

Exclusion of *Saxifraga taygetea* Boiss. & Heldr. (Saxifragaceae) and *Vinca major* L. subsp. *balcanica* (Pénzes) Kozuharov & A.V.Petrova (Apocynaceae) from the vascular flora of Italy

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Abstract. In this paper, which is based on literature surveys, revision of historical herbarium specimens, fieldwork, and morphometric analyses, the exclusion of *Saxifraga taygetea* Boiss. & Heldr. and *Vinca major* L. subsp. *balcanica* (Pénzes) Kozuharov & A.V.Petrova from Italy are proposed. This allows to update both the Italian vascular flora and the global distribution for both taxa, which must be considered endemic to the Balkans. This research also underscores the importance of herbaria to gain a deeper understanding of plant biodiversity worldwide.

Key words. Endemic taxon, field research, floristic updates, herbaria revisions, literature surveys, vascular plants

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Introduction

Within Mediterranean Basin biodiversity hotspot (Myers et al. 2000), after Turkey (Uludağ et al. 2017), Italy is the country with the greatest native floristic diversity (Stinca et al. 2021; Bartolucci et al. 2023). Italy's primacy is due first of all to its environmental heterogeneity (e.g. it shows a wide altitudinal range of about 4,810 m and the coexistence of three biogeographical regions, namely Alpine, Continental, and Mediterranean; EEA 2025). Furthermore, the work carried out by botanists (particularly expert in floristics and plant taxonomy) since the 15th century has also contributed to increasing the level of floristic knowledge. In fact, in Italy there is a long tradition of floristic studies (Stinca et al. 2021), which has led over time to the publication of many national floras which are still essential references for all botany scholars. In the last decades many new plant taxa, both native and exotic, have been reported for the first time (e.g. Wagensommer et al. 2014a; Stinca et al. 2016) or described as new for Italy (e.g. Perrino et al. 2018; Conti et al. 2023). This has allowed a great improvement in floristic knowledge, both at national and local level, and the recent publication of a new flora of Italy (i.e. that is, a complete work that includes identification keys of families, genera and species, as well as detailed descriptions of the species report for Italy in the wild as native and exotic; Pignatti et al. 2017a, 2017b, 2018, 2019). The progress of knowledge has also allowed publication of the new checklists of the vascular flora native and exotic (Bartolucci et al. 2024; Galasso et al. 2024). As for the native flora, the latest inventory includes 8,241 species and subspecies belonging to 1,111 genera and 153 families. Also noteworthy is the endemic component of the Italian flora, which is composed of 1,702 taxa, which is more than 20% of the total flora. Also important is the occurrence of many species that extend their geographic distribution just beyond national borders (e.g. endemic to the Alps and amphi-Adriatic). Furthermore, the Italian territory hosts the *loci classici* of 2,631 endemic and non-endemic vascular plants (Peruzzi et al. 2019) and, of these, the type localities of endemics are mostly present within the Mediterranean biogeographic region (Brundu et al. 2017). Despite the studies carried out by researchers even in very recent times (Domina et al. 2025), the occurrence of some species in Italy is very doubtful and worthy of further investigation.

To improve the knowledge of the Italian vascular flora and partially fill the gaps in his knowledge, in this paper I highlight the lack of evidence demonstrating the occurrence in Italy, even in the past,



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of *Saxifraga taygetea* Boiss. & Heldr. (Saxifragaceae) and *Vinca major* L. subsp. *balcanica* (Pénzes) Kozuharov & A.V.Petrova (Apocynaceae).

Methods

The study is based on literature surveys, herbaria revisions, fieldwork, and morphometric analyses for both taxa. The analyzed literature concerns both the original bibliographic sources (i.e. Cavara and Grande 1913 for *S. taygetea* and Trinajstić 1991 for *V. major* subsp. *balcanica*) and the subsequent relevant bibliographic sources (for details see Results and Discussion below). The herbaria I have selected for tracing and/or review of specimens are Herbarium Neapolitanum (NAP), Herbarium Göttingen (GOET), and Herbarium of Naturalis Biodiversity Center of Leiden (WAG) for *S. taygetea*, while for *V. major* subsp. *balcanica* I investigated the collections of the Herbarium Croaticum (ZA), Herbarium of the Croatian Natural History Museum (CNHM), and Herbarium Ivo and Marija Horvat (ZAHO) (acronyms according to Thiers 2025). I also analyzed the high-resolution digital photographs of other herbarium specimens preserved in many European institutional herbaria (B, BR, CAT, COI, GOET, K, L, MO, P, PI, TCD, WAG), most of which are available on the Global Biodiversity Information Facility (GBIF Secretariat 2025a). These herbarium vouchers are listed in the “Further herbarium specimens examined” paragraphs (since the historical samples lack geographical coordinates, these have been added, derived from modern sources and enclosed in square brackets). The fieldwork was conducted from 2000 to 2025 in Italy, especially in several localities within central and southern Italian administrative regions (about 88,000 km²), namely Molise (i.e. Mount Campo, Prato Gentile, Matese Mountains), Campania (i.e. Matese Mountains, Roccamonfina Volcano, Trebulani Mountains, Tifatini Mountains, Campi Flegrei, Mount Vesuvio, Lattari Mountains, Picentini Mountains, Partenio Mountains, Irpinia, Taburno-Camposauro massif, Mount Vesole, Mount Alburno, Mount Motola, Mount Cervati, Maddalena Mountains, Vallo di Diano, Volturno Plain, Sarno Plain, Sele Plain, Cilento Coast, Ischia Island, Procida Island, Vivara Island, Capri Island), Basilicata (i.e. Mount Santa Croce, Maddalena Mountains, Sirino-Papa massif, Mount Alpi, Pollino massif), Puglia (i.e. Daunia Mountains, Murge, Gargano massif), Calabria (i.e. Pollino massif, Sila massif, Serre, Dino Island, Cirella Island), and Sicilia (i.e. Lipari Island, Panarea Island, Sicani Mountains, Nebrodi Mountains, Mount Etna, Marettimo Island, Levanzo Island, Mount San Giuliano, Mount Cofano, Capo Peloro, Pantelleria Island). This allowed me to verify both the presence of the aforementioned taxa and to collect new herbarium specimens currently preserved in the Herbarium Austroitalicum of the University of Campania Luigi Vantitelli (IT). To evaluate the morphological differences between the specimens collected in Italy (previously identified as *S. taygetea* [4 specimens] and *V. major* subsp. *balcanica* [4 specimens]) and related species, morphometric analyses on a total of 74 selected herbarium samples have been performed (including 20 specimens

Table 1. List of selected herbarium samples on which morphometric analyses have been performed.

Herbarium sample	Taxon	No. of specimens measured	Origin	Herbarium sample	Taxon	No. of specimens measured	Origin
NAP 5757	<i>S. cfr. taygetea</i>	4	Italy	PI-GUAD 17056	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	1	Italy
BR 35675815	<i>S. taygetea</i>	1	Balkans	PI-GUAD 17057	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	1	Italy
BR 35675839	<i>S. taygetea</i>	1	Balkans	PI-GUAD 17059	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	1	Italy
GOET 11170	<i>S. taygetea</i>	2	Balkans	PI-GUAD 17063	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	1	Italy
K 4461421	<i>S. taygetea</i>	2	Balkans	PI-GUAD 17064	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	1	Italy
K 4461422	<i>S. taygetea</i>	1	Balkans	PI-GUAD 17065	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	1	Italy
K 4461423	<i>S. taygetea</i>	2	Balkans	PI-GUAD 17069	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	2	Italy
K 4461424	<i>S. taygetea</i>	1	Balkans	CNHM 80448	<i>V. m. cfr. subsp. balcanica</i>	4	Italy
K 4461428	<i>S. taygetea</i>	1	Balkans	MO 5159373	<i>V. m. subsp. balcanica</i>	4	Balkans
K 4461429	<i>S. taygetea</i>	4	Balkans	IT 4740	<i>V. m. subsp. major</i>	1	Italy
K 4461431	<i>S. taygetea</i>	2	Balkans	IT 4741	<i>V. m. subsp. major</i>	1	Italy
K 4461436	<i>S. taygetea</i>	1	Balkans	IT 7295	<i>V. m. subsp. major</i>	1	Italy
PI 17075	<i>S. taygetea</i>	2	Balkans	IT 9296	<i>V. m. subsp. major</i>	1	Italy
IT 4876	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	2	Italy	IT 9297	<i>V. m. subsp. major</i>	1	Italy
IT 9317	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	1	Italy	IT 9298	<i>V. m. subsp. major</i>	1	Italy
IT 9318	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	1	Italy	IT 9308	<i>V. m. subsp. major</i>	2	Italy
IT 9321	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	1	Italy	IT 9309	<i>V. m. subsp. major</i>	1	Italy
IT 9322	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	1	Italy	IT 9310	<i>V. m. subsp. major</i>	1	Italy
IT 9350	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	2	Italy	IT 9338	<i>V. m. subsp. major</i>	3	Italy
IT 9351	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	2	Italy	IT 9340	<i>V. m. subsp. major</i>	2	Italy
IT 9375	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	1	Italy	IT 9341	<i>V. m. subsp. major</i>	3	Italy
IT 9376	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	1	Italy	IT 9342	<i>V. m. subsp. major</i>	2	Italy

