

TAXONOMY OF THE GENUS *CARDAMINE* L. (*CRUCIFERAE*) IN THE CARPATHIANS AND PANNONIA. III.

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Abstract: The results of a taxonomic study of *Cardamine flexuosa* WITH., *C. glauca* SPRENG. ex DC., *C. graeca* L., *C. hirsuta* L., *C. impatiens* L., *C. parviflora* L., *C. resedifolia* L., and *C. trifolia* L. from the Carpathians and Pannonia are presented. Full synonymy, lectotypifications, descriptions, chromosome numbers, taxonomic history, notes on variation, distribution data and ecological notes are provided.

INTRODUCTION

This paper is the third in a series presenting a taxonomic revision of the genus *Cardamine* in the Carpathians and Pannonia. It deals with the remaining species of the genus not included in the previous two parts (MARHOLD 1994b, 1995), namely *Cardamine flexuosa* WITH., *C. glauca* DC., *C. graeca* L., *C. hirsuta* L., *C. impatiens* L., *C. parviflora* L., *C. resedifolia* L., and *C. trifolia* L. For an explanation of the materials used and arrangement of data see MARHOLD (1994b).

Cardamine flexuosa WITH.

Cardamine flexuosa WITH. ART. BRIT. PL., ed. 3: 578, 1796.

Ind. loc.: "Rookery at Edgbaston". Typus ignotus. [The name is interpreted according to the original description].

≡ *Cardamine hirsuta* subsp. *flexuosa* (WITH.) HOOK. f. Student Fl. Brit. Isl.: 25, 1870.

≡ *Cardamine scutata* subsp. *flexuosa* (WITH.) HARA J. Fac. Sci. Tokyo, Sect. 3, Bot. 6(2): 59, 1952.

= *Cardamine sylvatica* LINK Phytogr. Blätt. 1: 50, 1803.

Ind. loc.: sine. Typus ignotus.

≡ *Cardamine hirsuta* var. *sylvatica* (LINK) GAUDIN Fl. Helv. 4: 663, 1829.

≡ *Cardamine hirsuta* subsp. *sylvatica* (LINK) ČELAK. Prodr. Fl. Böhmen: 451, 1875.

= *Cardamine hirsuta* var. *hexandra* STOKES Bot. Mat. Med. 3: 445, 1812.

Ind. loc.: "Between Worcester and Ombersley". Typus ignotus.

= *Cardamine pusilla* SCHUR Enum. Pl. Transsilv.: 47, 1866.

Ind. loc.: "Am Silberbach im Michelsberger Thal; im Zoodthal bei Riu-szadului".
Lectotypus (**hoc loco designatus**): Am Silberbach im Michelsberger Thal, V.1846,
SCHUR (LW).

= *Cardamine drymeja* SCHUR Enum. Pl. Transsilv.: 47, 1866.

Ind. loc.: "Auf der Preschbe; auf dem Surul". Lectotypus (**hoc loco designatus**): Auf
der Preschbe, s. a. [collected before 1861], SCHUR (LW).

= *Cardamine tatrensis* ZAPAL Rozpr. Wydz. Mat.-Przyr. Akad. Umiejtn. Dział. B, Nauki
Biol. Ser. 3, 12: 12-13, 1912 (pro hybr.).

Ind. loc.: "In valle Koprowa Tatrorum loco 'Ciemnie Smreczyny' dicto (KOTULA)".

Holotypus: Ciemnie Smreczyny, 26.VII.1883, KOTULA (KRAM, no. 112958).

- *Cardamine hirsuta* auct. non L.: BESSER Prim. Fl. Galiciae austriac. 2: 75, 1809.

- *Cardamine umbrosa* auct. non ANDRZ. ex DC.: SCHUR Enum. Pl. Transsilv.: 47, 1866.

