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Short communication

Alyssum desertorum Stapf (Brassicaceae), new for the Italian flora

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Abstract – The occurrence of *Alyssum desertorum*, a species belonging to *A.* sect. *Alyssum*, is reported for the first time in Italy. It was found in Abruzzo (central Italy) in the territory of National Park of Gran Sasso and Laga mountains and surrounding areas. Morphological similarities with the other taxa recorded in Italy belonging to *A.* sect. *Alyssum* are briefly discussed. Information about the typification of the name, habitat, phenology and distribution in Italy are also provided.

Keywords: Abruzzo, *Alyssum*, central Apennine, distribution, typification, vascular flora

Introduction

The genus *Alyssum* L. (Brassicaceae) consists of about 195 species distributed in Europe, Asia, northern Africa and northern America (Warwick at al. 2008, Rešetnik et al. 2013, Li et al. 2014). This genus was divided into six sections by Dudley (1964): *Alyssum* sect. *Alyssum*, *A.* sect. *Gamosepalum* (Hausskn.) T. R. Dudley, *A.* sect. *Meniocus* (Desv.) Hook. f., *A.* sect. *Psilonema* (C. A. Mey.) Hook. f., *A.* sect. *Tetradenia* (Spach) T. R. Dudley, and *A.* sect. *Odontarrhena* (C. A. Mey.) W. D. J. Koch. Some years later the species of *A.* sect. *Tetradenia* were transferred into the genus *Hormathophylla* & T. R. Dudley (Kupfer 1974). However, recent molecular phylogeny studies indicate that *Alyssum* is polyphyletic and that the current taxonomic circumscription of the genus needs to be revised (Rešetnik et al. 2013, Li et al. 2014).

Thirteen *Alyssum* taxa are currently recorded in Italy (Conti et al. 2005, 2007, Španiel et al. 2011a, b, 2012; Magauer et al. 2014): *A. alyssoides* (L.) L., *A. cuneifolium* Ten. subsp. *cuneifolium, A. diffusum* Ten. subsp. *diffusum*, *A. diffusum* subsp. *calabricum* Španiel, Marhold, N.G. Passal. & Lihová, *A. diffusum* subsp. *garganicum* Španiel, Marhold, N.G.Passal. & Lihová, *A. minutum* Schltdl. ex DC., *A. orophilum* Jord. & Fourr, *A. repens* Baumg. (doubtfull presence), *A. siculum* Jord., *A. simplex* Rudolphi, *A. strigosum* Banks & Sol., *A. wulfenianum* Bernh. subsp. *wulfenianum* and *A. wulfenianum* subsp. *ovirense* (A. Kern.) Magauer, Schönsw. & Frajman. Only *A. diffusum* is endemic to Italy (Španiel et al. 2012, Peruzzi et al. 2014, Peruzzi et al. 2015). *Alyssum montanum* L. has been excluded from the flora of Italy (Španiel et al. 2011a, b, 2012), *A. ligusticum* Breistr. has to be transferred to the genus *Hormathophylla* as *H. halimifoli*a (Boiss.) P. Küpfer (Küpfer 1974, Warwick 2008) and finally all the species belonging to *A.* sect. *Odontarrhena* (C. A. Mey.) W. D. J. Koch (*A. argenteum* All., *A. bertolonii* Desv., *A. tavolarae* Briq., *A. alpestre* L., *A. nebrodense* Tineo) have recently been transferred to the genus *Odontarrhena* C. A. Mey. (Cecchi and Selvi 2013).

During the last few years, many papers concerning the taxonomic and floristic knowledge of the vascular flora of the central Apennines and Abruzzo were published (e.g., Conti and Peruzzi 2006, Conti et al. 2006, Peruzzi and Bartolucci 2006, Bartolucci and Peruzzi 2007, Conti 2007, 2010, Peruzzi et al. 2007, 2013, Conti et al. 2008, 2011, Di Pietro et al. 2008, Minutillo et al. 2010, Conti and Tinti 2012, Conti et al. 2012, Bartolucci and Conti 2013, 2014, Conti et al. 2015). In this context, we have also studied the vascular flora of the National Park of Gran Sasso and Laga Mountains over the last ten years (Bartolucci et al. 2007, Conti and Tinti 2008, Bartolucci et al. 2012). During the field research undertaken in 2013 concerning this project, we found an annual *Alyssum* with glabrous silicles and caducous sepals not corresponding to any recorded taxa for the Italian flora (Conti et al. 2005). During the editorial process of this manuscript, *Alyssum desertorum* was recorded as casual alien species from northern Italy, based on a single individual found in a camping in Trentino Alto Adige (Bertolli and Prosser 2014).

