robertson & al. 2010). The obtained results and our observations have prompted the following conclusions: 1. All microspecies recognized within *S. latifolia* group originate from hybridization between *S. aria* s.l. and *S. torminalis*; thus, irrespective of ploidy level, their genotypes contain the same gene set; 2. Morphological and genetic differences between hybrids result from their different chromosome number and different arrangement of the same genes; 3. Hybridogenous taxa differ morphologically from each other solely by quantitative, mostly

overlapping features; 4. All morphotypes form a hybrid swarm typical for polymorphic nothospecies. Taking into consideration the above facts, it is difficult to justify the need of distinguishing microspecies within *S. ×latifolia*. This practice, formerly criticized by Gabrielian (1978), is also at variance with the recommendations of the International Code of Botanical Nomenclature (McNeill & al. 2006: Appendix I, Art. H4).

Our observations are in line with the conclusions of Aas & al. (1994) that there is a continuous variation between hybrids and *S. aria*. All hybridogenous plants are more or less intermediate between *S. aria* and *S. torminalis*, but they are usually more similar to the former species. It is often difficult to insist if we are dealing with a hybrid or with pure *S. aria*, so it could be assumed that there is unidirectional introgression between the above taxa towards *S. aria*. Its great morphological variability seems to result partly from this phenomenon. Hybridization, however, has probably no influence on the *S. torminalis* gene pool; this species is always easy to distinguish from the hybridogenous specimens.

Aim and methods

When revising herbarium material of *Sorbus* in the Bulgarian herbaria, we discovered that *S. ×latifolia* grows in the Balkan Peninsula and in the Asiatic part of Turkey in northern Anatolia, in regions from which it has

not been recorded earlier. The aim of the article is to update the information about the occurrence of *S. ×latifolia*, because the new data change significantly the present distribution map of this taxon. Herbarium material of *Sorbus* has been studied in the herbaria of the Institute of Biodiversity and Ecosystem Research, Sofia (SOM), St. Kliment Ohridski University of Sofia (SO), Agricultural University in Plovdiv (SOA), as well as at the Institute of Dendrology in Kórník (KOR), Institute of Botany in Kraków (KRAM) and in the Herbarium Catalogue presented on-line by the Royal Botanic Garden Edinburgh [<http://elmer.rbge.org.uk/bgbase/vherb/bgbasevherb.php>; accessed 8 January 2013]. Living plants have been observed in the field in Bulgaria.

Results and discussion

Most new localities of *S. ×latifolia* are situated on the territory of Bulgaria (Fig. 1), mainly in the following floristic regions: Balkan Range, Znepole Region, Mt Sredna Gora (Mt Lozenska), and Rhodopi Mts (*Western* and *Central*). The name "*S. latifolia* Pers." was mentioned for the first time in the Bulgarian botanical literature by Stojanoff (1931), who reported that a herbarium specimen was collected by student G. Stamenoff near the village Treklyano in West Bulgaria. However, we were unable to find this herbarium specimen in the Bulgarian herbaria. Subsequently, information about the oc-