Exsiccata visa

DOMIN & KRAJINA Fl. Českoslov. Exs. no. 258 (BP, BRA, CGE, CL, K, KRA, LIM, NI,
OL, PR, PRC, W) - Fl. Exs. Reipubl. Social. Českoslov. no. 1609 (BM, CL, LIM, PR, W,
WU) - Fl. Polon. Exs. no. 322 (BM, BRNU, CL, KRA, KRAM, PRC, RNG, W) - Fl. Rom.
Exs. no. 1481 (BP, BRNU, CL, KRA, LW, PRC, SIB, W) - M. RACIBORSKI Pl. Polon. Exs.
no. 636 (KRA, KRAM, LW, LWS) - WOŁOSZCZAK Fl. Polon. Exs. no. 909 (BM, BP, CL, K,
KRA, KRAM, LW, LWS, W, WU);

Extra fines: BAENITZ Herb. Eur. no. 10212 (CL) - BILLOT Fl. Gall. Germ. Exs. no. 711
(CGE, OXF) - FIORI, BÉGUINOT & PAMPANI Fl. Ital. Exs. no. 555 (BM, K, OXF, WU) - Fl.
Exs. Austro-Hung. no. 85 (BM, CL, K, PR, PRC, SIB, W, WU) - Fl. Exs. Bavar. no. 408
(PR, WU) - Fl. Exs. Carniol. no. 77 (BM, CL, WU) - Fl. Exs. Reipubl. Bohem. Slov. no.
1029 (ut *C. hirsuta* L.) (CL, KRA, NI, OL, PR, PRC, W) - Fl. Gall. Germ. Exs. cent. 2, no.
8 (K, KRAM, W) - Fl. Jutl. Exs. no. 106 (ut *C. hirsuta* L.) (BM, CGE, PR, W) - Fl. Sequaniae
Exs. no. 307 (CGE) - Fl. Siles. Exs. no. 779 (CGE, CL, KRA, KRAM, PR, W), no. 1057 (ut
C. impatiens L.) (CL, W) - FRIDTZ Herb. Norveg. no. 12772 (ut *C. hirsuta* L.) (K) - FRIES
Herb. Norm. Suec. fasc. 7, no.18 (ut *C. hirsuta* var. *clandestina* Fr.) (CGE) - Herb. Fl. Loc.
France no. 23 (K, OXF, PRC) - REICHENBACH Fl. Germ. Exs. no. 1580 (BM, CGE, K, OXF,
PRC, W) - Rel. Maillleanae no. 679 (K, OXF, PRC, W, WU), no. 679a (OXF, PRC) -
SAMUELSSON Pl. Suec. Exs. no. 888 (W), no. 889 (W) - Soc. Dauphin. no. 1954 (CL, K), no.
1954b (BM) - Soc. Echang. Pl. Vasc. Eur. Occ. & Bas. Medit. no. 7427 (RNG), no. 10235
(RNG), no. 10236 (RNG), no. 11253 (RNG) - TAUSCH Herb. Fl. Bohem. no. 123 (ut *C. hirsuta*
L.) (PRC), no. 123b (PRC) - VAN HEURCK Herb. Pl. Rar. Crit. Belg. fasc. 3, no. 56 (BM,
CGE, K) - WELWITSCH Iter Lusit. no. 414 (ut *C. hirsuta* L.) (W) - WIRTGEN Herb. Pl. Crit.
Select. no. 555 (BM, CGE).

Icones

ASSENOV in JORDANOV Fl. Reipubl. Pop. Bulg. 4: 449, tab. 82, fig. 2, 1970. - CLAPHAM,
TUTIN & WARBURG Fl. Brit. Isl. Illustr. 1: 53, fig. 208, 1957. - DOSTÁL Nová Květ. ČSSR:
359, tab. 89, fig. 3, 1989. - HEJNÝ & SLAVÍK Květ. ČR 3: 105, tab. 23, fig. 1, 1992. - JÁVORKA
& CSAPODY Icon. Fl. Part. Austro-Orient. Eur. Centr.: 199, fig. 1517, 1975. - MAŁAŁSKI Fl.
Polon. Terrarumq. Icon. 9/4: fig. 1083a, 1966. - MÜLLER Fl. Dan. 5: fig. 735, 1782. - NYÁRÁDY
in SÁVULESCU Fl. Reipubl. Pop. Roman. 3: 265, tab. 46, fig. 2, 1955. - POLÍVKA, DOMIN &



