

## A SHORT SYNOPSIS OF THE TRIBE *ALYSSEAE* (*BRASSICACEAE*) IN CROATIA WITH SOME TAXONOMIC NOVELTIES

MIŠKO PLAZIBAT

Department of Botany, Faculty of Science, University of Zagreb,  
Marulićev trg 20/II, HR-10000 Zagreb, Croatia (e-mail: misko@lipa.botanic.hr)

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The tribe *Alyseae* consists of a significant group of plants found in the Croatian native flora. It comprises seven genera: *Alyssoides*, *Alyssum*, *Aurinia*, *Berteroa*, *Clypeola*, *Degenia* and *Fibigia* with a certain number of various endemics. Relationships, distribution and taxonomic limits of the taxa from the genera *Alyssum* and *Aurinia* were unclear and controversial as a result of polymorphism. Therefore, revision and analysis of comprehensive plant material has been done using a biosystematic and chemotaxonomical approach. Differences between taxa from the genera *Alyssum* and *Aurinia* are clearly detected. In this study two new varieties are described: *Alyssum desertorum* Stapf var. *socolacicum* Plazibat, var. nov. and *A. serpyllifolium* Desf. var. *metajnae* Plazibat, var. nov. The following new combinations are proposed: *Aurinia leucadea* (Guss.) K. Koch subsp. *media* (Host) Plazibat, stat. et comb. nov., *Aurinia leucadea* subsp. *scopulorum* (Ginzb.) Plazibat, comb. nov., *A. petraea* (Ard.) Schur subsp. *corymbosa* (Griseb.) Plazibat, stat. et comb. nov. and *A. petraea* subsp. *microcarpa* (Vis.) Plazibat, comb. nov. Presented revision shows that twenty three taxa of the tribe *Alyseae* grow in Croatia: *Alyssoides utriculata*, *Alyssum alyssoides*, *A. montanum* subsp. *gmelinii*, *A. montanum* subsp. *molliusculum*, *A. montanum* subsp. *montanum*, *A. montanum* subsp. *pagense*, *A. murale*, *A. repens* subsp. *transsilvanicum*, *A. serpyllifolium* var. *metajnae*, *A. simplex*, *A. strigosum*, *Aurinia leucadea* subsp. *leucadea*, *A. leucadea* subsp. *media*, *A. leucadea* subsp. *scopulorum*, *A. petraea* subsp. *microcarpa*, *A. saxatilis* subsp. *orientalis*, *A. saxatilis* subsp. *saxatilis*, *A. sinuata*, *Berteroa incana*, *B. mutabilis*, *Clypeola jonthlaspi* subsp. *jonthlaspi*, *Degenia velebitica* and *Fibigia triquetra*.

**Key words:** *Alyseae*, *Brassicaceae*, taxonomy, nomenclature, Croatia

**Plazibat, M.: Kratki prikaz tribusa *Alyseae* (*Brassicaceae*) u Hrvatskoj s nekim taksonomskim novostima. *Nat. Croat.*, Vol. 18, No. 2, 401–426, 2009, Zagreb.**

Tribus *Alyseae* obuhvaća jednu od značajnijih skupina biljaka hrvatske flore u kojoj se nalaze rodovi *Alyssoides*, *Alyssum*, *Aurinia*, *Berteroa*, *Clypeola*, *Degenia* i *Fibigia* s određenim brojem endema različitog taksonomskog stupnja. Unutar rodova *Alyssum* i *Aurinia* bilo je dosta neriješenih problema povezanih s velikim polimorfizmom morfoloških svojstava zbog kojih su postojala raznovrsna gledišta o statusu, broju i rasprostranjenju nekih svojti. Zbog toga je izvršena revizija i obrada opsežnog biljnog materijala pomoću biosistematskih i kemotaksonomskih metoda. Utvrđene su jasne razlike između pojedinih svojti kod rodova *Alyssum* i *Aurinia*. U radu su opisane dvije nove varijacije: *Alyssum desertorum* Stapf var. *socolacicum* Plazibat, var. nov. i *A. serpyllifolium* Desf. var. *metajnae* Plazibat, var. nov. Predložene su slijedeće preinake: *Aurinia leucadea* (Guss.) K. Koch subsp.

*media* (Host) Plazibat, stat. et comb. nov., *A. leucadea* subsp. *scopulorum* (Ginzb.) Plazibat, comb. nov., *A. petraea* (Ard.) Schur subsp. *corymbosa* (Griseb.) Plazibat, stat. et comb. nov. i *A. petraea* subsp. *microcarpa* (Vis.) Plazibat, comb. nov. Revizija pokazuje da u Hrvatskoj rastu 23 svoje tribusa *Alysseae*: *Alyssoides utriculata*, *Alyssum alyssoides*, *A. montanum* subsp. *gmelinii*, *A. montanum* subsp. *molliusculum*, *A. montanum* subsp. *montanum*, *A. montanum* subsp. *pagense*, *A. murale*, *A. repens* subsp. *transsiloanicum*, *A. serpyllifolium* var. *metajnae*, *A. simplex*, *A. strigosum*, *Aurinia leucadea* subsp. *leucadea*, *A. leucadea* subsp. *media*, *A. leucadea* subsp. *scopulorum*, *A. petraea* subsp. *microcarpa*, *A. saxatilis* subsp. *orientalis*, *A. saxatilis* subsp. *saxatilis*, *A. sinuata*, *Berteroa incana*, *B. mutabilis*, *Clypeola jonthlaspi* subsp. *jonthlaspi*, *Degenia velebitica* i *Fibigia triquetra*.

**Ključne riječi:** *Alysseae*, *Brassicaceae*, taksonomija, nomenklatura, Hrvatska

## INTRODUCTION

*Brassicaceae* (= *Cruciferae*), or mustard family, is a monophyletic group of about 338 genera and some 3709 species in 27 properly defined tribes of worldwide distribution, with centre being in temperate regions of the northern hemisphere, especially in the Irano-Turanian, Mediterranean, and Saharo-Sindian regions. The Latin, frequently used and older name of the family *Cruciferae* is derived from their 4 petals resembling a cross (cruciform). Crucifer species have radiated to many habitats, and are adapted to a wide range of biotic environments (DE CANDOLLE, 1821; BENTHAM & HOOKER, 1862; PRANTL, 1891; HAYEK, 1911; SCHULZ, 1936; JANCHEN, 1942; HEDGE, 1976; APPEL & AL-SHEHBAZ, 2002; AL-SHEHBAZ *et al.*, 2006).

Taxonomically the *Brassicaceae* present a large and rather homogeneous family, and problems of classification emerge from two levels: 1. on the suprageneric level, natural links within the family cause difficulties in grouping of the genera into tribes and subtribes; 2. on the generic level, there are taxonomic problems in the differentiation of the species within the group of closely related species in large genera (ANCHEV & DENEVA, 1997; ABDEL KHALIK *et al.*, 2002). Taxonomic structure of the whole family is characterized by a large number of monotypic and small genera, mostly with clearly defined taxonomic limits. Tribal divisions are controversial, ranging from three to 27 tribes (APPEL & AL-SHEHBAZ, 2002; AL-SHEHBAZ *et al.*, 2006; BAILEY *et al.*, 2006; AL-SHEHBAZ & WARWICK, 2007; WARWICK *et al.*, 2008). *Brassicaceae* are the largest family of the *Brassicales*, an order characterized by the presence of glucosinolates, which contain sulfur. When these compounds react with myrosinase (contained in specialized myrosin cells) they release hot, pungent mustard oils (JUDD *et al.*, 1999; BREMER *et al.*, 2003). It includes the thale cress, *Arabidopsis thaliana* (L.) Heynh., the standard model organism in the research of the molecular biology of the flowering plants (SOMERVILLE & MEYEROWITZ, 2002).

In the flora of Croatia *Brassicaceae* are one of the ten largest plant families, represented by some 180 species with a great number of intraspecific categories (SCHLOSSER & VUKOTINOVIĆ, 1869; TRINAJSTIĆ, 1983; BALL *et al.*, 1993; DOMAC, 1994; JALAS & SUOMINEN, 1994; JALAS *et al.*, 1996; O'KANE & AL-SHEHBAZ, 1997; PLAZIBAT, 1997, 2005; KUČERA & MARHOLD, 2006).