of *S. taygetea* from Balkans, 20 specimens of *S. rotundifolia* L. subsp. *rotundifolia* from southern Italy, 4 specimens of *V. major* subsp. *balcanica* from Balkans, and 20 specimens of *V. major* subsp. *major* from southern Italy) (Table 1). For this purpose, 17 quantitative characters (i.e. 8 for *Saxifraga* group and 9 for *Vinca* group) considered by several authors (Boissier 1849; Pénzes 1962; Stearn 1972; Webb 1987; Tutin et al. 1993; Koyuncu 2012; Csiky and Purger 2013; Koyuncu et al. 2015; Pils 2016; Pignatti et al. 2018; Zhang et al. 2021, 2024) to be of good taxonomic value in the groups studied were selected (Tables 2, 3). The variability of all selected characters was described by standard statistical parameters (mean and standard deviation) and expressed by box plots. As the morphometric dataset included many traits with deviations from normality (assessed with the Shapiro–Wilk test), the non-parametric statistical Kruskal–Wallis test followed by Dunn’s post hoc test with Bonferroni correction ($p < 0.05$) were used for evaluated the morphological differences between analyzed specimens for each quantitative character. All statistical analyses were performed using XLSTAT v. 2025.2.0 (Lumivero 2025).

Results

***Saxifraga taygetea* Boiss. & Heldr.**, in P.E.Boissier, Diagn. Pl. Orient. 10: 19 (1849)

Materials examined. ITALY — **BASILICATA** • Lucania, Monte Papa alla Scala dei Monaci; [40.1315°N, 15.8331°E]; about 1830 m a.s.l.; 19.VIII.1908; F. Cavara and L. Grande leg.; sub *Saxifraga rotundifolia* L. var. *taygetea* (Boiss. et Heldr.); NAP 5757 (Figure 1).

Identification. Following to pertinent literature (Boissier 1849; Webb 1987; Tutin et al. 1993; Pils 2016), *S. taygetea* is distinguished from *S. rotundifolia* subsp. *rotundifolia* by having a maximum height of 20 cm (vs. up to 50 cm), and the largest basal leaves up to 2.5 cm wide (vs. at least 2.5 cm), with 5–11 crenations or teeth (vs. at least 15). Morphometric analysis of the herbarium specimens I selected confirmed the validity of these morphological characters (Table 2, Figure 2A, C, E; Dunn’s post hoc test: $p < 0.01$). According to my data, the individuals collected by Cavara and Grande on Monte Papa (Italy) (NAP 5757) cannot be identified as *S. taygetea* as they do not have the above-mentioned characteristics. Indeed, these samples showed clear morphological differences with the Balkan samples of *S. taygetea* (i.e. width, length, and number of dentations or crenations of basal leaves, Figure 2C–E), while no significant statistical difference was observed with the *S. rotundifolia* subsp. *rotundifolia* samples collected in Italy for almost all selected characters. In fact, small differences only concerned the plant height, number of flowers for each inflorescence, and inflorescence length (Table 2, Figure 2A, G, H). For these three characters, the high standard deviation values for both taxa (Table 2) suggest the need to collect many samples to attempt their taxonomic identification.

A detailed description of the samples collected by Cavara and Grande on Monte Papa (NAP 5757) is provided below. Perennial, rhizomatous, hairy plant, with erect stem, up to 22.3 cm tall. Simple and alternate leaves, mostly gathered at the base of the stem with remains of dry leaves; the basal leaves are petiolate (up to 5.5 cm), reniform (up to 3.2 cm wide and 2.7 cm long) with a crenate-dentate margin and a whitish edge; the cauline leaves are progressively smaller with a dentate margin; the upper leaves are sessile and 3-lobed. Flowers are 5–10, arranged in panicle (2.0–6.7 cm long) at the apex of the stem; petals missing; stamens 5, 5–6 mm long. Capsule 5–6 mm long, with 2 divergent styles each 1.0–1.5 mm long.

Table 2. Comparison of morphological characters between *Saxifraga* cfr. *taygetea* from Italy and related taxa (i.e. *S. taygetea* Boiss. & Heldr., and *S. rotundifolia* L. subsp. *rotundifolia*). Data are reported as mean $\pm$ standard deviation. Asterisks after the p -value indicate significant differences between data sets (Kruskal–Wallis test, * $p < 0.05$, ** $p < 0.01$).

Characters	<i>S. cfr. taygetea</i> from Italy	<i>S. taygetea</i>	<i>S. rotundifolia</i> subsp. <i>rotundifolia</i>	Kruskal–Wallis test
Plant height (cm)	15.0 $\pm$ 5.0	16.4 $\pm$ 5.1	31.2 $\pm$ 11.3	$p < 0.0001^{**}$
Petiole length in basal leaf (cm)	4.1 $\pm$ 1.1	4.5 $\pm$ 2.3	5.9 $\pm$ 2.2	$p = 0.074$
Basal leaf width (cm)	2.9 $\pm$ 0.3	1.6 $\pm$ 0.5	4.1 $\pm$ 1.7	$p < 0.0001^{**}$
Basal leaf length (cm)	2.4 $\pm$ 0.2	1.3 $\pm$ 0.4	3.5 $\pm$ 1.4	$p < 0.0001^{**}$
Number of dentations or crenations in basal leaf (n.)	12.0 $\pm$ 1.4	8.2 $\pm$ 1.9	16.2 $\pm$ 15.0	$p < 0.0001^{**}$
Number of stem leaves (excluding the flower bracts; n.)	2.5 $\pm$ 1.7	1.5 $\pm$ 1.1	2.4 $\pm$ 1.0	$p < 0.048^{*}$
Number of flowers for each inflorescence (n.)	7.3 $\pm$ 2.1	6.7 $\pm$ 3.8	30.9 $\pm$ 20.1	$p < 0.0001^{**}$
Inflorescence length (cm)	4.4 $\pm$ 1.9	5.5 $\pm$ 3.2	13.8 $\pm$ 7.6	$p = 0.001^{**}$



Figure 1. Exsiccatum collected on Monte Papa (Italy) and identified as *Saxifraga taygetea* Boiss. & Heldr. by Cavara and Grande preserved in NAP (n. 5757). Photo by courtesy of the Herbarium Neapolitanum.