Fig. 1. *Cardamine flexuosa* WITH. (details of flowers and fruit enlarged).

oblong, entire or serrate segments. Inflorescence racemose, with 10-30 flowers; sepals narrowly ovate, 1.3-1.8 mm long, glabrous, margin membranous; petals white, obovate to oblanceolate, 2.5-3.5 mm long, apex rounded; stamens 6, anthers yellow; stigma conspicuous. Pedicels erect-patent or patent, siliques divergent from axis at the same angle as pedicels or erect, 15-20 (- 25) mm long \times 1.0-1.2 mm wide.

Flowering: April - June.

$2n = 32$

PODPĚRA Klíč Květ. Českoslov.: 48, fig. 67, 1928. - REICHENBACH Icon. Fl. Germ. Helv. 2: fig. 4303, 1837-1838. - ROSS-CRAIG Drawings Brit. Pl. 1: fig. 22, 1979. - ROTHMALER Exkursionsfl., ed. 6, 3: 160. 1987.

Icon nostra: Fig. 1.

Taxonomic history

Cardamine flexuosa WITH. was known as *C. sylvatica* LINK in most central European taxonomic literature of the last century. *Cardamine sylvatica*, however, was validly published seven years later than *C. flexuosa*, and the latter has priority. The original descriptions of both species are very detailed and, even in the absence of original material, they undoubtedly represent the same taxon.

Brief description

Biennial, or rarely annual, herb, 10-25 (-40) cm tall. Root thin. Stems 1-10, erect or ascending, flexuous, simple or branched, sparsely to densely hairy. Rosette not compact at anthesis, slightly compact at earlier stage; rosette leaves pinnate, with to 10 pairs of petiolulate, circular-obovate, crenate to lobate lateral leaflets; terminal leaflet the same shape but much larger than lateral ones. Cauline leaves 3-10, sparsely hairy; lower cauline leaves pinnate, with 2-6 pairs of leaflets similar in shape to those of rosette leaves; upper cauline leaves pinnatisect, with 2-5 pairs of narrower,

Variation

Cardamine flexuosa is a very variable species. SCHULZ (1903), ZAPAŁOWICZ (1912) and others recognized a large number of varieties and formas within this taxon. At least those referable to the European populations of *C. flexuosa* reflect variation which, in the opinion of the present author, is not worthy of formal taxonomic recognition.

General distribution

Cardamine flexuosa occurs throughout most of Europe to the west of Belorussia and the Ukraine, except for the Aegean area and Iceland. The recorded occurrence of *C. flexuosa* in China, Taiwan, Australia and New Zealand probably refers to other, closely related taxa.

Distribution in the Carpathians and Pannonia

Cardamine flexuosa is generally widespread in the Carpathians. In Pannonia it occurs only in the Slovenský kras (Slovakia) and the phytogeographical districts of Bakonyicum Vesprimense and Praenoricum Petovicum in Hungary. Absence of data from parts of the Carpathians is most probably due to limited knowledge of the flora of these areas and may not reflect the actual absence of the species.

Poland (Fig. 2)

Karpaty Zachodnie. 513.45. Beskid Śląski, 413.46. Kotlina Żywiecka, 513.47. Beskid Mały, 513.48. Beskid Makowski, 513.49. Beskid Wyspowy, 513.51. Beskid Żywiecki, 513.52. Gorce, 513.53. Kotlina Sądecka, 513.54. Beskid Sądecki, 513.62. Pogórze Ciężkowickie, 513.64. Pogórze Dynowskie, 513.65. Pogórze Przemyskie, 513.71. Beskid Niski, 514.11. Kotlina Orawsko-Nowotarska, 514.12. Pieniny, 514.13. Pogórze Spisko-Gubałowskie, 514.14. Rów Podtatrzański, 514.52. Tatry Zachodnie, 514.53. Tatry Wschodnie. - **Beskidy Wschodnie.** 522.12. Bieszczady Zachodnie.