The tribe *Alysseae*, which includes some significant plants in the Croatian flora, is of Eurasian and North African distribution, and only one species, *Alyssum obovatum* (C. A. Mey.) Turcz., extends its native range from northern and central Asia to northern North America (SCHULZ, 1936; DUDLEY & CULLEN, 1965; AL-SHEHBAZ *et al.*, 2006;

WARWICK *et al.*, 2008). The tribe probably consists of more than 260 species, from the following genera: *Alyssoides* Mill. (2 spp.), *Alyssum* L. (ca. 195 spp.), *Aurinia* Desv. (9 spp.), *Berteroa* DC. (5 spp.), *Bornmuellera* Hausskn. (7 spp.), *Clastopus* Bunge ex Boiss. (2 spp.), *Clypeola* L. (9 spp.), *Degenia* Hayek (1 sp.), *Fibigia* Medik. (13 spp.), *Galitzkya* V. V. Botschantz. (3 spp.), *Hormathophylla* Cullen & T. R. Dudley (10 spp.), *Physoptychis* Boiss. (2 spp.), and *Straussiella* Hausskn. (1 sp.) (WARWICK *et al.*, 2006). *Farsetia* Turra (27 spp.) and *Lobularia* Desv. (4 spp.) are assigned to the recently described tribe *Malcolmieae* (AL-SHEHBAZ & WARWICK, 2007; WARWICK *et al.*, 2008). The latest data on *Asperuginoides* Rauschert (1 sp.) and *Didymophysa* Boiss. (2 spp.) support their exclusion from the *Alyseae*, but their phylogenetic positions are not resolved (or well-supported) (WARWICK *et al.*, 2008). *Alyseae* are characterized by having stellatae trichomes, latiseptate or terete (rarely angustiseptate) mostly few-seeded silicles, usually appendaged filaments, often winged seeds, and basic chromosome number of primarily  $x=8$ , though lower and higher aneuploid series exist, but are rare (CONTANDRIOPOULOS, 1969; AL-SHEHBAZ, 1987; EL NAGGAR & EL HADIDI, 1998).

Trichome morphology has been used by many authors as a character in the classification of the *Brassicaceae*, especially in the tribe *Alyseae* with the largest genus *Alyssum*, where trichomes are widely present (ROLLINS & BANERJEE, 1976; ORAN, 1996; ANČEV, 2000; ABDEL KHALIK, 2005). The fruits are silicles of different shapes, but change from flattened to globose. The seed number alone must be used with caution and not as an a reliable or exclusive character because of the great variability in each specimen and each taxon.

The Irano-Turanian phytogeographical region, known for its great number of endemic *Brassicaceae* genera (HEDGE, 1976) was probably an ancient origin centre for *Alyssum*, as there 67 of its species occur; another 52 species have areas restricted to the East Mediterranean (DUDLEY, 1964b; GREUTER *et al.*, 1986). In Europe, 70 species of *Alyssum* are found of which 32 are European endemics. This endemism is partly centered on the Balkan Peninsula, where the genus is represented by 45 species including 17 Balkan endemics (BALL & DUDLEY, 1993; JALAS *et al.*, 1996). Two of seven genera present in Croatia from the tribe *Alyseae*, *Alyssum* and *Aurinia*, are taxonomically difficult to study and were investigated in more detail than others (PLAZIBAT, 2005).

## MATERIALS AND METHODS

The paper represents a part of the author's PhD Thesis in which morphological diversity, systems of classification, older literature, endemism, and distribution of the Croatian taxa of the tribe *Alyseae* are discussed (PLAZIBAT, 2005). The revision is based on field studies and collecting of plants in various parts of Croatia, on cultivated material grown in the Botanical garden of the Department of Botany, Faculty of Science, University of Zagreb from seeds of different species which were collected during the fieldwork or obtained by loan from Banco de Germoplasma, Jardín Botánico de Córdoba; Botanischer Gärten Berlin-Dahlem; Botanischer Gärten der Universität (TH), Karlsruhe; Botanischer Gärten Göttingen; Botanischer Gärten Marburg; Botanischer Gärten/Naturschutzzentrum Chemnitz; Botanischer Gärten und Alpengärten, Universität Innsbruck; Bundesgärten Wien, Alpengärten im Belvedere,

Wien; Civico Orto Botanico, Trieste; Giardino Botanico Alpino Rezia; Göteborgs Botaniska Trädgård; Hortus Botanicus Ljubljana; Hortus Botanicus Universitatis Iași; Jardin botanique Nantes Mairie; Jardin botanique national de Belgique, Meise; »Julia & Alexander N. Diomides« Botanic Garden; Muséum d'Histoire Naturelle-Cultures, Paris; Orto Botanico dell'Università di Siena; Orto Botanico di Palermo and Orto Botanico di Pisa. In consistence with Index of exsiccatae (cf. PLAZIBAT, 2005: p. 33–154) the examined specimens of over one thousand herbarium sheets are deposited in the herbaria ZA, ZAHO and FI (abbreviations according to HOLMGREN & HOLMGREN, 1998). A comprehensive plant material was studied by using the scanning electron microscope (SEM) and chemotaxonomical approach by TLC and HPLC coupled to a photo diode array detector and a mass spectrometer (BUCAR *et al.*, 2005), and that will be the subject of a separate paper. Keys with combination of vegetative and fruit characteristics of the taxa of tribe *Alysseae* in Croatia are provided, notes on their distribution, comments, selected synonymies, some taxonomic novelties, and photographs of representative specimens are presented.

## RESULTS

### A review of present and dubious taxa of the tribe *Alysseae* in Croatia

**Brassicales** Bromhead, Edinburgh New Philos. 24: 416 (1838).

**Brassicaceae** Burnett, Outlines Bot. 1123 (1835).

= *Cruciferae* Juss., Gen. Pl. 237 (1789) [nom. alt.].

***Alysseae*** Godr. in Gren. & Godr., Fl. France 1: 112 (1848).

= »*Alyssineae*« DC., Mém. Mus. Hist. Nat. (Paris) 7: 231 (1821); Syst. Nat. 2: 147, 280 (1821).

Key to the genera of the tribe *Alysseae*

- |  |                   |
|--|-------------------|
| 1a Inner sepals are strongly saccate   | 2                 |
| b Inner sepals are not strongly saccate  | 4                 |
| 2a Silicula strongly flattened, elliptical or elliptic-oblong, sessile   | <i>Fibigia</i>    |
| b Silicula strongly inflated, ovoid-globose or ellipsoidal   | 3                 |
| 3a Silicula ovoid-globose with stiff, green valves, stipitate  | <i>Alyssoides</i> |
| b Silicula ellipsoidal, silver-grey, covered with dense, stellate hairs  | <i>Degenia</i>    |
| 4a Petals yellow   | 5                 |
| b Petals white or pale yellow, sometimes becoming reddish  | 7                 |
| 5a Silicula globose, flattened, indehiscent, pendulous with a conspicuous membranous wing  | <i>Clypeola</i>   |
| b Silicula on erect pedicel, dehiscent, latiseptate (compressed parallel to the septum)  | 6                 |
| 6a Basal leaves entire or sinuate-dentate, up to 10 cm long, considerably larger than cauline, silicula (4–14 mm), globose, ellipsoidal or ovate, glabrous, flat or diverse inflated, seeds broadly winged, perennials or semishrubs | <i>Aurinia</i>    |

b All leaves are of similar feature and length, up to 4 cm, silicles 2–4 mm wide, valves usually densely pubescent, seeds narrowly winged, annuals, biennials, herbaceous perennials, rarely small shrubs *Alyssum*

7 Petals deeply bifid, over 1/3 of the length, perennials covered with stellate hairs, seeds 2–6 in each loculus *Berteroa*

*Alyssoides* Mill., Gard. Dict., ed. 4 (1754). Pages in this book are not enumerated, names of genera and other taxa are arranged alphabetically.