Further herbarium specimens examined

Saxifraga taygetea. ALBANIA — **GJIRKASTËR** • Badelania, Nimercka, Pumati; 22.VII.1894; A. Baldacci leg.; cliffs; K 4461429 ([GBIF occurrence 5152207757](#)) • Bresau, Bsumerka; 24.VII.1895; A. Baldacci leg.; among the wet rocks; sub *Saxifraga rotundif.* L. v. *taygetea* Boiss.; K 4461428 ([GBIF occurrence 5152215768](#)) • Nemercka Range, above Aiovishde; alt. 5800 ft a.s.l.; 22.VI.1933; A.H.G. Alston and N.Y. Sandwith leg.; limestone rocks in upper slopes; K 4461431 ([GBIF occurrence 5152188786](#)) • Nemercka; alt. 2000 m a.s.l.; 07.VII.1937; R.V. Pennington leg.; K 4461423 ([GBIF occurrence 5152170774](#)) • Summit of Nemercka range; alt. 6000 feet a.s.l.; 07.VII.1937; R.V. Pennington leg.; K 4461422 ([GBIF occurrence 5152172779](#)).

GREECE — **CENTRAL GREECE** • Mount Parnassus, Alpin region; [38.5355°N, 22.6216°E]; VIII.1832; T.H.H. von Heldreich leg.; WAG 4799 (isotype!) ([GBIF occurrence 2517675982](#)) • Mount Parnassus, Alpin region; [38.5355°N, 22.6216°E]; 18.VIII.1856; T.H.H. von Heldreich leg.; shady cliff; L 1880047 ([GBIF occurrence 2514160281](#)) • Mount Parnassus, Alpin region; [38.5355°N, 22.6216°E];

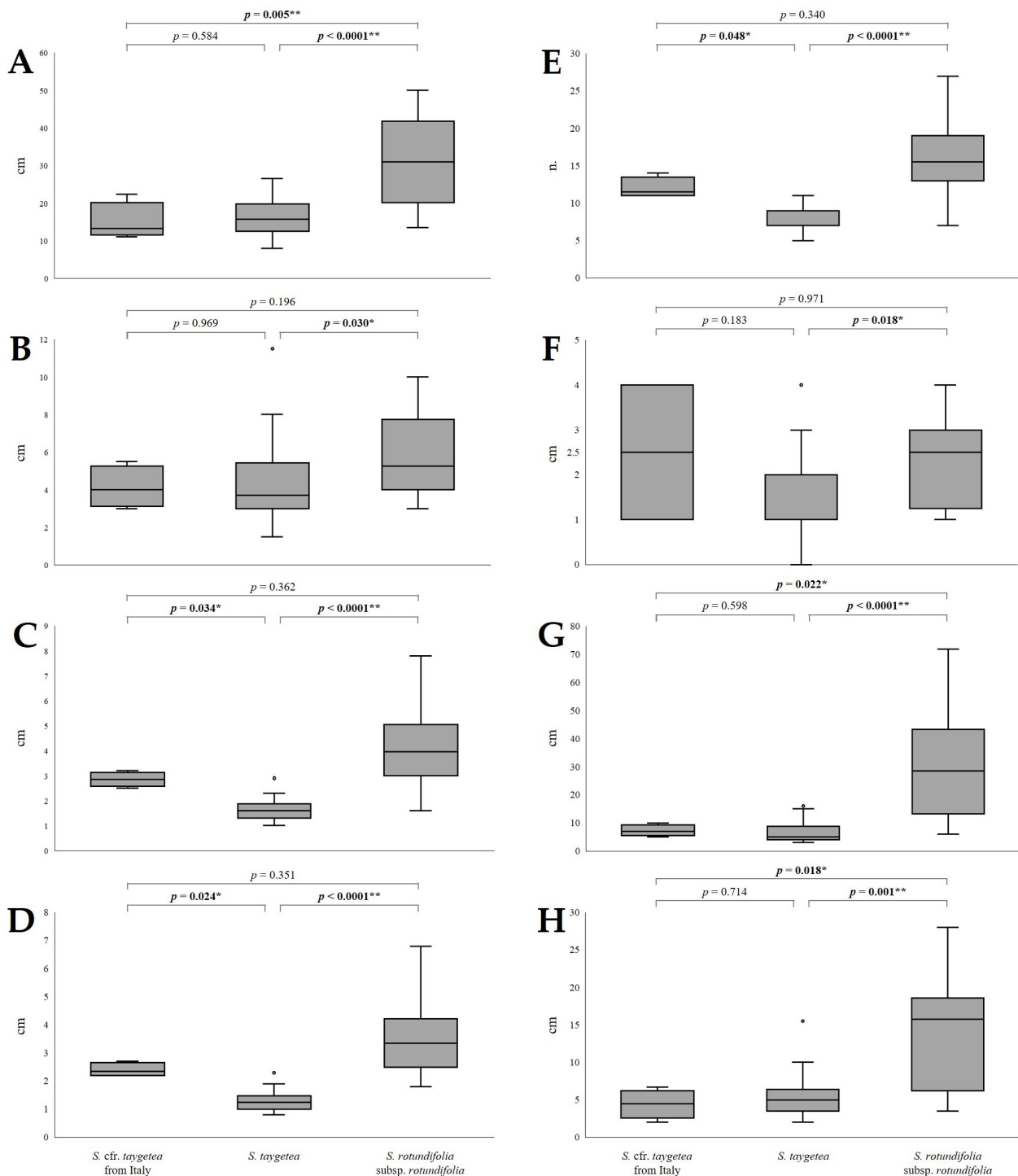


Figure 2. Box plots showing morphological variation between analyzed specimens of *Saxifraga* cfr. *taygetea* Boiss. & Heldr. collected on Monte Papa (Italy) by Cavara and Grande (left), *S. taygetea* from Balkan (center), and *S. rotundifolia* L. subsp. *rotundifolia* from southern Italy (right). Outlined central box depicts middle 50% of data, extending from 25th and 75th percentiles, and horizontal bar is the median. Ends of vertical lines (or “whiskers”) indicate minimum and maximum data values. Circles indicate outliers. Asterisks after the *p*-value indicate significant differences between data sets (Dunn’s post hoc test: * $p < 0.05$, ** $p < 0.01$). **A.** Plant height (cm). **B.** Petiole length in basal leaf (cm). **C.** Basal leaf width (cm). **D.** Basal leaf length (cm). **E.** Number of dentations or crenations in basal leaf (n.). **F.** Number of stem leaves (excluding the flower bracts; n.). **G.** Number of flowers for each inflorescence (n.). **H.** Inflorescence length (cm).

18.VIII.1856; Heldreich leg.; COI 60899 ([GBIF occurrence 2598801635](#)) • Mount Korax, Alpin region; [38.6474°N, 22.2545°E]; alt. 6000’–7680’; 23.VII.1879; T. Heldreich leg.; BR 35675839 ([GBIF occurrence 4073003713](#)) • Mount Korax, Alpin region; [38.6474°N, 22.2545°E]; alt. 6000’–7680’; 23.VII.1879; T. Heldreich leg.; K 4461424 ([GBIF occurrence 5152211771](#)) • Mount Korax, Alpin region; [38.6474°N, 22.2545°E]; alt. 6000’–7680’; 23.VII.1879; T. Heldreich leg.; K 4461435 ([GBIF occurrence](#)

5152214781) • Mount Parnassus, Alpin region; [38.5355°N, 22.6216°E]; VII.1886; T.G. Orphanides leg.; P 2920050 (GBIF occurrence 438053658) — **PELOPONNESE** • Taygetos; [36.9532°N, 22.3507°E]; VII.1844; T.H.H. von Heldreich leg.; GOET 11170 (isotype!) (GBIF occurrence 1638453088) • Mount Taygetos, Alpin region; [36.9532°N, 22.3507°E]; ad rupes; VI.1870; T.G. Orphanides leg.; PI 17075 (GBIF occurrence 3704088379) • Mount Taygetos, Alpin region (loco classico); [36.9532°N, 22.3507°E]; VIII.1897; K 4461448 (GBIF occurrence 5152177782) • Mount Taygetos, Alpin region; [36.9532°N, 22.3507°E]; VIII.1897; K 4461436 (GBIF occurrence 5152209788) • Trikkala, Peloponnesos; [37.9885°N, 22.4659°E]; alt. ca. 2200 m a.s.l.; 24.VII.1938; O. Grebenschikoff leg.; on the rocks / in humid places; sub *Saxifraga rotundifolia* v. *taygetea*; K 4461442 (GBIF occurrence 5152206795) — **WESTERN GREECE** • Kalabryta, Peloponessos; [38.0332°N, 22.1103°E]; alt. ca. 2200 m a.s.l.; 30.VII.1938; O. Grebenschikoff leg.; on the rocks / in humid places; sub *Saxifraga rotundifolia* v. *taygetea*; K 4461421 (GBIF occurrence 5152184798) • Chelmos (Aroania), Mt. Krya Vryssis; 25.VI.1949; C.N. Goulimy leg.; K 4461449 (GBIF occurrence 5152183795) — **EPIRUS** • Metsovon; [39.7702°N, 21.1828°E]; alt. 1500 m a.s.l.; 12.VII.1985; C. Évrard leg.; edge of a waterfall; BR 35675815 (GBIF occurrence 4072923497).