Moravia (Fig. 2)

Mesophyticum carpaticum. 77a. Ždánický les, 78. Bílé Karpaty lesní, 79. Zlínské vrchy, 80a. Vsetínská kotlina, 80b. Věřovické vrchy, 81. Hostýnské vrchy, 82. Javorníky, 84a. Beskydské podhůří. - **Oreophyticum carpaticum.** 99a. Radhošské Beskydy, 99b. Slezské Beskydy.

Slovakia (Fig. 2)

Pannonicum. 3. Slovenský kras. - **Carpaticum occidentale.** 9. Biele Karpaty (južná časť), 10. Malé Karpaty, 13. Strážovské a Súľovské vrchy, 14b. Vtáčnik, 14c. Kremnické vrchy, 14d. Poľana, 15. Slovenské rudohorie, 16. Muránska planina, 17. Slovenský raj, 19. Slanské vrchy, 20. Vihorlat, 21a. Malá Fatra (Lúčanská Fatra), 21b. Malá Fatra (Krivánska Fatra), 21c. Veľká Fatra, 21d. Chočské vrchy, 22. Nízke Tatry, 23a. Západné Tatry, 23b. Vysoké Tatry, 23c. Belianske Tatry, 24. Pieniny, 25. Turčianska kotlina, 26a. Liptovská kotlina, 26b. Spišské kotliny, 27a. Biele Karpaty (severná časť), 27b. Javorníky, 28. Západné Beskydy, 29. Spišské vrchy, 30a. Šarišská vrchovina, 30b. Čergov, 30c. Nízke Beskydy. - **Carpaticum orientale.** 31. Bukovské vrchy.

Hungary (Fig. 3)

II. Bakonyicum. 3. Vesprimense. - **III. Praenoricum.** 3. Petovicum. - **V. Praeillyricum.** 1. Saladiense, 4. Sopianicum.

Ukraine (Fig. 4)

Carpathicum orientale. I. Prykarpattja, II. Schidni Beskydy j Nyz'ki Polonyny, III. Gorgany, IV. Svydovec', V. Čornohora, VI. Čyvčyno-Grynjav's'ki hory, VII. Marmaros'ki Al'py, VIII. Vulkanični Karpaty.

Romania

Districts Maramureş, Bistriţa-Năsăud, Mureş, Harghita, Neamt, Braşov, Sibiu, Argeş [?], Vâlcea, Hunedoara, Caraş-Severin, Bihor, Cluj, Sălaj.

Minimum altitude: Praenoricum Petovicum, Barsszentmihályfalva, 200 m, 1960, KÁROLYI (BP); Praeillyricum Saladiense, Miklósfá, Mórichely, 150 m, 1950, KÁROLYI (BP); Pogányszentpéter, Vasko Gyula völgy, 150 m, 1950, KÁROLYI (BP).

Maximum altitude: Západné Tatry, Gáborova dolina, 1505 m (HORÁK 1971: tab. 4); Distr. Maramureş, Mții Rodnei, Pietra alba, 1565 m (ZAPĄŁOWICZ 1889: 103).

Ecology and phytosociology

Cardamine flexuosa typically occurs in the wet margins along forest roads and various other open habitats on acid soils, rich in humus. It is found in forest communities of the alliances *Fagion* LUQUET 1926, *Piceion excelsae* PAWŁOWSKI in PAWŁOWSKI et al. 1928, *Chrysanthemion rotundifolii* KRAJ. 1933 and the suballiance *Alnion glutinoso-incanae* OBERD. 1953.

***Cardamine hirsuta* L.**

Cardamine hirsuta L. Sp. Pl.: 655, 1753.

Ind. loc.: "In Europae areis, hortis, arvis". Lectotypus: (LINN, no. 835.13) (FAWCETT & RENDLE 1914: 239; JAFRI 1973: 171, cf. MARHOLD, in press).

= *Cardamine umbrosa* ANDRZ. ex DC. Syst. Nat. 2: 260-261, 1821.

Ind. loc.: "In sylvaticis Europae, in Cebennis, Volhynia". Typus ignotus.