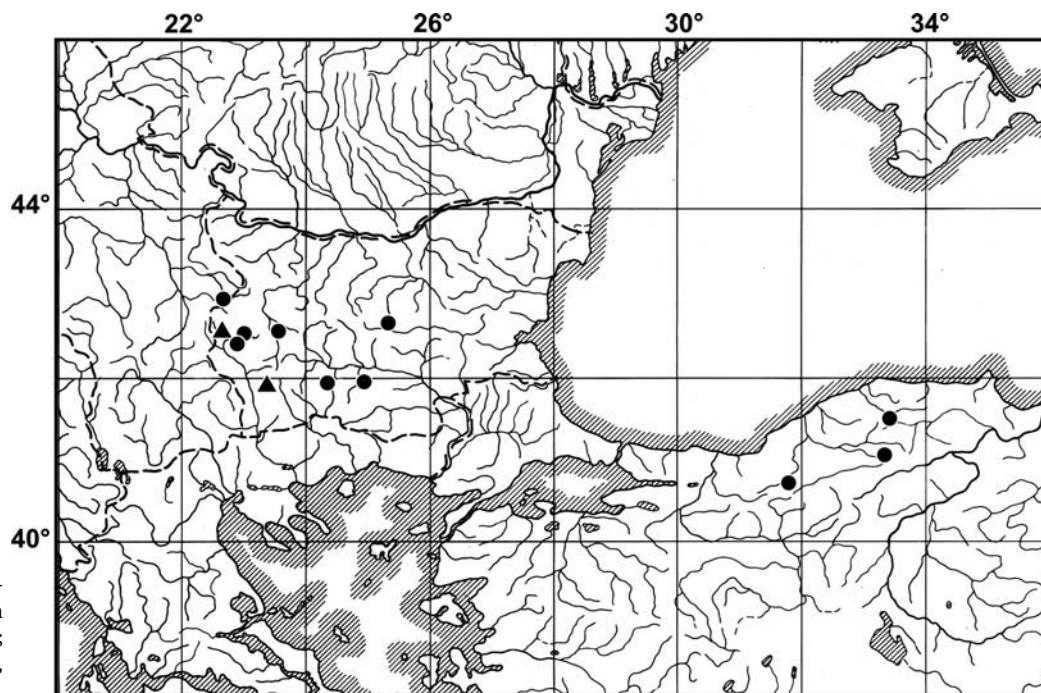


Fig. 1. Distribution of *Sorbus ×latifolia* in the Balkan Peninsula and SW Asia; ● – herbarium specimens, ▲ – data from literature.

currence of hybrids between *S. aria* and *S. torminalis* in this country was published by Vălev (1973) in *Flora of R Bulgaria* (Znepole Region and Byala Reka in the Pirin Mts), although the latter record was not documented by a herbarium specimen.

In summer of 2012, we visited two of the Bulgarian localities of *S. ×latifolia*: the one around St. Petka Monastery near Asenovgrad and another one on peak Polovrak in Mt Lozenska, SE of Sofia. In the former locality, the Broad-leaf Whitebeam was gathered in 1978 by Popova (SOA 35212, 35213) and Dimitrov (SOA 42624, 42625, 428630). Unfortunately, we did not find it there. The slopes around St. Petka Monastery are presently covered by a dense mixed young forest and favourable places for light-demanding plants are scarce. Along the road towards the summit we have observed only saplings and young sterile specimens of *S. aria* s.l. and *S. torminalis*.

The locality of *S. ×latifolia* on Polovrak was discovered by Vihodcevsky in 1973 (KOR 19855; SO 72246). The plants collected there were determined by Gabrielian as “*Sorbus badensis* Düll (*S. aria* × *S. graeca*)”, a nothomorph known only from Germany, now included in the *S. latifolia* group (Meyer & al. 2005). Our visit to Polovrak was successful. We have found there a dozen or so shrubby individuals of *S. ×latifolia* in the summit area on the steep, rocky south-facing slope (Fig. 2). The woody taxa in the immediate vicinity include *Acer campestre* L., *Corylus avellana* L., *Cotoneaster niger* (Fries) Fries, *C. tomentosus* (Aiton) Lindl., *Crataegus rhipidophylla* Gand., *Cytisus hirsutus* L., *Euonymus verrucosus* Scop., *Fagus sylvatica* L., *Fraxinus ornus* L., *Juniperus communis* L., *Prunus cerasifera* Ehrh., *Prunus*



Fig. 2. *Sorbus ×latifolia* on peak Polovrak in Mt Lozenska, W Bulgaria. Inset: unripe fruit (photo V. Vladimirov).

spinosa L. subsp. *dasyphylla* (Schur) Domin, *Quercus petraea* (Matt.) Liebl., *Rosa canina* L., and *Sorbus graeca*. From the notes on the herbarium labels it appears that in other places the hybrids grow in similar habitats: on sunny slopes, in deforested pastured summit areas of low mountains, along forest margins, in larger clearings, along forest roads etc., and probably they do not occur above 1300–1400 m a.s.l. It can be inferred that the present distribution range of *S. ×latifolia* in Bulgaria comprises the following floristic regions (Fig. 1): Balkan Range (*Central*) (Fig. 3), Znepole Region, Pirin Mts (*Northern* – only literature data; needs confirmation), Mt Sredna Gora (*Western*) (Fig. 4) and Rhodopi Mts (*Western, Central*).