*Alyssoides utriculata* (L.) Medik., Philos. Bot. 1: 189 (1789).

= *Alyssum utriculatum* L., Mantissa: 92 (1767) [basion.]. – Lectotypus (AL-SHEHBAZ & TURLAND in CAFFERTY & Jarvis 2002: 531): Herb. Linn. no. 828.22 (LINN). Description according to the material from Greece.

= *Vesicaria utriculata* (L.) Lam. f. *psilocalyx* Beck, Glasn. Zemaljsk. Muz. Bosni Hercegovini 28: 133 (1916).

= *Alyssoides utriculata* (L.) Medik. f. *psilocalyx* (Hayek) V. Nikolić, Fl. SR Srbije IX (Dodatak): 78 (1977).

= *Alyssoides utriculata* (L.) Medik. f. *psilocalyx* (Beck) Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 4 (1982).

Distribution in Croatia: coastal areas of S Croatia, Lika.

General distribution: SW and W areas of the Central Alps, Apennines, Balkan Peninsula, S Romania and N Anatolia.

*Alyssum* L., Sp. Pl.: 650 (1753); Gen. Plant. ed. 5: 722 (1754).

Key to the species of the genus *Alyssum*

- |  |                      |
|--|----------------------|
| 1a Annuals without non-flowering rosettes or short stems   | 2                    |
| b Biennials or perennials with non-flowering rosettes or short stems                                       | 6                    |
| 2a Ovary and silicula glabrous   | <i>A. desertorum</i> |
| b Ovary and silicula with different types of indumentum  | 3                    |
| 3a Sepals persistent, prominent filiform nectaries at the base of the stamens                              | <i>A. alyssoides</i> |
| b Sepals deciduous, nectaries very small, scarcely visible   | 4                    |
| 4a Silicula with only stellate hairs   | <i>A. simplex</i>    |
| b Silicula with unbranched, bifid and stellate hairs   | 5                    |
| 5a Silicula with nearly equal bifid branches, and stellate hairs   | <i>A. strigosum</i>  |
| b Silicula with stellate hairs and patent, tubercle-based, unbranched or bifid hairs with unequal branches | <i>A. hirsutum</i>   |
| 6a Ovules and seeds 1 in each loculus  | 7                    |
| b Ovules and seeds 2 in each loculus   | 9                    |
| 7a Silicula is not densely pubescent, surface of valves is visible   | <i>A. murale</i>     |
| b Silicula is densely pubescent, surface of valves is not visible  | 8                    |

- 8a Leaves of the non-flowering stems are flat *A. tortuosum*  
 b Leaves of the non-flowering stems are plicate *A. serpyllifolium*
- 9a Silicula is distinctly emarginate *A. emarginatum*  
 b Silicula is not distinctly emarginate 10
- 10a Silicula with unbranched, bifid and stellate hairs *A. austrodalmaticum*  
 b Silicula only with stellate hairs 11
- 11a Flowering and sterile shoots are creeping *A. ovirens*  
 b Flowering and sterile shoots are erect or elevated, not creeping 12
- 12a Pedicels are with appressed stellate hairs, and sometimes with long, bifid hairs, the feature is not bristling *A. montanum*  
 b Pedicels are with stellate hairs with irregular, not appressed rays and with bifid hairs, the feature is bristling 13
- 13a Middle leaves of stem are over 1 cm wide, trichomes with 5–7 rays *A. wierzbickii*  
 b Middle leaves of stem are under 1 cm wide, trichomes with 8 and more rays *A. repens*

*Alyssum alyssoides* (L.) L., Syst. Nat. ed. 10, 2: 1130 (1759). – Neotypus (POLATSCHEK in CAFFERTY & JARVIS 2002: 532): France; Montpellier, Herb. Endl. *Alyssum calycinum*, Endlicher s.n. (W). Lectotypus [(T. R. DUDLEY in J. Arnold Arb. 45: 63, 1964): Herb. Clifford 329, Clypeola no. 2 (BM)] is in the contrary with Codex (Art. 8.1).

- = *Clypeola alyssoides* L., Sp. Pl.: 652 (1753) [basion.]. »Habitat in Austria, Gallia«.  
 = *Alyssum calycinum* L., Sp. Pl. ed. 2: 908 (1763) [nom. illeg.].  
 = *A. phymatocarpum* Schloss. & Vuk., Syll. Fl. Croat. 156 (1857).  
 = *A. parviflorum* Schloss. & Vuk., in Exsicc., Herb. Croat. (ZA).  
 = *A. Schlosseri* Heuff., in Exsicc., Herb. Croat. (ZA).

Distribution in Croatia: common in coastal and montane zones, rare elsewhere.

General distribution: widespread in Europe, N Africa and W Asia, naturalized or casual elsewhere.

*A. austrodalmaticum* Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 7–8 (1982); Anal. Fl. Jugosl. 2 (3): 308 (1983).

Holotypus: Hb. Dr Ivo Trinajstić, ZA. No. 11.678. Leg. Dr Ivo Trinajstić, 30. III. 1969.

Distribution in Croatia: narrowly endemic to S Dalmatia.

*Remarks:* Very dubious species. Type material is not deposited at ZA!

- A. desertorum* Stapf, Denkschr. Kaiserl. Akad. Wiss. Wien Math.-Naturwiss. Kl. 51: 302 (1886) – Lectotypus (DUDLEY in DAVIS 1965: 376): »Caucasus, Azerbaydzan, in deserto prope Jelizabethpol [Kirovabad]«, 5 April 1882, Pichler s. n. (W, iso-K).  
 = *A. desertorum* Stapf var. *socolacicum* Plazibat, var. nov.; Flora macedonica: Nidže planina, Sokolac, 09. 08. 1937., leg. I. Horvat. **Differential diagnosis:** *Typo habitu et siliculorum forma similis, sed a typo et formae ceterae pleno superior, pluriramoso,*



Fig 1. *Alyssum desertorum* var. *socoladicum* (ZAHO)

*caulibus fructiferis arcuatis vel adscendentibus supra 30 cm longis distinguitur.* It differs from other forms of the species by luxuriant feature and fruiting stems over 30 cm in length. Holotype, designated here; No. 0282-295 (Fig. 1); Herbarium Ivo et Marija Horvat (ZAHO).

Distribution in Croatia: Plase near Rijeka (only one verified record in the Schlosser's collection).

General distribution: eastern part of Central Europe, SE Europe and SW Asia to Afghanistan.

*A. emarginatum* Zahlbr. ex Vis., Fl. Dalm. 3: 117 (1852).

This taxon is yet unexplained. According to the description in VISIANI (1852) it has some characteristics of *A. montanum* and *A. simplex* as well. It was not possible to find anything similar in the surroundings of Šibenik (MILOVIĆ, 1983; 2002) which is signified as the type locality of this plant. *A. emarginatum* probably belongs to the complex of *A. simplex*.

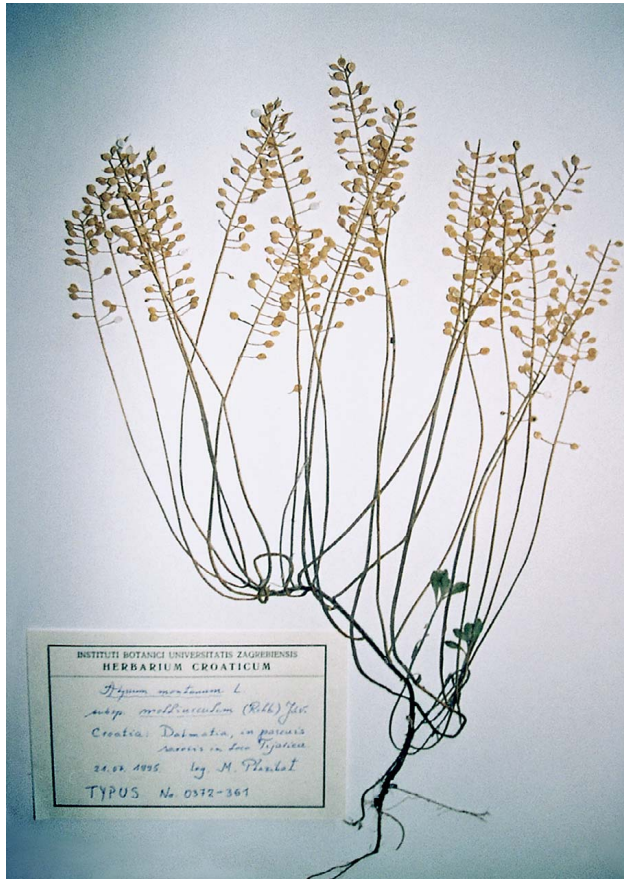


Fig 2. *Alyssum montanum* subsp. *molliusculum* (ZA)

*A. hirsutum* M. Bieb., Fl. Taur.-Cauc. 2: 106 (1808). Typus: »In Tauriae et Iberiae campis apricis«, M. Bieb., LE.