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Materials and methods

According to the relevant literature and some European floras (Dudley 1962, 1964, 1965, Ball and Dudley 1996, Hartvig 2002, Schneeweiss 2000, Plazibat 2009), we were able to identify the plant collected, and housed in Herbarium Apenninicum (APP), as *Alyssum desertorum*. The protologue (Stapf 1886) and the original material (W, WU, JE, studied from digital images) were also examined as well as the material from FI, FIAF and GE, in order to confirm the preliminary identification. Acronyms are according to Thiers (2015).

Results and discussion

Alyssum desertorum, belongs to *A*. sect. *Alyssum,* is native to central and south-eastern Europe, and central-west Asia, and it is considered naturalized in northern America (Dudley 1964, 1965, 1968, Cheo et al. 2001, Hartvig 2002, Plazibat 2009). According to Greuter et al. (1986) and Marhold (2011), previous indications of this species in Italy (Fiori 1924 as *Alyssum minimum* Willd.) are erroneous. Fiori (1924) reported it from Croatia (Istria a Castelvenere), where the species was recently excluded (Plazibat 2009), and from Genova (north-western Italy). We searched for the specimens cited by Fiori (FI, FIAF, GE) but none was found. Hence, the occurrence in Italy of *Alyssum desertorum* is reported here for the first time.

All the species belonging to *A*. sect. *Alyssum* occurring in Italy (*A. minutum*, *A. simplex*, *A. strigosum*, *A. wulfenianum*, *A. repens*, *A. diffusum*, *A. cuneifolium*, *A. orophilum*) have pubescent silicles with the exception of *A. minutum*. This latter species, quoted from southern Italy, Sicily and Sardinia (Conti et al. 2005, Arrigoni 2010), is characterized by styles hairy at the base, glabrous silicles with sparse indumentum on the upper margins only when young and persistent sepals. In contrast, *A. desertorum* has styles glabrous, silicles always glabrous and sepals deciduous (Fig. 1).

Fig. 1. *Alyssum desertorum*: a – inflorescence, b – raceme whit glabrous silicles and caducous sepals (Photo by: a – F. Conti, b – F. Bartolucci).

Dudley (1962) recognized three varieties for *A. desertorum* on the basis of the fruit trichomes and the habitus: var. *desertorum* (erect or decumbent habitus with racemes elongated up to 10 cm), var. *himalayensis* T.R. Dudley (with minute stellate hairs on the silicles margin), and var. *prostratum* T.R. Dudley (with reduced and prostrate habitus, and racemes condensed up to 2 cm). A fourth variety, *A. desertorum* var. *socolacicum* Plazibat, was recently described from Macedonia (Plazibat 2009), and it is characterized by luxuriant habitus and racemes over 30 cm in length.

The plants we have collected belong to *A. desertorum* var. *desertorum*.

Alyssum desertorum Stapf, Denkschr. Kaiserl. Akad. Wiss., Wien. Math.-Naturwiss. Kl. 51(2): 302. 1886 var. *desertorum*

Lectotype (First step: Dudley 1965. Second step: Rechinger 1968): [Azerbaijan] Jelizabethapol, 1882, *Pichler T. s.n.* ex Iter persicum D.ris J.E. Polak (W 1904-0002633!, image is available at http://herbarium.univie.ac.at/database/detail.php?ID=548215; isolectotypes: WU-0043213! image is available at http://herbarium.univie.ac.at/database/de-tail.php?ID=119430, WU-0043214! image is available at http://herbarium.univie.ac.at/data-base/detail.php?ID=119431, JE-00003062!, K).