In the Balkan Peninsula *S. ×latifolia* was found already in 1901, near Drzina village, now in Serbia (Tošev 106, SOM 36533), but the herbarium specimen collected there was determined by Tošev as *S. aria*. Subsequently, B. Achtarov identified the plant correctly as “*S. aria* × *S. torminalis*” but this fact, as far as it is known, has not been mentioned in botanical literature.

In *Flora Europaea* (Warburg & Karpati 1968), *S. ×latifolia* is given as endemic to Europe, but in 1980 it was mentioned by Maire (1980) from Morocco in NW Africa (O. Ghar-Rouban). In our opinion, the two specimens kept in KOR (nr 19958, Fig. 5), collected in 1962 by Coode and Yaltirik near Kastamonu in N Turkey, belong also to this taxon. These plants, received as duplicates from the Royal Botanic Garden Edinburgh (E), have been determined as “*S. aff. kusnetzovii* Z.”. The herbarium sheets from E are cited by Gabrielian (1972) in the *Flora of Turkey* among the atypical specimens of *S. kusnetzovii* Zinserl.: “A specimen from A4 Kastamonu (35 km from Daday to Azdavay, D. 38662!), which differs in its ovate, markedly acuminate leaves but otherwise resembles this species, probably belongs here”. Two other specimens determined as *S. kusnetzovii* undoubtedly belong to *S. ×latifolia*; their images are presented in the Herbarium Catalogue of the Royal Botanic Garden Edinburgh. They have also been collected in NE Anatolia (Davis & Coode, D. 37716; Dönmez 9927), not far from the locality mentioned above (Fig. 1).

The Turkish localities of *S. ×latifolia* are the only ones situated outside of the range of *S. aria* sensu stricto. They may have originated either through long-distance transport of diaspores, or as a result of “local hybridization” between *S. torminalis* and either *S. umbellata*, or *S. graeca*, both related to and often treated as conspecific with *S. aria*. All Turkish specimens represent morpho-



Fig. 3. *Sorbus ×latifolia*: herbarium specimen collected in C Bulgaria (KOR 19844) (photo W. Danielewicz).



Fig. 4. *Sorbus x latifolia*: herbarium specimen collected in W Bulgaria (KOR 18922) (photo W. Danielewicz).



Fig. 5. Mature fruits of *Sorbus ×latifolia*; numerous lenticels are visible (from KOR 18922) (photo W. Danielewicz).

types differing markedly from each other, but the plant from Susuz village (Dönmez 9927, E) is particularly interesting because of its unusually broad leaves.

Sorbus ×latifolia is a tall shrub or low tree. Its twigs are tomentose when young, often becoming glabrous at maturity. Winter buds are ovoid to fusiform, bud scales are tomentose at first, glabrescent or hairy on the margin. Leaves are variable in shape, broadly ovoid to obovate, rounded to broadly cuneate and entire at base, acute at apex, with shallow, sharply serrate, acute or subacuminate lobes in the lower half, diminishing gradually toward the apex; dark-green, glistening, glabrous or very sparsely tomentose on the adaxial side; grayish-green and loosely arachnoid-tomentose on the abaxial surface; inflorescence is loosely arachnoid-tomentose, usually glabrescent; young hypanthia are densely arachnoid-tomentose; styles are free or united at base; fruits are few, partly not well developed, slightly tomentose when young, glabrous when mature, variable in colour: red, red-brown, orange-red, brown-red, usually with more or less numerous small lenticels (Figs. 2, 6).

The hybrid, as a whole, is morphologically very polymorphic, but usually easily recognized when the main distinctive features of the parent species are well known. *Sorbus torminalis* has leaves with few, usually more or less deep lobes that are glabrous and glistening above, glabrous to densely pilose beneath (never arachnoid-tomentose), styles are connate at base, mature fruits are brown, covered with numerous small lenticels. Differences between hybrids and *S. aria* are less obvious, but the leaves of the latter species are evenly serrate to shallowly lobed in the

upper half, usually densely gray-white- or white-arachnoid-tomentose beneath, styles are free, mature fruits are always red and have few lenticels. *Sorbus kusnetzovii*, which is occasionally difficult to distinguish from *S. ×latifolia*, has always obovate, ±hairy leaves, not glistening on the adaxial side, and broader obtuse serrate lobes.