Saxifraga rotundifolia subsp. *rotundifolia*. ITALY — **CAMPANIA** • Montevergine; [40.9423°N, 14.7184°E]; 26.VI.1897; M. Guadagno leg.; sub *Saxifraga rotundifolia* L.; PI-GUAD 17061 (GBIF occurrence 3704088372) • Mount Mutria, Matese Mts.; [41.3833°N, 14.5175°E]; 28.VI.1898; M. Guadagno leg.; sub *Saxifraga rotundifolia* L.; PI-GUAD 17065 (GBIF occurrence 3704088386) • Mount S. Angelo a 3 Pizzi towards Pimonte; [40.6474°N, 14.5064°E]; 15.V.1898; M. Guadagno leg.; sub *Saxifraga rotundifolia* L.; PI-GUAD 17059 (GBIF occurrence 3704088369) • Mount Sacro di Novi; [40.2174°N, 15.3354°E]; alt. 1200 m a.s.l. up to the summit; 15.VII.1907; M. Guadagno leg.; grassy and shady places; sub *Saxifraga rotundifolia* L. v. *repanda* W.; PI-GUAD 17063 (GBIF occurrence 3704088370) • Mount Sacro di Novi; [40.2174°N, 15.3354°E]; alt. 1600–1700 m a.s.l.; 15.VII.1907; M. Guadagno leg.; rocks under the beech trees; sub *Saxifraga rotundifolia* L.; PI-GUAD 17069 (GBIF occurrence 3704088385) • Sorgente dell'Acqua Fredda, Stabiani Mts.; without collection date; M. Guadagno leg.; sub *Saxifraga repanda* Willd.; PI-GUAD 17057 (GBIF occurrence 3704088373) • Mount Cerreto, cliffs below the summit towards Tramonti; [40.6923°N, 14.5902°E]; without collection date; M. Guadagno leg.; sub *Saxifraga rotundifolia* L.; PI-GUAD 17064 (GBIF occurrence 3704088364) • Monte S. Vergine, near Avellino; [40.9423°N, 14.7184°E]; 30.V.1959; shady bank near the church, D.A. Webb leg.; sub *Saxifraga rotundifolia* L. [var. *apennina* D.A.Webb]; TCD 18103 holotype • Pietramelara, Mount Maggiore, locality Pizzo San Salvatore; 41.2371°N, 14.1967°E; alt. 858–1037 m a.s.l.; 05.V.2017; A. Stinca and M. Ravo leg.; broadleaf forest; IT 4876 • Cava de' Tirreni, locality Lucinale; 40.7046°N, 14.6721°E; 468 m a.s.l.; 15.V.2025; A. Stinca leg.; limestone cliff at the edge of the beech forest; IT 9350 • Cava de' Tirreni, locality Lucinale; 40.7046°N, 14.6721°E; 468 m a.s.l.; 15.V.2025; A. Stinca leg.; limestone cliff at the edge of the beech forest; IT 9351 • Monte San Giacomo, between locality Vallescura and Rifugio Monte Cervati; 40.2879°N, 15.4771°E; alt. 1356 m a.s.l.; 01.VI.2025; A. Stinca leg.; limestone cliff at the edge of the beech forest; IT 9321 • Monte San Giacomo, between locality Vallescura and Rifugio Monte Cervati; 40.3003°N, 15.4966°E; alt. 1356 m a.s.l.; 01.VI.2025; A. Stinca leg.; limestone cliff at the edge of the beech forest; IT 9322 • Sanza, between the peak of the Mount Cervati and Santuario della Madonna della Neve; 40.2882°N, 15.4762°E; alt. 1820 m a.s.l.; 21.VI.2025; A. Stinca leg.; limestone cliff at the edge of the beech forest; IT 9317 • Sanza, between the peak of the Mount Cervati and Santuario della Madonna della Neve; 40.2882°N, 15.4762°E; alt. 1820 m a.s.l.; 21.VI.2025; A. Stinca leg.; limestone cliff at the edge of the beech forest; IT 9318 — **BASILICATA** • Monte Sirino; [40.1327°N, 15.8361°E]; 22.VI.1995; R. Galesi leg.; sub *Saxifraga rotundifolia* L.; CAT 107590 (<https://cat.unict.it/omeka-s/s/orto-botanico-ed-herbarium/item/76700>) — **CALABRIA** • Serra San Bruno, Bosco S. Maria; [38.5526°N, 16.3127°E]; 1100 m a.s.l.; 15.V.1917; M. Guadagno leg.; sub *Saxifraga repanda* W.; PI-GUAD 17056 (GBIF occurrence 3704088374) • Vallone Cecita; 39.3875°N, 16.5638°E; alt. 1150–1250 m a.s.l.; 13.VI.1997; G. Cesca and others leg.; sub *Saxifraga rotundifolia* L.; B 10 1252335 (GBIF occurrence 4444401799) • Serra San Bruno, locality Bosco Archiforo, Pietra del Signore; 38.5516°N, 16.3430°E; alt. 1080 m a.s.l.; 27.V.2024; A. Stinca leg.; edges of a stream inside the forest dominated by *Abies alba* Mill.; IT 9075 • Serra San Bruno, locality Bosco Archiforo, Pietra del Signore; 38.5516°N, 16.3430°E; alt. 1080 m a.s.l.; 27.V.2024; A. Stinca leg.; edges of a stream inside the forest dominated by *Abies alba* Mill.; IT 9076 — **SICILIA** • Messina; [38.1937°N, 15.5542°E]; without collection date; F. Tornabene leg.; in humid and calcareous areas; sub *Saxifraga rotundifolia* Lin.; CAT 4705 (<https://cat.unict.it/omeka-s/s/orto-botanico-ed-herbarium/item/14770>).

Vinca major L. subsp. *balcanica* (Pénzes) Kozuharov & A.V.Petrova, Fl. Nar. Republ. Bulgariya 8: 427 (1982)

Materials examined. ITALY — CAMPANIA • Vallo di Lucania; [40.2305°N, 15.2652°E]; 14.VI.1987; I. Trinajstić leg.; sub *Vinca balcanica* Pénzes; CNHM 80448 (four herbarium sheets) (Figure 3).