Description: Annual, stems erect or decumbent up to 25 cm tall; indument (stem, leaves, fruiting pedicels, sepals and petals) with appressed, sessile, 6–20-rayed stellate trichomes. Cauline leaves subsessile or attenuate at the base, linear to oblanceolate-linear with apex acute, 0.5–2.5 cm × (0.5)1–3(4) mm. Racemes elongate and cylindrical up to 10 cm. Fruiting pedicels ascending or subdivaricate, straight, 1.5–3 (3.5) mm. Sepals oblong, 1.4–1.8(2) × 0.4–0.5 mm, deciduous. Petals yellow, oblanceolate. Fruit ovate to orbicular, glabrous, 3–4(4.5) mm, apex emarginate; valves not veined, uniformly inflated at the centre, broadly flattened at margin; style 0.3–0.7(1) mm, slender, glabrous. Seeds often 2 per locule, ovate, 1.2–1.5 × 0.9–1.1 mm, slightly compressed, narrowly winged.

Habitat: disturbed sites, roadsides, arid fields, rocky slopes, 700–1.200 m a.s.l.; usually grows together with *A. simplex* and *A. alyssoides*.

Phenology: flowering from April to June.

Notes on the typification: *A. desertorum* was described from material collected during an expedition to Persia in 1882 (Stapf 1886): In collibus prope Baku (13.IV); in deserto prope Jelisabethpol in consortio *A. linifolii* (5.IV); inter Tiflis et Baku (1.IV). Dudley (1962) indicated a specimen at W as syntype: "Persia: in desertis prope Jelizabethpol, Iter Polak, 5 Apr. 1882, Pichler (W)". Three years later he designated isolectotypes (Dudley 1965), and not a lectotype as he wrote, indicating duplicate specimens of a single gathering preserved in two different herbaria: "Caucasus, Azerbaydzhan, in deserto prope Jelizabethpol [Kirovabad], 5.IV.1882, Pichler (W, K)". According to Art. 9.17 of the ICN (McNeill et al. 2012) the Dudley's lectotypification must be accepted (first-step) but may be narrowed to a single one of the specimens of the gathering (second-step). Rechinger (1968) selected the specimen housed in W as a lectotype.

Fig. 2. Distribution map of *Alyssum desertorum* in Italy (circles).

Distribution in Italy (Fig. 2): Abruzzo region (central Italy), municipality of L'Aquila in the territory of National Park of Gran Sasso and Laga Mountains and surrounding areas. The previous record from Genova (north-western Italy) (Fiori 1924 as *A. minimum* Willd.) is erroneous and no specimens from this area were found.

Specimina visa: Italy: Abruzzo. Orto Botanico di S. Colombo (Barisciano, L'Aquila), incolti aridi, 1100 m, 18 April 2013, *F. Bartolucci s.n.* (APP n. 52960); da Fonte Vedice lungo la strada sterrata per Filetto (Barisciano, L'Aquila), incolto arido, 1200 m, 20 April 2013, *F. Conti s.n.* (APP n. 55127); presso Barisciano in loc. La Cona, incolti al margine stradale, 860 m, 20 April 2013, *F. Conti s.n.* (APP n. 55194); loc. Urràino (Caporciano, L'Aquila), campi, 730 m, 19 April 2013, *F. Conti s.n.* (APP.n. 55197).

Additional specimens examined: [Azerbaijan] Baku, 13.IV.1882, *Pichler T. s.n.* ex Iter persicum D.ris J. E. Polak (WU-0043211! image is available at http://herbarium.univie.ac.at/database/detail.php?ID=119433, WU-0043212! image is available at http://herbarium.univie.ac.at/database/detail.php?ID=119432).

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References

Arrigoni, P. V., 2010: Flora dell'Isola di Sardegna, II. Carlo Delfino editore, Sassari.

Ball, P. W., Dudley, T. R., 1996: *Alyssum* L. In: Tutin, T. G., Heywood, V. H., Burges, N. A., Valentine, D. H., Moore, D. M. (eds.), Flora Europaea 1, 2nd ed., 359–369. Cambridge University Press. Cambridge.

Bartolucci, F., Conti, F., 2013: Taxonomic notes on *Geum micropetalum* Gasp. and *Geum heterocarpum* Boiss. (Rosaceae) in Italy. Plant Biosystems 147, 806–811.