Examined herbarium specimens:

Bulgaria: Balkan Range (Central) – Stara Planina, Shipka Pass, Orlovo Gnezdo loc., calcareous rocks, 10.06.1962, coll. K. Browicz (KOR 19844), sub *Sorbus aria*; Central Stara Planina, peak Stoletov, Orlovo Gnezdo loc., 1300 m, coll. N. Vihodcevsky (SO 72254), sub *Sorbus aria* f. *incisa*; **Znepole Region** – Mt Golo Bardo, northern slope of peak Ostritsa, summit area, on a grassy, stony slope, limestone, 26.07.1965, coll. N. Vihodcevsky (SO 35911), sub *Sorbus aria*, rev. S. Vălev as *S. austriaca*; Kolosh Planina, 09.06.1976, coll. J. Koeva (SO 86793), sub *Sorbus* sp.; **Mt Sredna Gora (Western)** – Mt Lozenska, on the slope above Dolni Lozen village, 29.07.1948, coll. A. Janev (SO 35912), sub *Sorbus aria*; Mt Lozenska, *inter frutices in declivibus supra pag.* Gorni Lozen *ad cca.* 900 m.s.m., *solo calcareo*, 09.09.1973, coll. N. Vihodcevsky (KOR 18922; SO 72245), sub “Aff. *Sorbus graeca* Spach var. *taurica* (Zinserl.) Gabr.”, det. E. Gabrielian; Mt Lozenska, *inter frutices orientalem ab cac.* Polovrak *ad cca.* 1100 m.s.m., *solo calcareo*, 16.09.1973, coll. N. Vihodcevsky (KOR 19855; SO 72246), sub “Aff. *Sorbus badensis* Düll (*S. aria* × *S. graeca*)”, det. E. Gabrielian; Mt Lozenska, peak Polovrak above Lozenski Monastery, in thickets on a steep calcareous slope, 13.07.2012, coll. V. Vladimirov & J. Zieliński (KOR 48801; SOM 168711, 169143); Mt Lozenska Planina, peak Lalina Mogila, 1100 m, 09.09.1973, coll. N. Vihodcevsky (SO 72254, 72255), sub *Sorbus aria* f. *incisa*; **Rhodopi Mts (Western)** – Outskirts of Ravnogor village, Garvanova Skala loc., in a forest, 17.05.1971, coll. S. Dimitrov (SOA 23502), sub *Sorbus mougeotii*; **Rhodopi Mts (Central)** – Asenovgrad Distr., along the road to St. Petka, 21.05.1978, coll. M. Popova (SOA 35212, 35213), sub *Sorbus aria*; *ibidem*, 28.05.1978, coll. S. Dimitrov (SOA 42624, 42625, 42630), sub *Sorbus aria*; along the trail from Bachkovski Monastery to Chervenata Stena, 07.08.1965, coll. N. Vihodcevsky, sub *Sorbus aria* (SO 35917); NE slope of Mt Bezovo near Bachkovo, in dry meadows, 11.08.1961, coll. A. Jasiewicz (KRAM 412590), sub *S. aria*.

Serbia: Near Drzina village, along the trail to the border post in the oak forest, 19.05.1901, coll. A. Tošev 106 (SOM 36533), sub *Sorbus aria*, rev. B. Achtarov as *Sorbus aria* × *S. torminalis*.

Turkey: Prov. Kastamonu, Daday to Azdavay, 35 km from Daday, on the banks in Abietum, 1000 m, 30.07.1962, coll. Coode & Yaltirik in: Davis 38662 (KOR 19958; E: barcode E00408672), sub *Sorbus* aff.

kusnetzovii Z.; Prov. Bolu, above Yedi Göl (above Devrek), in a *Fagus-Carpinus* forest, small tree 3–4 m, 900 m a.s.l., 18.07.1962, coll. Davis & Coode in: Davis 37716, sub aff. *Sorbus kusnetzovii* Zinserl. (E: barcode E00408665); A4 Kastamonu: between Araç district and the border of Çankırı province, near Susuz village, 1300 m, 05.06.2001, coll. Dönmez 9927, sub *Sorbus kusnetzovii* Zinserl. (E: barcode E00220307).