Identification. In accordance with the available bibliographic sources (Pénzes 1962; Stearn 1972; Pils 2016; Pignatti et al. 2018), *V. major* subsp. *balcanica* is distinguished from *V. major* subsp. *major* by having the flowering stem up to 12 cm long (vs. up to 30 cm), and largest leaves up to 2.0 wide and 5.0 cm long (vs. up to 6 cm wide and 9 cm long). Morphometric analysis of the herbarium specimens I selected confirmed the validity of these morphological characters (Table 3, Figure 4A, C, D; Dunn's post hoc test: $p < 0.01$). Based on my results, the individuals collected by Trinajstić in Vallo delle Lucania (Italy) (CNHM 80448) cannot be identified as *V. major* subsp. *balcanica* as they do not have the

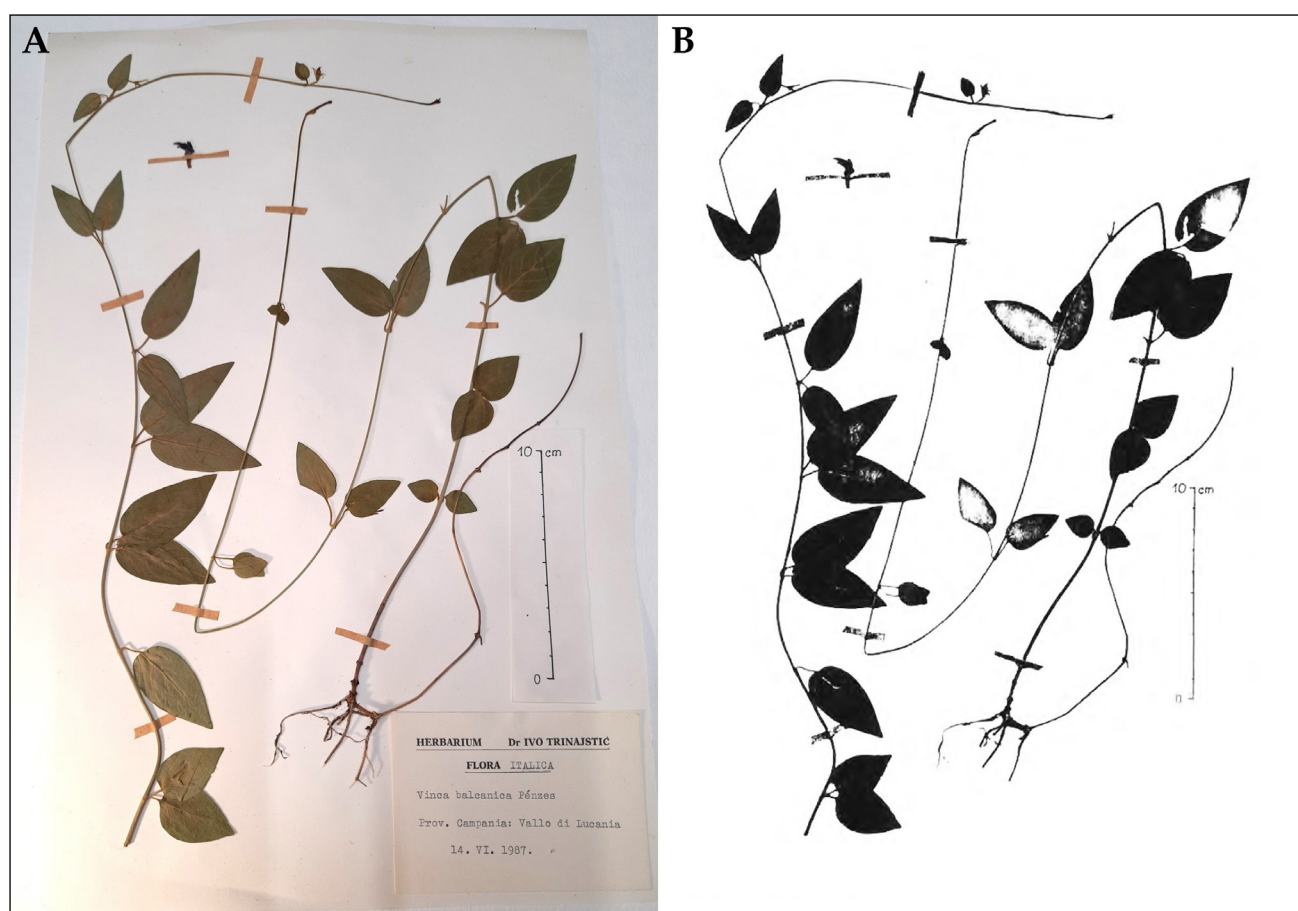


Figure 3. A. Exsiccatum collected in Vallo della Lucania (Italy) and identified as *Vinca balcanica* Pénzes by Trinajstić preserved in CNHM (n. 80448). B. Same specimen shown in the Trinajstić's paper (1991). Photo by courtesy of the Herbarium of the Croatian Natural History Museum.

Table 3. Comparison of morphological characters between *Vinca major* cfr. subsp. *balcanica* individuals from Italy and related taxa (i.e. *V. major* L. subsp. *balcanica* (Pénzes) Kozuharov & A.V.Petrova, and *V. major* L. subsp. *major*). Data are reported as mean $\pm$ standard deviation. Asterisks after the p -value indicate no significant differences between data sets (Kruskal–Wallis test, * $p < 0.05$, ** $p < 0.01$).

Characters	<i>V. major</i> cfr. subsp. <i>balcanica</i> from Italy	<i>V. major</i> subsp. <i>balcanica</i>	<i>V. major</i> subsp. <i>major</i>	Kruskal–Wallis test
Flowering stem length (cm)	54.3 $\pm$ 12.2	10.0 $\pm$ 1.8	39.9 $\pm$ 14.8	$p = 0.002^{**}$
Number of nodes (n.)	8.5 $\pm$ 1.1	4.5 $\pm$ 0.6	8.2 $\pm$ 1.6	$p = 0.007^{**}$
Median stem leaf width (cm)	2.1 $\pm$ 0.2	1.2 $\pm$ 0.1	2.4 $\pm$ 0.6	$p = 0.005^{**}$
Median stem leaf length (cm)	4.5 $\pm$ 0.5	2.0 $\pm$ 0.3	4.1 $\pm$ 0.9	$p = 0.004^{**}$
Petiole length in median stem leaf (cm)	0.8 $\pm$ 0.1	0.4 $\pm$ 0.1	0.7 $\pm$ 0.2	$p = 0.004^{**}$
Calyx-lobes length (cm)	0.7 $\pm$ 0.1	0.7 $\pm$ 0.1	0.9 $\pm$ 0.2	$p = 0.090$
Corolla tube length (cm)	1.0 $\pm$ 0.0	1.0 $\pm$ 0.3	1.3 $\pm$ 0.2	$p = 0.090$
Diameter of the corolla lobes (cm)	1.4 $\pm$ 0.0	3.2 $\pm$ 0.3	3.3 $\pm$ 0.7	$p = 0.223$
Flower peduncle length (cm)	1.4 $\pm$ 0.0	2.7 $\pm$ 0.4	3.0 $\pm$ 0.9	$p = 0.227$