Bartolucci, F., Conti F., 2014: Typification, morphological characterization and distribution of *Knautia gussonei* (Caprifoliaceae). Phytotaxa 167, 104–110.

Bartolucci, F., Peruzzi, L., 2007: Distribuzione del genere *Gagea* Salisb. (Liliaceae) nell'Appennino centro-settentrionale. Biogeographia 28, 205–238.

Bartolucci, F., Conti, F., Tinti, D., Scassellati, E., Di Santo, D., 2007: La flora del Parco Nazionale del Gran Sasso e Monti della Laga. Biogeographia 28, 39–44.

Bartolucci, F., Ranalli, N., Bouvet, D., Cancellieri, L., Fortini, P., Gestri, G., Di Pietro, R., Lattanzi, E., Lavezzo, P., Longo, D., Marsili, S., Peccenini, S., Peruzzi, L., Salerno, G., Soldano, A., Tilia, A., Turcato, C., Viciani, D., Wagensommer, R.P., Conti, F. 2012: Contributo alla conoscenza floristica del settore settentrionale del Gran Sasso d'Italia (Parco Nazionale del Gran Sasso e Monti della Laga) (Abruzzo): resoconto dell'escursione del Gruppo di Floristica (S.B.I.) nel 2010. Informatore Botanico Italiano 44, 355–385.

Bertolli, A., Prosser, F. (eds.), 2014: Segnalazioni floristiche tridentine IX. Annali dei Musei Civici-Rovereto. Sezione Archeologia, Storia, Scienze Naturali 29, 131–174.

Cecchi, L., Selvi, F., 2013: Notulae: 2024–2026. In: Barberis G., Nepi C., Peccenini S., Peruzzi L. (eds.), Notulae alla checklist della flora vascolare italiana: 16 (2000 – 2026). Informatore Botanico Italiano 45, 308.

Cheo, T.-Y., Lu, L., Yang, G., Al-Shehbaz, I. A., Dorofeev, V., 2001: *Alyssum* Linnaeus. In: Zheng-Yi, W., Raven, P. H. (eds.), Flora of China, Brassicaceae through Saxifragaceae 8, 59–63. Science Press/Missouri Botanical Garden Press, Bejing/St. Louis.

Conti, F., 2007: Morphometric study and taxonomy of *Genista pulchella* Vis s.l. (Fabaceae), a south european species. Botanical Journal of the Linnean Society 153, 245–254.

Conti, F., 2010: A new species of *Lathyrus* L. (Fabaceae) from Central Apennine (Italy). Plant Biosystems 144, 814–818.

Conti, F., Peruzzi, L., 2006: *Pinguicula* (Lentibulariaceae) in Central Italy: taxonomic study. Annales Botanici Fennici 43, 321–337.

Conti, F., Tinti, D., 2008: Il Lago di Campotosto e la sua Flora. Litografia Brandolini. Sambuceto di S. Giovanni Teatino (Chieti).

Conti, F., Tinti, D., 2012: Flora vascolare della Riserva Naturale "Gole del Sagittario" (Abruzzo). Bollettino del Museo Civico di Storia Naturale di Verona 36, 3–30.

Conti, F., Abbate, G., Alessandrini, A., Blasi, C. (eds.), 2005: An annotated checklist of the Italian vascular flora. Palombi Editori, Roma.

Conti, F., Bartolucci, F., Catonica, C., D'orazio, G., Londrillo, I., Manzi, A., Tinti, D., 2006: Aggiunte alla flora d'Abruzzo. II contributo. Informatore Botanico Italiano 38, 113–116.

Conti, F., Alessandrini, A., Bacchetta, G., Banfi, E., Barberis, G., Bartolucci, F., Bernardo, L., Bonacquisti, S., Bouvet, D., Bovio, M., Brusa, G., Del Guacchio, E., Foggi, B., Frattini, S., Galasso, G., Gallo, L., Gangale, C., Gottschlich, G., Grünanger, P., Gubellini, L., Iiriti, G., Lucarini, D., Marchetti, D., Moraldo, B., Peruzzi, L., Poldini, L., Prosser, F., Raffaelli, M., Santangelo, A., Scassellati, E., Scortegagna, S., Selvi, F., Soldano, A., Tinti, D., Ubaldi, D., Uzunov, D., Vidali, M., 2007: Integrazioni alla checklist della flora vascolare italiana. Natura Vicentina 10, 5–74.