= *Cardamine hirsuta* var. *campestris* FR. Novit. Fl. Suec.: 201, 1828.

Ind. loc.: "Per provincias campestris sueciae meridionalis". Typus ignotus.

= *Cardamine hirsuta* var. *multicaulis* SCHUR Enum. Pl. Transsilv.: 47, 1866.

Ind. loc.: "Auf dem schotterigen Ufern des Schewesbaches im Jungen Wald bei Hermannstadt." Lectotypus (**hoc loco designatus**): Hermannstadt, 1848, SCHUR (LW).

≡ *Cardamine hirsuta* subsp. *multicaulis* (SCHUR) ČELAK. Prodr. Fl. Böhmen: 451, 1875 [ut "*multicaulis* (HOPPE sp.)"].

– *Cardamine parviflora* auct. non-L.: BESSER Prim. Fl. Galiciae Austriac. 2: 75, 1809.

– *Cardamine multicaulis* HOPPE ex W.D.J. KOCH ROEHL. Deutschl. Fl., ed. 3, 4: 605, 1833 (pro syn.).

– *C. multicaulis* HOPPE ex SCHUR Enum. Pl. Transsilv.: 47, 1866 (pro syn.).

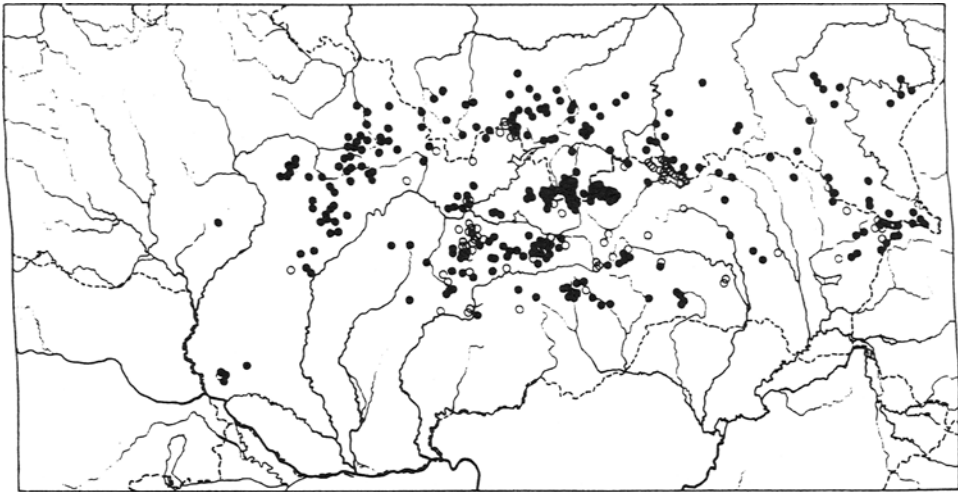


Fig. 2. Map of the distribution of *Cardamine flexuosa* WITH. in the Carpathian part of Poland and Moravia and in Slovakia (● - herbarium specimens, ○ - data from the literature).