Distribution in Croatia: surroundings of Zagreb and Mt Kalnik (on two dubious herbarium sheets in the Schlosser's collection).

General distribution: SE Europe, Caucasus and Asia Minor.

*A. montanum* L., Sp. Pl.: 650 (1753), »Habitat in Helvetia«.

*Remarks:* The mountain madwort (*A. montanum*) is a complex species which deserves special attention as it contains diploid and other forms of ploidy, as well as perennial and short-living races. In the flora of Croatia following intraspecific taxa were found to grow:

*A. montanum* subsp. *gmelinii* (Jord.) Hegi & Em. Schmid in Hegi, Ill. Fl. Mitt.-Eur. 4 (1): 451 (1919).

= *A. arenarium* C. C. Gmel., Fl. Bad. 3: 36 (1808).





Fig 3. *Alyssum montanum* subsp. *montanum* in its natural habitat near the village of Smerovišće

**Differential diagnosis:** Raceme elongated in fruit. Non-flowering short stems without leaves arranged in rosettes.

Distribution in Croatia: Podravina and Slavonia regions.

General distribution: Central and E Europe.

*A. montanum* subsp. *molliusculum* (Rchb.) Jáv., Magyar Fl. 1: 441 (1925).

= *A. montanum* L. –  $\gamma$  *molliusculum*: tomento laxo molli. Rchb., Fl. Germ. Excurs.: 670 (1832) [basion.].

= *A. litorale* Trinajstić f. *molliusculum* (Rchb.) Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 7 (1982).

**Differential diagnosis:** Raceme elongated in fruit. Non-flowering short stems with leaves arranged in rosettes. Pedicels with appressed stellate and erect bifid hairs. Typus (hic designatus): In pascuis saxosis in loco Tijarica, Dalmatia, Croatia, 21. 07. 1995., leg. M. Plazibat, No. 0372-361 (Fig. 2), Herbarium Croaticum (ZA).

Distribution in Croatia: from Lika to S Dalmatia.

General distribution: Dinaric Alps and Šara-Pindus mountain range.

***A. montanum* subsp. *montanum***

= *A. samoborensis* Horvat ex Kušan, Acta Bot. Croat. 29: 183 (1970).

**Differential diagnosis:** Raceme elongated in fruit. Pedicels with appressed stellate and without erect bifid hairs. Typus (hic designatus): In montosis prope pagum Smerovišće (Fig. 3), Samoborska gora, Croatia, 31. 03. 1935., leg. I. Horvat, No. 0337-98, Herbarium Croaticum (ZAHO).

Distribution in Croatia: rare in most of Croatia, absent from Podravina and Slavonia regions.

General distribution: Central and S Europe.

***A. montanum* subsp. *pagense*** (Baumgartner) Hayek, Repert. Spec. Nov. Regni Veg. Beih. 30 (1): 433 (1925).

= *A. montanum* L. prol. *pagense* Baumgartner, Jahresber. Nieder-Österr. Landes-Lehrerseminars Wiener-Neustadt 34, Beil.: 19 (1907) [basion.].

= *A. montanum* L. var. *zdunicii* Radić, Bilje Biokova: 56 (1976).

= *A. litorale* Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 6 (1982) non Rupr., Fl. Caucasi 1: 103 (1869).

= *A. litorale* Trinajstić f. *brevifolium* Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 7 (1982).

= *A. litorale* Trinajstić f. *macrocarpum* (Beck) Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 7 (1982).

= *A. litorale* Trinajstić f. *stenophyllum* Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 7 (1982).

= *Alyssum pagense* (Baumgartner) Lovrić, Period. Biol. 91 (1): 169 (1989) [nom. nud.].

**Differential diagnosis:** Raceme short and dense in fruit. Typus (hic designatus): In pascuis saxosis insulae Pago, Croatia, 08. 07. 1995., leg. M. Plazibat, No. 0481-399 (Fig. 4), Herbarium Croaticum (ZA).

Distribution in Croatia: endemic to coastal areas of Croatia, from Kvarner to S Dalmatia.

***A. murale*** Waldst. & Kit., Descr. Icon. Pl. Rar. Hung. 1: 5 (1799). – Typus: »Deva atque Banatus«, Romania, Waldstein no. 49574a (PR).

= *A. murale* Waldst. & Kit. var. *rotundum* Nyár. f. *lepidocarpum* Nyár. subf. *densistellatum* Nyár., Bul. Gräd. Bot. Univ. Cluj 7: 74 (1927).

= *A. murale* Waldst. & Kit. var. *variabile* Nyár. f. *griseum* Nyár., Bul. Gräd. Bot. Univ. Cluj 7: 76 (1927).

= *A. murale* Waldst. & Kit. var. *variabile* Nyár. f. *Reichenbachianum* [(Rupr., Fl. Caucasi: 101 (1869)] Nyár., Bul. Gräd. Bot. Univ. Cluj 7: 76 (1927).

= *A. murale* Waldst. & Kit. var. *variabile* Nyár. f. *ellipticum* Nyár., Bul. Gräd. Bot. Univ. Cluj 7: 77 (1927).

= *A. murale* Waldst. & Kit. var.  $\beta$ . *pumilum* [(Vis., Fl. Dalm. 3: 116 (1850)] Nyár., Bul. Gräd. Bot. Univ. Cluj 7: 79 (1927).

= *A. murale* Waldst. & Kit. f. *ellipticum* (Nyár.) Diklić, Fl. SR Srbije 3: 308 (1972).



Fig. 4. *Alyssum montanum* subsp. *pagense* (ZA)

= *A. murale* Waldst. & Kit. f. *griseum* (Nyár.) Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 8 (1982).

= *A. murale* Waldst. & Kit. f. *reichenbachianum* (Nyár.) Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 8 (1982).

= *A. murale* Waldst. & Kit. f. *rotundum* (Nyár.) Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 8 (1982).

Distribution in Croatia: Dalmatia.

General distribution: SE Europe and SW Asia.

*A. ovirens* A. Kern., Sched. Fl. Exsicc. Austro-Hung. 2: 99 (1882).

Distribution in Croatia: absent.

General distribution: SE Alps and Dinaric mountains (Italy, Austria, Slovenia, Bosnia and Herzegovina, Montenegro).

*A. repens* Baumg., Enum. Stirp. Transs. 2: 237 (1816).

*A. repens* subsp. *transsilvanicum* (Schur) Nyman, Consp. Fl. Eur.: 56 (1878).

= *A. transsilvanicum* Schur, Enum. Pl. Transsilv.: 63 (1866).

Distribution in Croatia: NW Croatia, Hrvatsko zagorje.

General distribution: eastern part of Central Europe, Balkan Peninsula.

*A. serpyllifolium* Desf., Fl. Atl. 2: 70 (1798). – Typus [Algiers] »Habitat in Atlante prope Tlemsen« Desfontaines.

= *A. robertianum* Bern. pro Horvatić, Prir. Istraž. Kralj. Jugoslavije 18: 198 (1933).