Conti, F., Bartolucci, F., Manzi, A., Miglio, M., Tinti, D., 2008: Aggiunte alla Flora d'Abruzzo: III contributo. Annali del Museo Civico di Rovereto, Sezioni: Architettura, Storia, Scienze Naturali 23, 127–140.

Conti, F., Bartolucci, F., Iocchi, M., Tinti, D., 2011: Atlas of the pteridological knowledge of Abruzzo (Central Italy). Webbia 66, 251–305.

Conti, F., Bartolucci, F., Tomović, G., Lakušić, D., 2012: *Jacobaea vulgaris* subsp. *gotlandica* (Compositae), new for Italy and Montenegro. Botanica Serbica 36, 145–147.

Conti F., Uzunov D., Bartolucci F., 2015: Correction of the typification of *Corydalis solida* var. *bracteosa* and lectotypification of *C. densiflora* (Papaveraceae). Phytotaxa 197, 222–224.

Di Pietro, R., Tondi, G., Minutillo, F., Bartolucci, F., Tinti, D., Cecchetti, S., Conti, F., 2008: Ulteriore contributo alla conoscenza della flora vascolare dei Monti della Laga (Appennino centrale). Webbia 63, 55–67.

Dudley, T. R., 1962: Some new Alyssa from the near east. Notes from the Royal Botanic Garden, Edinburgh 24, 157–165.

Dudley, T. R., 1964: Synopsis of the genus *Alyssum*. Journal of the Arnold Arboretum 45, 358–373.

Dudley, T. R., 1965: *Alyssum* L. In: Davis, P. H. (ed.), Flora of Turkey and East Aegean Islands 1, 362–409. Edinburgh, Edinburgh University Press.

Dudley, T. R. 1968: *Alyssum* (Cruciferae) introduced in North America. Rhodora 70, 298–300.

Fiori, A., 1924: Nuova Flora Analitica d'Italia 1(4). Tipografia di M. Ricci, Firenze.

Greuter, W., Burdet, M. M., Long, G., 1986: Med-Checklist 3. Conservatoire et jardin botaniques de la Ville de Genève, Geneve.

Hartvig, P., 2002: *Alyssum* L. In: Strid, A., Tan, K. (eds.), Flora Hellenica 2, 199–224. A.R.G. Gantner, Ruggell.

Küpfer, P., 1974: Recherches sur les liens de párente entre la flore orophyle des Alpes et celle des Pyrénées. Boisseria 23, 1–322.

Li, Y., Kong, Y., Zhang, Z., Yin Y., Liu, B., Lv, G., Wang, X., 2014: Phylogeny and biogeography of *Alyssum* (Brassicaceae) based on nuclear ribosomal ITS DNA sequences. Journal of Genetics 93, 313–323.

Magauer, M., Schönswetter, P., Jang, T.-S., Frajman, B., 2014: Disentangling relationships within the disjunctly distributed *Alyssum ovirense*/*A. wulfenianum* group (Brassicaceae), including description of a novel species from the north-eastern Alps. Botanical Journal of the Linnean Society 176, 486–505.

Marhold, K., 2011: Brassicaceae. In: Euro+Med Plantbase – the information resource for Euro-Mediterranean plant diversity. Retrieved November 13, 2014 from http://www.emplantbase.org/home.html.

McNeill, J., Barrie, F. R., Buck, W. R., Demoulin, V., Greuter, D. L., Hawksworth, D. L., Herendeen, P. S., Knapp, S., Marhold, K., Prado, J., Proud'Homme van Reine, W. F., Smith, J. F. & Wiersema, J. H. (eds.), 2012: International code of nomenclature for algae, fungi and plants (Melbourne Code): Adopted by the Eighteenth International Botanical Congress, Melbourne, Australia, July 2011. Regnum Vegetabile 154, 1–274.