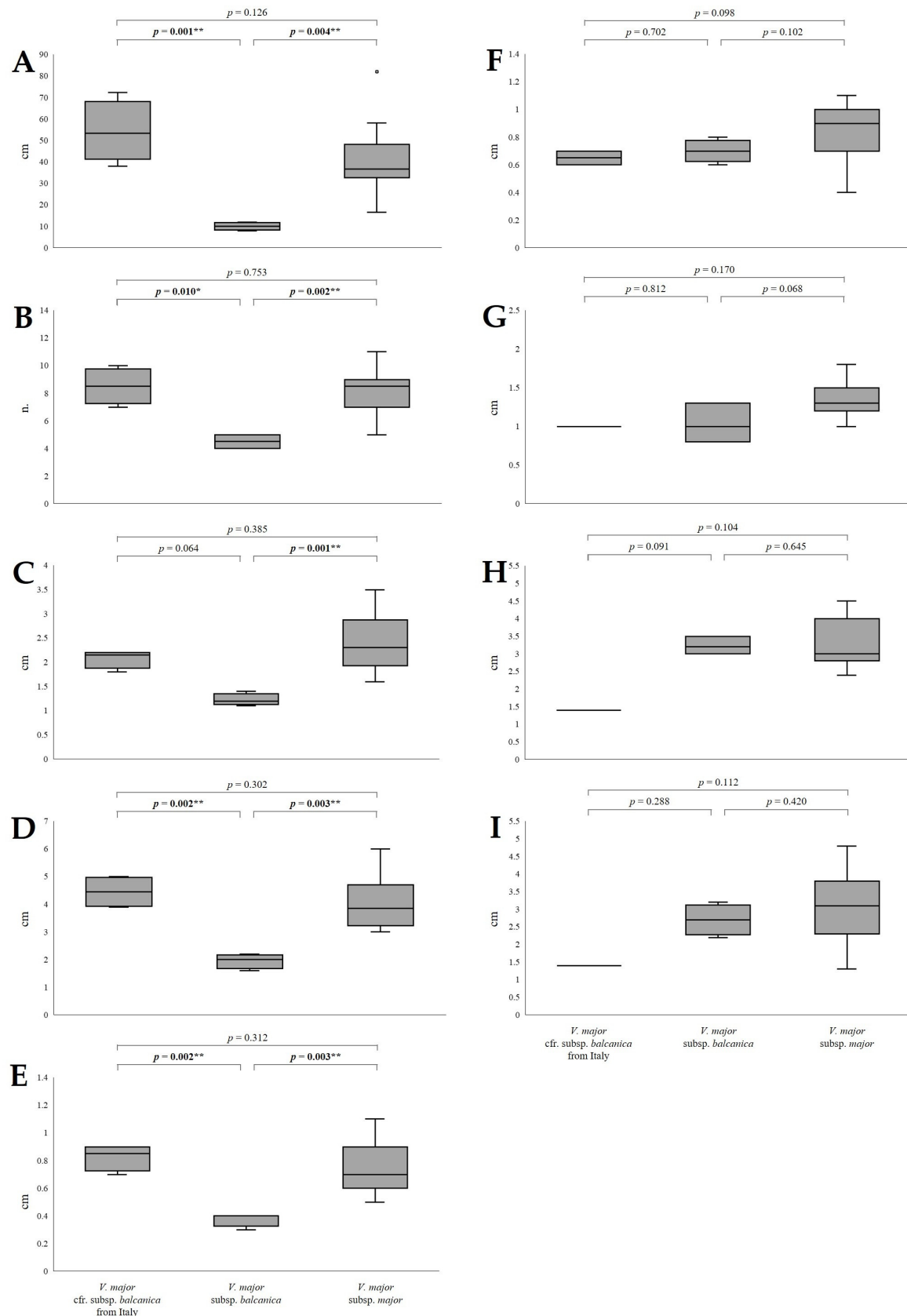


Figure 4. Box plots showing morphological variation between analyzed specimens of *Vinca major* L. cfr. subsp. *balcanica* (Pénzes) Kozuharov & A.V.Petrova collected in Vallo della Lucania (Italy) by Trinajstić (left), *V. major* subsp. *balcanica* from Balkan (center), and *V. major* subsp. *major* from southern Italy (right). Outlined central box depicts middle 50% of data, extending from 25th and 75th percentiles, and horizontal bar is the median. Ends of vertical lines (or “whiskers”) indicate minimum and maximum data values. Circle indicates outlier. Asterisks after the *p*-value indicate significant differences between data sets (Dunn’s post hoc test: * $p < 0.05$, ** $p < 0.01$). **A.** Flowering stem length (cm). **B.** Number of nodes (n). **C.** Median stem leaf width (cm). **D.** Median stem leaf length (cm). **E.** Petiole length in median stem leaf (cm). **F.** Calyx-lobes length (cm). **G.** Corolla tube length (cm). **H.** Diameter of the corolla lobes (cm). **I.** Flower peduncle length (cm).

above-mentioned characteristics. Indeed, these samples showed clear morphological differences with the Balkan samples of *V. major* subsp. *balcanica* (i.e. flowering stems length, median stem leaves width [although not statistically significant] and length, number of nodes, and petiole length in median stem leaves, Figure 4A–E), while no significant statistical difference was observed with the *V. major* subsp. *major* samples collected in Italy for all selected characters (Table 3, Figure 4). I would like to point out that the corolla measurements performed on the sample stored in CNHM are not very reliable as the plant material was not well dried.

A detailed description of the samples collected by Trinajstić in Vallo della Lucania (CNHM 80448) is provided below. Perennial herb, with ascending or procumbent stems up to 72.3 cm long, with 7–10 nodes. Opposite, simple and petiolate (petiole up to 0.9 cm) leaves, the largest ones placed in the centre of the stem with ovate blade (up to 2.2 cm wide and 5.0 cm long) and an entire and ciliate margin. Flowers are solitary and pedunculated in leaf-axils (peduncle about 1.4 cm long), with a hypocrateriform corolla and calyx-lobes almost linear (6–7 mm long).

Further herbarium specimens examined

Vinca major subsp. *balcanica*. ALBANIA — **TIRANA** • Tiranë, E side of Mt. Dajtitm midway between Priskës and Molla; west side of roadway, NE exposure; 16.IV.1994; S.L. Holmes and S.C. Rhodes leg.; sub *Vinca balcanica* Péntzes; MO 5159373 ([GBIF occurrence 4441100384](#)).

Vinca major subsp. *major*. ITALY — **CAMPANIA** • Between Atrani and Pontone; [40.6396°N, 14.6063°E]; in the bushes and hedges; alt. ca. 300 m a.s.l.; 17.V.1910; C.C. Lacaita leg.; sub *Vinca major* L.; PI 56783 ([GBIF occurrence 3914706454](#)) • Portici, at the Parco Gussone; [40.8125°N, 14.3474°E]: alt. 70 m a.s.l.; 16.IV.2007; A. Stinca leg.; holm oak forest edge; IT 124 • Castel Morrone, at the Comola grande; 41.1174°N, 14.3397°E; alt. 150–220 m a.s.l.; 26.II.2017; A. Stinca leg.; forest; IT 4740 • Castel Morrone, at the Comola grande; 41.1174°N, 14.3397°E; alt. 150–220 m a.s.l.; 26.II.2017; A. Stinca leg.; forest; IT 4741 • Massa Lubrense, near Chiesa di Santa Maria della Neve; 40.5987°N, 14.3639°E; alt. 417 m a.s.l.; 23.III.2025; A. Stinca leg.; roadside; IT 9308 • Massa Lubrense, near Chiesa di Santa Maria della Neve; 40.5987°N, 14.3639°E; alt. 417 m a.s.l.; 23.III.2025; A. Stinca leg.; roadside; IT 9309 • Massa Lubrense, near Chiesa di Santa Maria della Neve; 40.5987°N, 14.3639°E; alt. 417 m a.s.l.; 23.III.2025; A. Stinca leg.; roadside; IT 9310 — **BASILICATA** • Savoia di Lucania, at Vallone del Tuorno; 40.5811°N, 15.5376°; alt. 500 m a.s.l.; 07.VI.2013; A. Stinca and M. Ravo leg.; broadleaf forest; IT 7295 • Rionero in Vulture, locality Il Castello; 40.9256°N, 15.5554°E; alt. 550–719 m a.s.l.; 06.VI.2015; A. Stinca and M. Ravo leg.; broadleaf forest; IT 5183 • Rionero in Vulture, locality Il Castello; 40.9256°N, 15.5554°E; alt. 550–719 m a.s.l.; 06.VI.2015; A. Stinca and M. Ravo leg.; broadleaf forest; IT 5184 • Bella, on the WSW side of the Mount Santa Croce; 40.7797°N, 15.5816°E; alt. 1100–1300 m a.s.l.; 15.IV.2024; A. Stinca leg.; mixed forest of beech and turkey oak; IT 7488 • Bella, on the WSW side of the Mount Santa Croce; 40.7797°N, 15.5816°E; alt. 1100–1300 m a.s.l.; 15.IV.2024; A. Stinca leg.; mixed forest of beech and turkey oak; IT 7489 • Bella, in locality Acqua dei Piscioi; 40.7877°N, 15.5529°E; alt. 1053 m a.s.l.; 18.V.2024; A. Stinca leg.; edge of the Turkey oak forest; IT 9296 • Bella, locality Acqua dei Piscioi; 40.7877°N, 15.5529°E; alt. 1053 m a.s.l.; 18.V.2024; A. Stinca leg.; edge of the Turkey oak forest; IT 9297 • Bella, locality Acqua dei Piscioi; 40.7877°N, 15.5529°E; alt. 1053 m a.s.l.; 18.V.2024; A. Stinca leg.; edge of the Turkey oak forest; IT 9298 • Bella, on the ENE side of the Mount Santa Croce; 40.7766°N, 15.5933°E; alt. 1190–1250 m a.s.l.; 12.VI.2024; A. Stinca leg.; edge of broadleaf forest; IT 7611 • Bella, on the WSW side of the Mount Santa Croce; 40.7797°N, 15.5816°E; alt. 1100–1300 m a.s.l.; 14.VI.2024; A. Stinca leg.; mixed forest of beech and turkey oak; IT 7585 • Bella, on the WSW side of the Mount Santa Croce; 40.7797°N, 15.5816°E; alt. 1100–1300 m a.s.l.; 14.VI.2024; A. Stinca leg.; mixed forest of beech and turkey oak; IT 7586 • Castelluccio Superiore, near locality Foresta; 40.0155°N, 15.9428°E; alt. 763 m a.s.l.; 18.V.2025; A. Stinca leg.; edge of broadleaf forest; IT 9338 • Castelluccio Inferiore in locality La Difesa; 40.0160°N, 15.9853°E; alt. 816 m a.s.l.; 18.V.2025; A. Stinca leg.; Turkey oak forest; IT 9340 • Castelluccio Inferiore, locality La Difesa; 40.0160°N, 15.9853°E; alt. 816 m a.s.l.; 18.V.2025; A. Stinca leg.; Turkey oak forest; IT 9341 • Castelluccio Inferiore, locality La Difesa; 40.0160°N, 15.9853°E; alt. 816 m a.s.l.; 18.V.2025; A. Stinca leg.; Turkey oak forest; IT 9342 — **CALABRIA** • Valley of River Argentino; 39.7977°N, 15.9850°E; alt. 300–370 m a.s.l.; 13.VI.1997; G. Cesca and others leg.; sub *Vinca major*; B 10 1250475 ([GBIF occurrence 4444400605](#)) • Oriolo Calabro, locality Contrada Serra Salice; 40.0463°N, 16.4282°E; edge of a forest with a prevalence of *Quercus pubescens*; alt. ca. 700 m a.s.l.; 26.03.2013; F. Roma-Marzio leg.; PI 62985 ([GBIF occurrence 4415990306](#)) — **SICILIA** • Madonie, locality Panormi; [37.8834°N, 14.0166°E]; without collection date; F. Tornabene leg.; sub *Vinca major* Lin.; CAT 7761 (<https://cat.unict.it/omeka-s/s/orto-botanico-ed-herbarium/item/17825>) • Randazzo; [37.8778°N, 14.9508°E]; alt. 750 m a.s.l.; without collection date; G. Zodda leg.; sub *Vinca major* L.; CAT 7764 (<https://cat.unict.it/>)