**Fig. 5.** *Alyssum serpyllifolium* var. *metajnae* in flowering and in the stage of fructification near the village of Metajna, on the island of Pag

- = *A. robertianum* Bern. pro Horvatić, Bull. Int. Acad. Yugoslave Sci., Cl. Sci. Math. 27: 203 (1933).
- = *A. serpyllifolium* Desf. var. *metajnae* Plazibat, var. nov. – Differential diagnosis: *Ab typo et var. mult. silicula major est*. Typus (hic designatus): In pascuis saxosis prope pagum Metajna (nomen!), insula Pag, Croatia; 07. 08. 1995., leg. M. Plazibat, No. 0659-392, Herbarium Croaticum (ZA).

The new variety, which differs from other forms of the species by larger silicula has isolated geographical distribution, and it is named after village Metajna near which it was collected (Fig. 5).

Distribution in Croatia: on the island of Pag.

General distribution: S Europe (W Mediterranean part) and N Africa.

- A. simplex* Rudolphi, J. Bot. (Schrader) 1799 (2): 290 (1799).
- = *Clypeola minor* L., Fl. Monsp. (Nathorst, Dissert. No. 70, 21, 1756), non Amoen. Acad.: 4 (1759) [nom. nudum]. – Typus: Magnol, Botanicum Monspeliensis ed. 2., 251 (1688) – »*Thlaspi Alysson dictum minus, capsulis majoribus rotundis, non foliatis*«. Montpellier, France.
- = *A. campestre* L., Sp. Pl. ed. 2: 909 (1763) [nom. ambig.].
- = *A. campestre* L. var. *simplex* (Rudolphi) Willd., C. a L. Sp. Pl. 3: 467 (1800).
- = *A. latifolium* Vis., Fl. Dalmat. 3: 118 (1850).
- = *A. minus* (L.) Rothm., Repert. Spec. Nov. Regni Veg. 50: 77 (1941) [nom. illeg.].
- = *A. rothmaleri* A. I. Galushko, Fl. Severn. Kavkasa 2: 54 (1980) [nom. illeg.].
- = *A. minus* (L.) Rothm. f. *latifolium* (Vis.) Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 6 (1982).
- = *A. minus* (L.) Rothm. f. *micranthum* (C. A. Mey.) Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 6 (1982).
- = *A. minus* (L.) Rothm. f. *micropetalum* (Fisch.) Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 6 (1982).
- = *A. campestre* (L.) L. subsp. *campestre* in Jalas, Ann. Bot. Fenn. 33: 283 (1996).

Distribution in Croatia: Istria, Kvarner, Lika and Dalmatia.

General distribution: Mediterranean area and SW Asia.

*Remarks:* DUDLEY (1964a) attempted to clarify the nomenclatural confusion of the taxa *A. alyssoides* and *A. minus* (= *A. campestre* sensu multorum auctorum pro parte maiore), but it continues with papers by STEARN (1973) and JALAS (1996). In the most recent time the oldest validly published name *A. simplex* is prevailing (SMEJKAL, 1992; KÜPFER & NIETO FELINER, 1993; ZHOU *et al.*, 2001; CHILTON & TURLAND 2005). As shown by GREUTER *et al.* (1986), *Alyssum minus* Rothm. is illegitimate and, together with *A. micranthum* C. A. Mey., should be reduced to the synonym of the previously published *A. simplex* Rudolphi.

- A. strigosum* Banks & Sol. in Russell, Nat. Hist. Aleppo ed. 2, 2: 257 (1794) – Typus: [Syria] »Environs of Aleppo«, Russell (BM).
- = *A. minus* (L.) Rothm. subsp. *strigosum* (Banks & Sol.) Stoj. in Jordanov, Fl. Nar. Rep. Bălg. 4: 503 (1970).

= *A. campestre* (L.) L. subsp. *strigosum* (Banks & Sol.) Jalas, Ann. Bot. Fenn. 33: 283 (1996).

Distribution in Croatia: on the island of Vis (Fig. 6).

General distribution: Apennines, Balkan Peninsula and SW Asia.



Fig. 6. *Alyssum strigosum* from the island of Vis (ZA)

*A. tortuosum* Willd., Sp. Pl. 3 (1): 466 (1800).

= *A. tortuosum* Waldst. & Kit., Pl. Rar. Hung. 1: 94, tab. 91 (1802).

Distribution in Croatia: Mt Velebit (only one herbarium specimen in the Schlosser's collection).

General distribution: Central and SE Europe, Caucasus and Siberia.

*A. wierzbickii* Heuff., Flora (Regensb.) 18: 242 (1835).

= *A. repens* Baumg. subsp. *wierzbickii* (Heuff.) Hayek in Repert. Spec. Nov. Regni Veg. Beih. 30 (1): 436 (1925).

Distribution in Croatia: surroundings of Ljubešćica (only one herbarium specimen in the Schlosser's collection).

General distribution: Balkan Peninsula (Bulgaria, Romania, Serbia).

*Aurinia* Desv., J. Bot. 3: 162 (1814).

= *Aurinia* Desv. sect. *Leptoceratium* Griseb., Spic. Fl. Rum. & Bith. 1: 271 (1843). –  
Typus: *Alyssum sinuatum* L., Sp.Pl., 2: 651 (1853). [= *Alyssoides sinuatum* (L.) Medik., Philos. Bot. 1: 189 (1789)].

Key to the taxa of the genus *Aurinia*

- 1a Silicula orbicular, strongly inflated, or with the valves inflated in the middle and flat towards the edge 2  
 b Silicula orbicular to elliptic-orbicular, valves almost flat or weakly inflated in the middle 5
- 2a Valves inflated in the middle and with broad flattened margin *A. petraea* subsp. *petraea* 3  
 b Silicula orbicular or with narrow flattened margin 3
- 3a Silicula with narrow flattened margin *A. petraea* subsp. *microcarpa* 4  
 b Silicula orbicular without narrow flattened margin 4
- 4a Silicula 3.5-5.5 mm, seeds 2-4 in each loculus *A. petraea* subsp. *corymbosa*  
 b Silicula 7-12 mm, seeds 4-8 in each loculus *A. sinuata*
- 5a Seeds 2 in each loculus 6  
 b Seeds 4-8 in each loculus 8
- 6a Silicula usually longer than wide, with rounded apex *A. saxatilis* subsp. *saxatilis*  
 b Silicula wider than long or as wide as long, with emarginate or truncate apex 7
- 7a Silicula not more than 6 x 6 mm *A. saxatilis* subsp. *orientalis*  
 b Silicula usually more than 6 x 6 mm *A. saxatilis* subsp. *megalocarpa*
- 8a Leaves of non-flowering stems 4–6 cm, lanceolate, sinuate-dentate, silicula 5–7 mm *A. leucadea* subsp. *media*  
 b Leaves of non-flowering stems 7–10 cm, usually entire, silicula 7–14 mm 9
- 9a Silicula 7-10 mm, seeds 4 in each loculus *A. leucadea* subsp. *leucadea*  
 b Silicula 10-14 mm, seeds 4-6 in each loculus *A. leucadea* subsp. *scopulorum*

*Aurinia leucadea* (Guss.) K. Koch, Hort. Dendrol. 23 (1853).

= *Alyssum leucadeum* Guss., Pl. Rar.: 268 (1826) [basion.].

= *Alyssum saxatile* Vis., Fl. Dalm. 3: 116 (1852) non L.

*A. leucadea* subsp. *leucadea*

Distribution in Croatia: Central and S Dalmatia, on the islands of Svetac, Vis, Hvar, Šolta, Brač, Palagruža, Korčula, Lastovo, Glavat, Mljet.

General distribution: Croatia, Italy (Salento meridionale).

- A. leucadea* subsp. *media* (Host) Plazibat, stat. et comb. nov.  
 = *Alyssum medium* Host, Fl. Austriaca 2: 244 (1831) [basion.].  
 = *Aurinia hostiana* Lovrić, Šumar. Enciklop. 1: 504 (1980).  
 = *Aurinia media* (Host) Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 4 (1982).