Minutillo, F., Tondi, G., Conti, F., 2010: *Sedum nevadense* (Crassulaceae), new for the italian flora. Flora Mediterranea 19, 115–117.

Peruzzi, L., Bartolucci, F. 2006: *Gagea luberonensis* J.-M. Tison (Liliaceae) new for the Italian flora. Webbia 61, 1–12.

Peruzzi, L., Bartolucci, F., Frignani, F., Minutillo, F., 2007: A new species of *Gagea* Salisb. sect. *Gagea* (Liliaceae) from C Italy: *G. tisoniana* sp. nov. Botanical Journal of the Linnean Society 155, 337–347.

Peruzzi, L., Bartolucci, F., Astuti, G., Bernardo, L., Conti, F., 2013: *Knautia dinarica* (Caprifoliaceae): taxonomy, typification and update of the Italian distribution. Phytotaxa 166, 34–40.

Peruzzi, L., Conti, F., Bartolucci, F., 2014: An inventory of vascular plants endemic to Italy. Phytotaxa 168, 1–75.

Peruzzi, L., Domina, G., Bartolucci, F., Galasso, G., Peccenini, S., Raimondo, F.M., Albano, A., Alessandrini, A., Banfi, E., Barberis, G., Bernardo. L., Bovio, M., Brullo, S., Brundu, G., Brunu, A., Camarda, I., Carta, L., Conti, F., Croce, A., Iamonico, D., Iberite, M., Iiriti, G., Longo, D., Marsili, S., Medagli, P., Pistarino, A., Salmeri, C., Santangelo, A., Scassellati, E., Selvi, F., Soldano, A., Stinca, A., Villani, M, Wagensommer, R. P. & Passalacqua, N.G. (2015) An inventory of the names of vascular plants endemic to Italy, their loci classici and types. Phytotaxa 196, 1–217.

Plazibat, M., 2009: A short synopsis of the tribe *Alysseae* (Brassicaceae) in Croatia with some taxonomic novelties. Natura Croatica 18, 401–426.

Rechinger, K. H., 1968: Flora Iranica 57: 155−156. Graz, Akademische druck- u Verlagsanstalt.

Rešetnik, I., Satovic, Z., Schneeweiss, G. M., Liber, Z., 2013: Phylogenetic relationships in Brassicaceae tribe *Alysseae* inferred from nuclear ribosomal and chloroplast DNA sequence data. Molecular Phylogenetics and Evolution 69, 772–86.

Schneeweiss, G. M., 2000: Die kurzlebigen Arten der Gattung *Alyssum* (Brassicaceae) in Österreich. Annalen des Naturhistorischen Museums in Wien 102 B, 389–407.

Španiel, S., Marhold, K., Filová, B., Zozomová-Lihová, J., 2011a: Genetic and morphological variation in the diploid-polyploid *Alyssum montanum* in Central Europe: taxonomic and evolutionary considerations. Plant Systematics and Evolution 294, 1–25.

Španiel, S., Marhold, K., Passalacqua, N.G., Zozomová-Lihová, J., 2011b: Intricate variation patterns in the diploid-polyploid complex of *Alyssum montanum-A. repens* (Brassicaceae) in the Apennine Peninsula: evidence for long-term persistence and diversification. American Journal of Botany 98, 1887–1904.

Španiel, S., Zozomová-Lihová, J., Passalacqua, N.G., Marhold, K., 2012: Infraspecific classification of *Alyssum diffusum* (Brassicaceae) in Italy. Willdenowia 42, 37–56.

Stapf, T., 1886: Die botanischen Ergebnisse der Polak'schen Expedition nach Persien im Jahre 1882. Denkschriften der Kaiserlichen Akademie der Wissenschaften 51, 302.

Thiers, B. 2015: Index herbariorum, a global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Retrieved February 2, 2015 from http://sweetgum.nybg.org/ih/.

Warwick, S. I., Sauder, C. A., Al-Shehbaz, I. A., 2008: Phylogenetic relationships in the tribe *Alysseae* (Brassicaceae) based on nuclear ribosomal ITS DNA sequences. Canadian Journal of Botany 86, 15–336.