[omeka-s/s/orto-botanico-ed-herbarium/item/17828](https://cat.unict.it/omeka-s/s/orto-botanico-ed-herbarium/item/17828)) • Sant'Angelo di Brolo; [38.1126°N, 14.8838°E]; IV.1894; Caldarera leg.; sub *Vinca major* L.; CAT 7762 (<https://cat.unict.it/omeka-s/s/orto-botanico-ed-herbarium/item/17826>) • Lipari, in the southern part of the island; 38.4518°N, 14.9550°E; alt. 5–220 m a.s.l.; 19.IV.2022; A. Stinca and M. Ravo leg.; roadside; IT 3805.

Discussion

Saxifraga taygetea was first validly published by Boissier and Heldreich in “Diagnoses Plantarum Orientalium novarum” of Boissier (1849) originally from the Taygetos Mountains in Greece. It was later recorded on other mountains of the southern Balkan Peninsula (Marhold 2025). This hemicryptophyte has also been reported in Italy, specifically in Basilicata region in 1913 by Cavara and Grande (sub *Saxifraga rotundifolia* var. *taygetea* Boiss. et Heldr.) for “Scala dei Monaci (1830 m.)” (that is a locality in the Sirino-Papa massif) and “Alpe (1630 m)” (today known as Monte Alpi or Alpe di Latronico) (Cavara and Grande 1913), and in Abruzzo in 1967 by Zodda (sub *Saxifraga rotundifolia* L. var. *taygetea* (Bss.)) for “Monte Gorzano” (which is a peak of the Monti della Laga) (Zodda 1967). However, in all these localities the occurrence of *S. taygetea* has not been confirmed by other botanists (Caputo et al. 1977; Corbetta and Pirone 1986; Conti and Bartolucci 2016). More recently this species has been excluded from the vascular flora of Abruzzo, while in Basilicata and therefore in Italy it is still considered to be of doubtful presence (Bartolucci et al. 2024). My research conducted in NAP herbarium, where specimens of Cavara and Grande are known to be preserved (Stafleu and Cowan 1976), allowed me to trace a single pertinent specimen collected on the “Monte Papa alla Scala dei Monaci” on 19 August 1908 (voucher number 5757). This exsiccata is composed by four complete individuals not mounted on a sheet and, strangely, two labels with the same information (Figure 1). Revision of this specimen performed with a morphometric study using many herbarium specimens of *S. taygetea* collected in Greece (including the isotypes stored in GOET and WAG herbaria) and Albania through high-resolution digital photographs available on the Global Biodiversity Information Facility (GBIF Secretariat 2025b) and many exsiccata of *S. rotundifolia* subsp. *rotundifolia* from southern Italy (Table 1), as well as the protologue of Boissier (1849) and dichotomous keys (e.g. Tutin et al. 1993; Pils 2016) or taxonomic notes (Webb 1987) did not confirm the identification performed by Cavara and Grande. In fact, the individuals from Monte Papa, are only smaller and does not show significant morphological differences compared to the individuals of *S. rotundifolia* subsp. *rotundifolia* which are frequently found in the forests of Basilicata and southern Italy (Table 2, Figure 2). On the other hand, both species are morphologically similar and recognised in the monophyletic section *Cotylea* Tausch (Tkach et al. 2015). I note that the plants of the central-southern Apennines have been described by Webb (1987) as *S. rotundifolia* var. *apennina* D.A. Webb (*S. rotundifolia* var. *repanda* auct. Fl. Ital., non (Willd.) Eichler) and deserve further taxonomic investigation (holotypus is shown in Figure 5). During my searches in herbaria, I also found a specimen identified as *S. taygetea* collected by Robert Krisai in Vetralla municipality (Lazio region, central Italy) on 26 March 1983 and stored in the LI herbarium (LI 877716). This specimen is composed by two young individuals mounted on sheet and a printed label (Figure 6). Since the herbarium sample lacks developed stems and flowers, it cannot be taxonomically identified. It is important to note that *S. taygetea* has never been reported in Lazio (Anzalone et al. 2010; Bartolucci et al. 2024). In addition, also my fieldwork in the last few years in central and southern Italy have not confirmed the occurrence of *S. taygetea*. Therefore, in the current state of knowledge and based on the above reasons, *S. taygetea* must be excluded from the Italian vascular flora.

Vinca major subsp. *balcanica*, a taxon first validly published to the taxonomic rank of species (i.e. *V. balcanica* Pénzes) by Pénzes (1962) and traditionally considered endemic to the Balkan Peninsula (POWO 2025a), was reported also for Italy by Trinajstić (1991) based on a collection performed on 14 June 1987 at Vallo della Lucania, a municipality located in the southern part of the Campania region (southern Italy). Afterwards, only Pignatti et al. (2018) and, more recently, Bartolucci et al. (2024) mentioned this record. My research conducted in CNHM, ZA, and ZAHO herbaria, where Trinajstić's specimens are known to be preserved (S. Buzjak and N. Vuković pers. comm.), allowed me to trace in CNHM four pertinent specimens (mounted on sheets) collected by Trinajstić in the aforementioned Italian locality and date (voucher number 80448, Nikolić et al. 2025). These specimens are undoubtedly a single gathering (i.e. a collection presumed to be of a single taxon made by the same collector(s) at the same time from a single locality, Art. 8.2 of the International Code of Nomenclature (Turland et al. 2025)) and one such exsiccata is shown in Trinajstić's paper (Figure 3). Revision of these specimens, performed with a morphometric approach using some exsiccata of *V. major* subsp. *balcanica* from



Figure 5. Holotypus of *Saxifraga rotundifolia* L. var. *apennina* D.A. Webb preserved in TCD (n. 18103). Photo by courtesy of the Herbarium of Trinity College.