**Differential diagnosis:** *Ab typo et A. leucadea subsp. scopulorum siliculis minime, 5.0–7.0 mm, petala apice profunde emarginata distinguitur.* Compared to the type and *A. leucadea* subsp. *scopulorum* silicula is smaller, petals are very deeply emarginated. Typus (hic designatus): *Alyssum medium* Host, Littorale – Osero, 20. Mai 1859., leg. Elise Braig, No. 0846-102, Herbarium Croaticum (ZA).

Distribution in Croatia: endemic (from Istria to N Dalmatia, on the islands of Krk, Cres, Unije, Lošinj, Školjić near Plavnik, St. Grgur, Rab, Pag).

- A. leucadea* subsp. *scopulorum* (Ginzb.) Plazibat, comb. nov.  
 = *Alyssum leucadeum* Guss. f. *scopulorum* Ginzb., Oesterr. Bot. Z. 70 (9–12): 238 (1921). [basion.].  
 = *Aurinia scopulorum* (Ginzb.) Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 5 (1982).  
 = *Aurinia scopulorum* (Ginzb.) Trinajstić f. *simplex* Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 5 (1982).  
 = *Aurinia leucadea* (Guss.) K. Koch subsp. *diomedea* Brullo, De Marco & Giusso, Inform. Bot. Ital. 35: 243 (2003).

**Differential diagnosis:** *Ab typo et A. leucadea subsp. media siliculis permagnis, 10–14 mm, loculis (4-) 6-spermis (-7), foliis basalibus longioribus differt.* Compared to the type and *A. leucadea* subsp. *media* silicula is larger, 10–14 mm, seeds (4-) 6 (-7) in each loculus. Typus: Parva insula Kamik prope insulam Svetac in centro maris Adriatici, Dalmatia – Croatia (TRINAJSTIĆ, 1982).

Distribution in Croatia: on the islets of Kamik and Jabuka.

General distribution: Croatia, Italy (Isole Tremiti).

- Aurinia petraea* (Ard.) Schur, Enum. Pl. Transs. 61 (1866).  
 = *Alyssum petraeum* Ard., Animadv. Bot. Spec. Alt.: 30 (1764) [basion.].  
 = *Alyssum gemonense* L., Mant. Pl.: 92 (1767) [nom. illeg.].

**Remarks:** Based on morphology and phytogeography it can be concluded that minor differences in the fruit shape and the features of inflorescences do not warrant the delimitation of these taxa as separated species. It is better to treat these three morphotypes as different subspecies of *A. petraea*:

- A. petraea* subsp. *corymbosa* (Griseb.) Plazibat, stat. et comb. nov.  
 = *Aurinia corymbosa* Griseb., Spic. Fl. Rumel. 1: 271 (1843) [basion.].  
 = *Alyssum corymbosum* (Griseb.) Boiss., Fl. Orient. 1: 265 (1867).  
 = *Alyssanthus corymbosus* (Griseb.) Trinajstić, Suppl. Fl. Anal. Jugosl. 7: 10 (1982).

**Differential diagnosis:** *Siliculae globosae, glabrae, non marginatae, loculis 4- (rarius 2–3) spermis.* Silicula orbicular, glabrous, without narrow flattened margin, seeds 4 (rarely 2–3) in each loculus.

Distribution in Croatia: absent.



General distribution: Balkan Peninsula (Bosnia and Herzegovina, Serbia, Montenegro, Albania, Macedonia, Greece).

*A. petraea* subsp. *microcarpa* (Vis.) Plazibat, comb. nov.

= *Vesicaria microcarpa* Vis., Flora (Regensb.) 12, Ergänzungsbl. 1: 18 (1829) [basion.].

= *Alyssum microcarpum* (Vis.) Vis., Fl. Dalmat. 3: 115 (1850).

= *Alyssum petraeum* Ard. subsp. *microcarpum* (Vis.) Jáv., Magyar Fl.: 443 (1925).

= *Aurinia microcarpa*; Lovrić, Šumar. Enciklop. 1: 504 (1980).

= *A. microcarpa* (Vis.) Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 4 (1982).

= *A. microcarpa* (Vis.) Greuter & Burdet, Willdenowia 13 (1): 86 (1983).

**Differential diagnosis:** *Siliculae globosae, glabrae, parum marginatae, loculis dispermis (rarius 4-spermis)*. Silicula globose, glabrous, with minute, narrow flattened margin, seeds 2 (rarely 4) in each loculus. Typus (hic designatus): In apricis saxosis montis Biokovo, 30. 07. 1990., leg. M. Plazibat, No. 0881-159 (Fig. 7), Herbarium Croaticum (ZA).

Distribution in Croatia: Dalmatia (Mt Biokovo).

General distribution: Balkan Peninsula (Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Albania, Greece, Romania).

*Remarks:* A considerable morphological overlap occurs in the zones of neighbouring contact of the two upper subspecies. The subspecies *corymbosa* is morphologically close to subsp. *microcarpa* and could conceivably be treated as a variation of that taxon.

*A. petraea* subsp. *petraea*

**Differential diagnosis:** *Siliculae ellipticae ad obovatae, marginae compressae, medio inflatae, glabrae, loculis 1-2 spermis*. Silicula elliptical to obovate, valves inflated but with narrow flattened margin, glabrous, seeds 1-2 in each loculus.

Distribution in Croatia: absent.

General distribution: SE Alps (Italy, Slovenia).

*Aurinia saxatilis* (L.) Desv., Jour. Bot. Appl. 3: 162 (1814).

= *Alyssum saxatile* L., Sp. Pl.: 650 (1753) [basion.]. – Holotypus cultivated at Botanical garden in Leiden (L, herb. Royen; Herb. Lugdb. Bat. no. 901050).

= *Aurinia media* Schur, Enum. Pl. Transsilv.: 61 (1866).

*A. saxatilis* subsp. *megalocarpa* (Hausskn.) T. R. Dudley, Jour. Arnold Arb. 45: 397 (1964).

= *Alyssum orientale* Ard. var. *megalocarpum* Hausskn., Mitth. Thüring. Bot. Vereines 3–4: 112 (1893) [basion.]. – Holotypus: In saxosis ins. Chios, 1853, Pauli (JE).

= *Alyssum saxatile* L. subsp. *megalocarpum* (Hausskn.) Rech. f., Beih. Bot. Centralbl. 54 (2): 611 (1936).

Distribution in Croatia: absent.

General distribution: SE Greece and W Anatolia.



Fig. 7. *Aurinia petraea* subsp. *microcarpa* (ZA)

- A. saxatilis* subsp. *orientalis* (Ard.) T. R. Dudley, Jour. Arnold Arb. 45: 394 (1964).  
 = *Alyssum orientale* Ard., Animadv. Bot. Spec. Alt. 2: 32, tab. 15, fig. 1 (1764) [basion.].  
 – Typus: »ab Oriente«, Arduino (PAD).  
 = *Clypeola tomentosa* L., Mantissa: 92 (1767). Holotypus: »ab Oriente«, Arduino (LINN no. 828:3).  
 = *Alyssum affine* Ten., Index Sem. Hort. Neapol. 1830: 13 (1830); Syll. Fl. Neap.: 315 (1831). Holotypus: Italia, in saxosis Japygiae: Lecce, Martina, 1819, Tenore 23716 (NAP).  
 = *Aurinia orientalis* (Ard.) Griseb., Spicil. Fl. Rumel. & Bith. 1: 272 (1843).  
 = *Alyssum saxatile* L. var. *orientale* (Ard.) Beck, Glasn. Zem. Muz. Bosn. Herceg. 28: 129 (1916).  
 = *Alyssum saxatile* L. subsp. *orientale* (Ard.) Rech. f., Ann. Naturhist. Mus. Wien 43: 300 (1929). – Typus: »Orient«, Seslerio.

Distribution in Croatia: on the island of Palagruža (two branches on herbarium sheet in the Vukotinović's collection).

General distribution: S Italy, S part of the Balkan Peninsula and W Anatolia.

***A. saxatilis*** subsp. *saxatilis*

Distribution in Croatia: Hrvatsko zagorje.

General distribution: Central Europe.