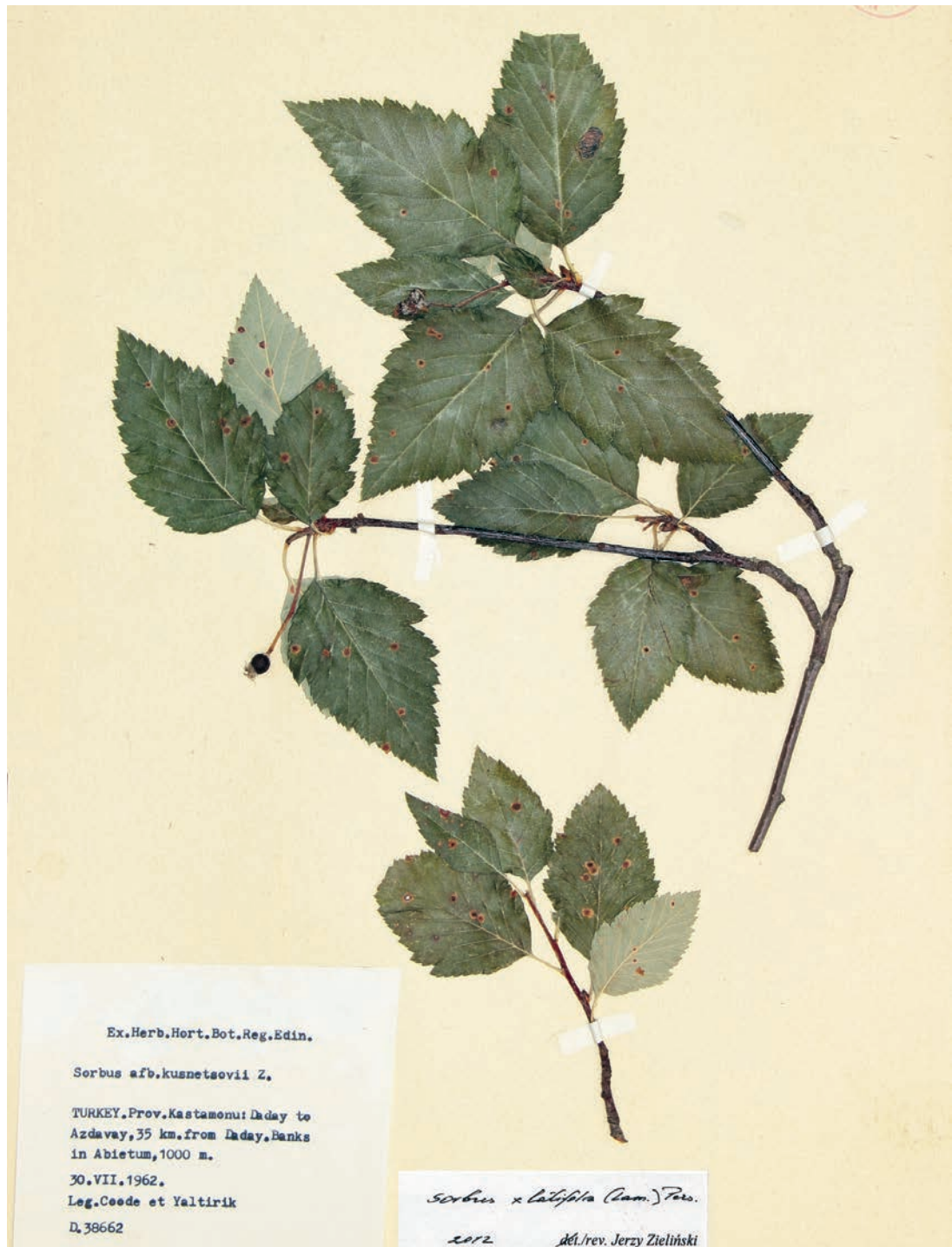


Fig. 6. *Sorbus* × *latifolia*: herbarium specimens collected in NE Anatolia (KOR 19958) (photo W. Danielewicz).

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