Albania and many herbarium samples collected in southern Italy (Table 1), as well as different dichotomous keys (e.g. Stearn 1972, Pils 2016, Pignatti et al. 2018) and the Pénzes's protologue (1962), did not confirm the identification performed by Trinajstić. In fact, the specimens from Vallo della Lucania, do not show significant morphological differences compared to the individuals of *V. major* subsp. *major* which are frequently found in Campania and southern Italy (Table 3, Figure 4). In addition, fieldwork carried out by me in the last few years in southern Italy, as well as investigations in herbaria (see "Further herbarium specimens examined" paragraphs) and recent local botanical literature (e.g. Moggi 2002; Biondi et al. 2008; Wagensommer et al. 2014b; Rosati et al. 2017; Conti et al. 2019; Croce et al. 2019; Stinca et al. 2019; Rosati et al. 2020; Barone et al. 2023; Gianguzzi et al. 2023), have not confirmed

Figure 6. Exsiccatum collected on Vetralla and identified as *Saxifraga taygetea* Boiss. & Heldr. by Krisai preserved in LI (n. 877716). Photo by courtesy of the Oberösterreichische Landeskultur GmbH available on the Global Biodiversity Information Facility (GBIF occurrence 4997672073).



the occurrence of *V. major* subsp. *balcanica*. On the other hand, as also reported in the Pénzes's prologue (1962: 329–330; “Proxima est *Vincae majori*, ab illa differ habitu minori, probabiliter huius forma diploidiea”), *V. major* subsp. *balcanica* is very similar to *V. major* subsp. *major* which, according to Stearn (1972), requires further study to ascertain its taxonomic validity. Therefore, in the current state of knowledge and based on the above reasons, *V. major* subsp. *balcanica* must be excluded from the Italian vascular flora.

It is widely known that detailed knowledge of the vascular flora, both at a national and local scale, is essential for planning appropriate conservation and enhancement of nature and territory (e.g. Wagensommer et al. 2023). In fact, floristic studies can reveal rare or endangered species that are therefore worthy of protection (Rahnama et al. 2024), but such studies can also uncover alien species harmful to native biocenoses (Heneidy et al. 2024). At the same time, these studies provide the basic information needed to draw up Red Lists (Lončarević et al. 2024), to analyze vegetation (Di Pietro and Wagensommer 2014; Perrino et al. 2022), to study interspecific plant interactions (Bonanomi et al. 2022), to explore the nutraceutical potential of plants (Gravina et al. 2023), and to understand the effect of natural (Idbella et al. 2023) or anthropogenic disturbances (Stinca et al. 2020) on

natural ecosystems. If carried out with scientific rigor, the census of the vascular flora of any study area involves the collection of samples of the detected taxa and their deposit in a public herbarium (Carter et al. 2007). Herbaria play a pivotal role because each collected and preserved specimen represents a verifiable record of the presence of a species in a defined place at a specific time (Borsch et al. 2020). Indeed, the preserved material in herbaria allows researchers to verify the accuracy of the reports and, if the taxonomic identifications are found to be incorrect, to revise the samples. Thanks to the voucher specimens traced in the herbaria, during this research it was possible to verify and correct two reports for the Italian flora. The careful analysis of the samples stored in NAP and CNHM and the comparison of many specimens preserved in some European herbaria (i.e. B, BR, CAT, COI, GOET, IT K, L, MO, P, PI, TCD, WAG), in fact, revealed that *S. taygetea* had been confused with *S. rotundifolia* subsp. *rotundifolia*, and that *V. major* subsp. *balcanica* had been confused with *V. major* subsp. *major*. The exclusion of a plant species/subspecies from a national flora through the review of historical specimens (e.g. Yuan et al. 2018; Bartolucci et al. 2020; Nayak et al. 2022), although it is a less frequent activity than with first reports (e.g. Villar et al. 2014; Salerno and Stinca 2017; El Zein et al. 2021; Mei et al. 2021; Carrión et al. 2024) highlights the importance of herbarium collections for surveying Earth's plant diversity. In addition, this research emphasizes the importance of free access to information in herbaria through the kind availability of the curators and digitization of the collections for use by the international research community. In this context, several projects for the digitization (e.g. Borsch et al. 2020; Roma-Marzio et al. 2023; De Smedt et al. 2024; Mihaly et al. 2024) of the collections and sharing scientific data (GBIF Secretariat 2025a) are noteworthy.

Results of this research have clear implications on the chorology of the two taxa, which from amphi-Adriatics (Pignatti et al. 2017a, 2018) must be considered as exclusive endemics to the Balkan Peninsula. Therefore, the results presented here are fully with POWO (2025a, 2025b) who consider *S. taygetea* and *V. major* subsp. *balcanica* native only to the Balkans. In accordance with herbarium specimens and relevant literature that I analyzed (e.g. Boissier 1849; Péntzes 1962; Trinajstić 1991; Pils 2016; Barina et al. 2018; Dimopoulos et al. 2025; Marhold 2025), *S. taygetea* is reported for Albania, Greece, North Macedonia and Montenegro, while *V. major* subsp. *balcanica* is known only for Albania, North Macedonia and Kosovo (Figure 7). Consequently, the native Italian vascular flora reduces from 8,241 to 8,239 species and subspecies, but it is confirmed to be the second richest in Europe, preceded only by Turkey.

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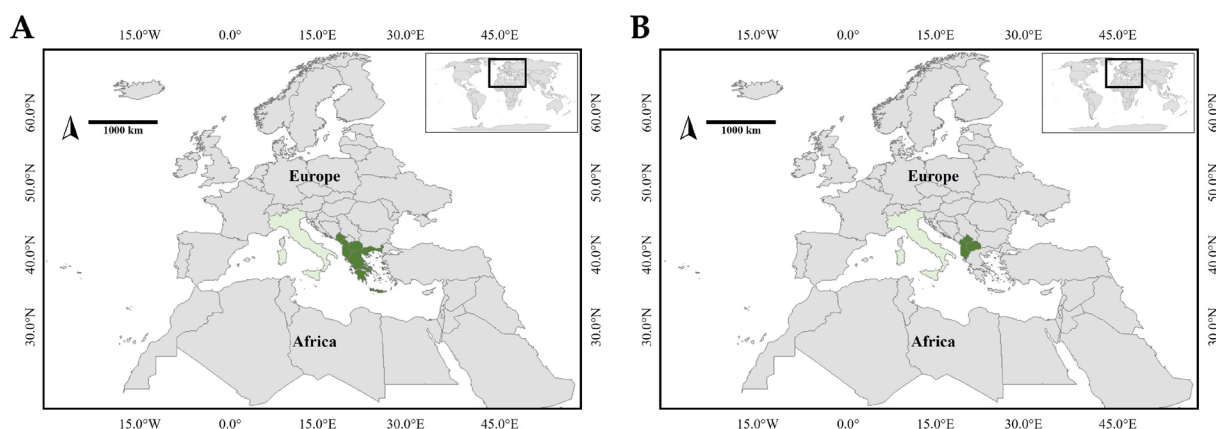


Figure 7. Map of the current global distribution range (dark green areas) of the studied taxa. **A.** *Saxifraga taygetea* Boiss. & Heldr. **B.** *Vinca major* L. subsp. *balcanica* (Péntzes) Kozuharov & A.V.Petrova. Italian territory, from which both taxa have been excluded, is indicated in light green.

Additional information

Conflict of interest

The author declares that no competing interests exist.

Ethical statement

No ethical statement is reported.

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Data availability

All data that support the findings of this study are available in the main text.

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