*Aurinia sinuata* (L.) Griseb., Spicil. Fl. Rumel. 1: 271 (1843).

= *Alyssum sinuatum* L., Sp. Pl.: 651 (1,753) [basion.]. – Lectotypus (LÓPEZ GONZÁLEZ in CAFFERTY & JARVIS 2002: 530): Herb. Burser XI: 30, right specimen (UPS).

= *Alyssoides sinuata* (L.) Medik., Philos. Bot. 1: 189 (1789) [comb. inval.].

= *Vesicaria sinuata* (L.) Cav., Descr. Pl.: 404 (1802).

= *Alyssanthus sinuatus* (L.) Trinajstić, Suppl. Fl. Anal. Jugosl. 7: 10 (1980).

= *Alyssanthus sinuatus* (L.) Trinajstić f. *simplex* Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 4 (1982).

Distribution in Croatia: coastal areas of Croatia.

General distribution: W part of the Balkan Peninsula, SE Italy.

*Berteroa* DC., Reg. Veg. Syst. Nat. 2:290 (1821).

*Berteroa incana* (L.) DC., Reg. Veg. Syst. Nat. 2: 291 (1821).

= *Alyssum incanum* L., Sp. Pl. ed. 1: 650 (1753).

= *Berteroa incana* L. var. *trichocarpa* Rohlena, Magyar Bot. Lapok 6: 51 (1907).

= *Berteroa incana* (L.) DC. f. *trichocarpa* (Rohlena) Trinajstić, Suppl. Fl. Anal. Jugosl. 8: 9 (1982).

Distribution in Croatia: W and NW Croatia.

General distribution: Central and E Europe, W and C Asia.

*Berteroa mutabilis* (Vent.) DC. Reg. Veg. Syst. Nat. 2: 292 (1821).

= *Alyssum mutabile* Vent., Descr. Pl. Nouv.: 85 (1800).

Distribution in Croatia: coastal areas of Croatia from Kvarner to S Dalmatia.

General distribution: S Italy, Balkan Peninsula and Caucasus.

*Clypeola* L., Gen. Pl. ed. 1: 397 (1737); Gen. Pl. ed. 5: 293 (1754).

*Clypeola jonthlaspi* L., Sp. Pl.: 652 (1753). »Habitat in Italiae, Narbonae sabulosis«.

***C. jonthlaspi*** subsp. *jonthlaspi*

Distribution in Croatia: coastal areas of Croatia.

General distribution: throughout the Mediterranean area and eastwards to Tien Shan.

*Degenia* Hayek, Oesterr. Bot. Z. 60: 93 (1910).

*Degenia velebitica* (Degen) Hayek, Oesterr. Bot. Z. 60: 93 (1910).

= *Lesquerella velebitica* Degen, Magyar Bot. Lapok 8: 3 (1909) [basion.].

= *Alyssum velebiticum* Degen in exsicc. ex Degen, Magyar Bot. Lapok 8: 4 (1909).

= *Vesicaria velebitica* Degen in excicc. ex Degen, Magyar Bot. Lapok 8: 4 (1909).

Distribution in Croatia: endemic to Mts Velebit and Velika Kapela.

*Fibigia* Medik., Pflanzengattungen 1: 90 (1792).

*Fibigia triquetra* (DC.) Boiss. ex Prantl in Engler & Prantl, Natürl. Pflanzenfam. 3 (2): 196 (1891).

= *Farsetia triquetra* DC., Syst. Nat. 2: 290 (1821) [basion.].

= *Lunaria scabra* Forssk. ex Vis., Stirp. Dalm. Spec.: XX (1826).

= *Farsetia dalmatica* Vis., Flora (Regensb.) 12 (1), Ergbl.: 15 (1829) [nom. illeg.].

= *Alyssum gnaphalodes* Port. in sched. ex Vis., Fl. Dalm. 3 (1): 119 (1850).

= *Pevalekia triquetra* (DC.) Trinajstić, Suppl. Fl. Anal. Jugosl. 7: 10 (1980).

Distribution in Croatia: endemic to Dalmatia.

## DISCUSSION AND CONCLUSION

The results of investigations of the tribe *Alyseae* (PLAZIBAT, 2005) contributed to declining some doubts which were presented in a large number of books and papers (BALL & DUDLEY, 1993; BECK, 1916; ČEREPANOV, 1981; DIKLIĆ, 1972; DOMAC, 1994; HAYEK, 1925; HORVAT *et al.*, 1974; HORVATIĆ, 1933, 1934; JALAS, 1996; JALAS *et al.*, 1996; JÁVORKA, 1925; KUŠAN, 1970; MARKGRAF, 1986; MARTINČIĆ *et al.*, 1999; MICEVSKI, 1995; NIKOLIĆ & TOPIĆ, 2005; PIGNATTI, 1982; PLAZIBAT, 1997; SCHLOSSER & VUKOTINOVIĆ, 1869; SCHUR, 1866; TRINAJSTIĆ, 1983; TRPIN, 1978, 1984, 1990; VISIANI, 1852).

Taxa *Alyssoides utriculata*, *Alyssum alyssoides*, *A. murale*, *A. simplex*, *Aurinia saxatilis*, *A. sinuata*, *Berteroa incana*, *B. mutabilis*, *Clypeola jonthlaspi*, *Degenia velebitica* and *Fibigia triquetra* have a clear taxonomic and nomenclatural status. Based on the expanded synonymy and specimens in the herbaria it is easy to conclude that *Alyssum alyssoides*, *A. murale* and *A. simplex* are slightly more variable than others.

The species described under the name of *Alyssum austrodalmaticum* (TRINAJSTIĆ, 1982; 1983) without any illustration, and whose holotype is not deposited at the cited herbarium is very dubious. Some authors (LOVRIĆ, 1995; RAC & LOVRIĆ, 2002; 2003), consider it is a synonym of the species *A. pulvinariae* Velen., but that opinion is an unexplained hypothesis.

Plant described by VISIANI (1852) from the surroundings of Šibenik under the name of *A. emarginatum* is similar to some exemplars of the very polymorphic species *A. simplex* which have a little more emarginated silicula.

Certain taxa like *A. desertorum*, *A. hirsutum*, *A. ovirense*, *A. tortuosum*, *A. wierzwickii*, *A. petraea* subsp. *corymbosa* and *Fibigia clypeata* for which dubious literature or herbarium data exist (DOMAC, 1994; HEĆIMOVIĆ 1982; MILOVIĆ 1983) need to be excluded from the Croatian flora. At the Herbarium (ZA) there are only two sheets of *A. saxatilis* subsp. *saxatilis*, and two branches of *A. saxatilis* subsp. *orientalis*. According to the recent literature data (REGULA-BEVILACQUA & ŠEGULJA, 2000; LOVRIĆ & RAC, 2003) these taxa can be treated as members of Croatian flora.

Under the complex *A. montanum* in the Croatian flora we can differentiate four subspecies: *A. montanum* subsp. *gmelinii*, *A. montanum* subsp. *molliusculum*, *A. montanum* subsp. *montanum* and *A. montanum* subsp. *pagense*.

Species determined in the work of HORVATÍĆ (1933) as *Alyssum robertianum* which was noted as *A. nebrodense* by VISIANI (1852) for the island of Pag, and subsequently cited with these names (BECK, 1901; HORVAT *et al.*, 1974), or omitted (TRINAJSTIĆ, 1983; DOMAC, 1994), is a very interesting plant for the flora of Croatia. After comparative investigations (PLAZIBAT, 2005) it was identified as a new variation – *A. serpyllifolium* var. *metajnae* of this West Mediterranean species from the section *Odon-tarrhena*.

In the indeterminate herbarium of S. Horvatić from the island of Vis the species *Alyssum strigosum* was identified. This is the first reliable find of this species in the flora of Croatia. Among the collected material it was confused with *A. simplex*, without conspicuous marks of hybridization.

The group of *A. leucadea* with similar morphological and ecological characteristics which grow on the Adriatic islands and along the coast are considered as one (*A. leucadea*) or three species (*A. leucadea*, *A. media*, *A. scopulorum*) with small number of intraspecific categories (AKERROYD, 1993; PIGNATTI, 1982; TRINAJSTIĆ, 1983). Based on biosystematic and chemotaxonomical data (PLAZIBAT, 2005) the following intraspecific classification is proposed: *A. leucadea* subsp. *leucadea*, *A. leucadea* subsp. *media* and *A. leucadea* subsp. *scopulorum*.

For the closely related taxa *Aurinia corymbosa*, *A. microcarpa* and *A. petraea* the following intraspecific classification is proposed: *A. petraea* subsp. *corymbosa*, *A. petraea* subsp. *microcarpa* and *A. petraea* subsp. *petraea*.

Presented revision shows that twenty-three taxa of the tribe *Alysseae* grow in Croatia: *Alyssoides utriculata*, *Alyssum alyssoides*, *A. montanum* subsp. *gmelinii*, *A. montanum* subsp. *molliusculum*, *A. montanum* subsp. *montanum*, *A. montanum* subsp. *pagense*, *A. murale*, *A. repens* subsp. *transsilvanicum*, *A. serpyllifolium* var. *metajnae*, *A. simplex*, *A. strigosum*, *Aurinia leucadea* subsp. *leucadea*, *A. leucadea* subsp. *media*, *A. leucadea* subsp. *scopulorum*, *A. petraea* subsp. *microcarpa*, *A. saxatilis* subsp. *orientalis*, *A. saxatilis* subsp. *saxatilis*, *A. sinuata*, *Berteroa incana*, *B. mutabilis*, *Clypeola jonthlaspi* subsp. *jonthlaspi*, *Degenia velebitica* and *Fibigia triquetra*.

Without new data and recent plant material which would be deposited in the official herbaria, it is necessary to exclude the following taxa from the flora of Croatia: *A. austrodalmaticum* (*incertae sedis*), *A. desertorum*, *A. emarginatum*, *A. hirsutum*, *A. nebrodense*, *A. ovirense*, *A. pulvinare*, *A. robertianum*, *A. tavolarae*, *A. tortuosum*, *A. wierzbickii*, *A. petraea* subsp. *corymbosa*, *A. petraea* subsp. *petraea* and *Fibigia clypeata*.

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## SAŽETAK

### Kratki prikaz tribusa *Alysseae* (*Brassicaceae*) u Hrvatskoj s nekim taksonomskim novostima

M. Plazibat

Rezultati obrade biljnog materijala, mikroskopskih i fitokemijskih istraživanja provedenih u okviru tribusa *Alysseae* omogućili su dobar uvid u taksonomske i holološke odnose te otklanjanje određenih dvojbi prisutnih u dosadašnjim radovima.

Bez obzira na različita shvaćanja pojedinih autora jasan taksonomski i nomenklturni status imaju svoje *Alyssoides utriculata*, *Alyssum alyssoides*, *A. murale*, *A. simplex*, *Aurinia saxatilis*, *A. sinuata*, *Berteroa incana*, *B. mutabilis*, *Clypeola jonthlaspi*, *Degenia velebitica* i *Fibigia triquetra*.

Vrsta opisana pod nazivom *Alyssum austrodalmaticum* bez ikakvog ilustrativnog materijala, čiji holotip nije pohranjen u naznačenoj zbirci, a koju neki autori smatraju

sinonimom vrste *A. pulvinarae* do konkretnije usporedbe s drugim biljkama i zorne predodžbe o njenom izgledu ostaje vrlo dvojbena i nesigurna nova svojta.

Biljka iz okolice Šibenika koju Roberto de Visiani navodi pod nazivom *A. emarginatum* vjerojatno je samo jedan od oblika vrlo polimorfne vrste *A. simplex* kod koje se ponekad mogu vidjeti forme s nešto jače izrubljenim vrhom komuščice. U okviru kompleksa *Aurinia saxatilis* u hrvatskim herbarskim zbirkama postoje samo dva lista s materijalom tipične svojte, te nekoliko fragmenata svojte *A. saxatilis* subsp. *orientalis*. Uz navedene i neki noviji literaturni podaci pokazuju da ove biljke rastu u Hrvatskoj.

Brojni prethodni radovi kao i intraspecifične podjele unutar kompleksa *A. montanum* uspoređeni s rezultatima do kojih se došlo u ovim istraživanjima omogućili su jasno razlikovanje slijedećih svojti: *A. montanum* subsp. *gmelinii*; *A. montanum* subsp. *molliusculum*; *A. montanum* subsp. *montanum* i *A. montanum* subsp. *pagense*.

Vrsta određena kao *Alyssum robertianum*, a već kod Visianija zabilježena za otok Pag kao *A. nebrodense* te pod navedenim nazivima navođena ili pak izostavljena iz literature pripada među rijetke biljke hrvatske flore. Nakon provedenih komparativnih istraživanja utvrđeno je da se radi o novoj varijaciji (*A. serpyllifolium* var. *metajnae*) slikovite zapadnomediterranske vrste iz sekcije *Odontarrhena*.

Revizijom neobrađenog biljnog materijala skupljenog na otoku Visu u zbirci Stjepana Horvatića pronađena je vrsta *Alyssum strigosum* što je dosad jedini siguran dokaz o prisustvu ove svojte u hrvatskoj flori.

Skupina biljaka sličnih morfoloških i ekoloških karakteristika koje rastu na otocima i uzduž hrvatske i manjeg dijela talijanske obale Jadrana ovisno o shvaćanju pojedinih autora smatra se jednom vrstom (*A. leucadea*) ili se dijeli na nekoliko vrsta (*A. leucadea*, *A. media*, *A. scopulorum*) s manjim brojem intraspecifičnih svojti. Uočljiva je bliska srodnost, ali isto tako i neke postojeane razlike unutar navedene skupine biljaka te se ovdje predlaže slijedeća intraspecifična podjela: *A. leucadea* subsp. *leucadea*, *A. leucadea* subsp. *media* i *A. leucadea* subsp. *scopulorum*.

Za rješavanje taksonomske problematike svojte *Aurinia microcarpa* blisko srodne sa svojtima *A. petraea* i *A. corymbosa* predložena je slijedeća podjela: *A. petraea* subsp. *corymbosa*, *A. petraea* subsp. *microcarpa* i *A. petraea* subsp. *petraea*.

Sve dok se u novije vrijeme ne pronađu i validno objave, potkrijepljeno biljnim materijalom koji bi morao biti pohranjen u nekoj službeno priznatoj i javno dostupnoj zbirci, zbog nepouzdanih literaturnih ili herbarskih podataka iz hrvatske flore treba isključiti svojte *A. austrodalmaticum* (*incertae sedis*), *A. desertorum*, *A. emarginatum*, *A. hirsutum*, *A. nebrodense*, *A. ovirensense*, *A. pulvinare*, *A. robertianum*, *A. tavolarae*, *A. tortuosum*, *A. wierzbickii*, *A. petraea* subsp. *corymbosa*, *A. petraea* subsp. *petraea* i *Fibigia clypeata*.

U Hrvatskoj je utvrđena prisutnost slijedećih svojti tribusa *Alysseae*: *Alyssoides utriculata*, *Alyssum alyssoides*, *A. montanum* subsp. *gmelinii*, *A. montanum* subsp. *molliusculum*, *A. montanum* subsp. *montanum*, *A. montanum* subsp. *pagense*, *A. murale*, *A. repens* subsp. *transsilvanicum*, *A. serpyllifolium* var. *metajnae*, *A. simplex*, *A. strigosum*, *Aurinia leucadea* subsp. *leucadea*, *A. leucadea* subsp. *media*, *A. leucadea* subsp. *scopulorum*, *A. petraea* subsp. *microcarpa*, *A. saxatilis* subsp. *orientalis*, *A. saxatilis* subsp. *saxatilis*, *A. sinuata*, *Berteroa incana*, *B. mutabilis*, *Clypeola jonthlaspi* subsp. *jonthlaspi*, *Degenia velebitica* i *Fibigia triquetra*.