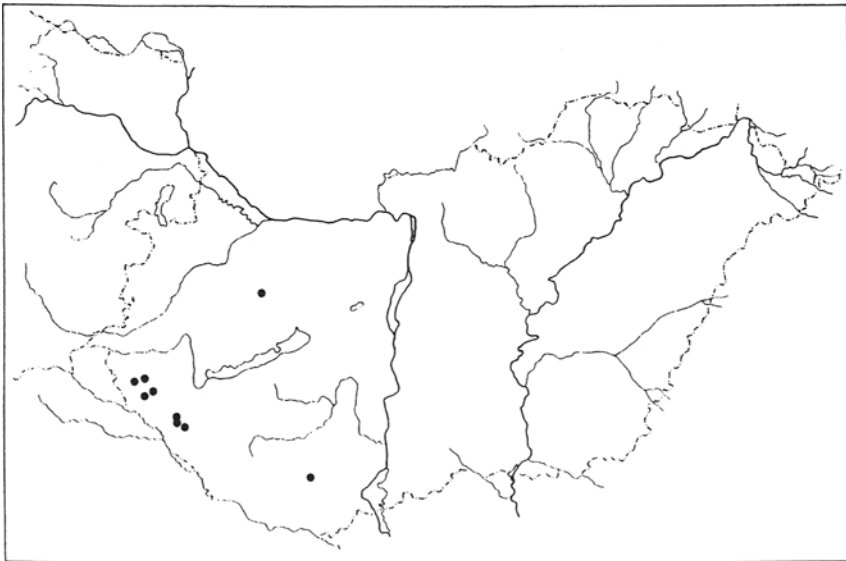


Fig. 3. Map of the distribution of *Cardamine flexuosa* WITH. in the Pannonian part of Hungary.

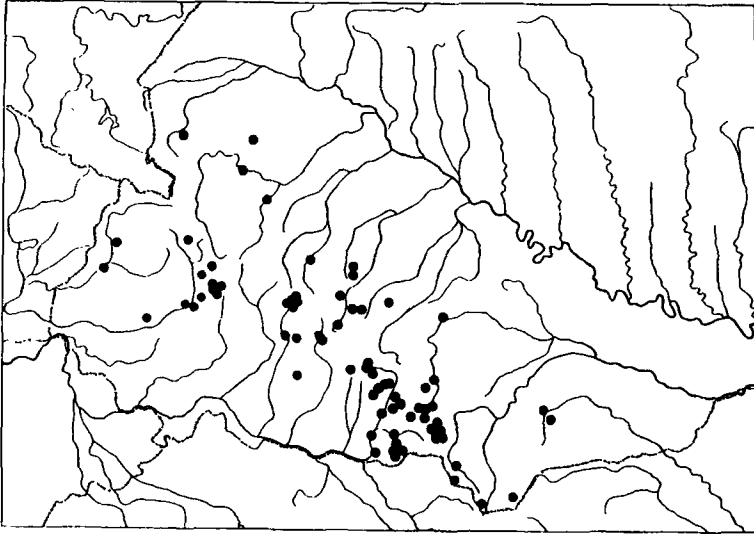


Fig. 4. Map of the distribution of *Cardamine flexuosa* WITH in the Carpathian part of the Ukraine.

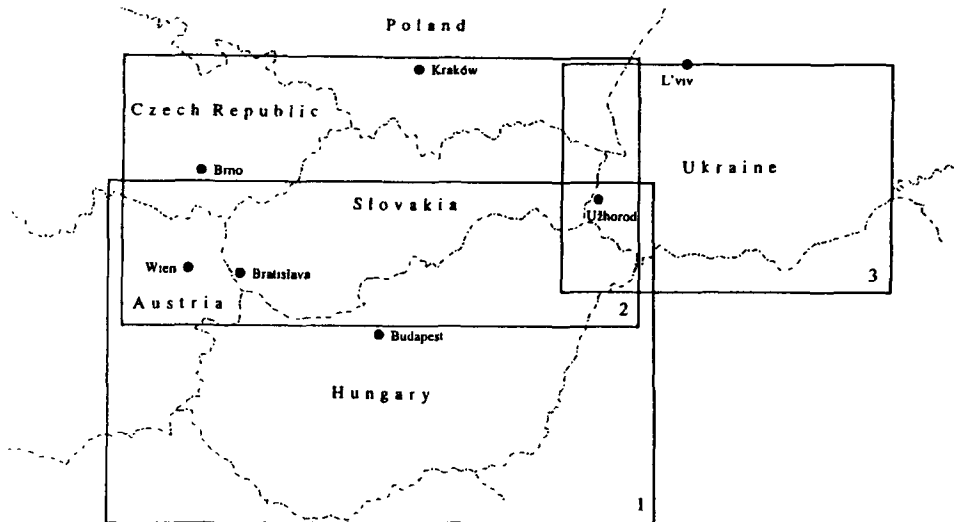


Fig. 5. Scheme of the distribution maps: 1 - Austria and Hungary; 2 - Moravia (Czech Republic), Poland, and Slovakia; 3 - the Ukraine.

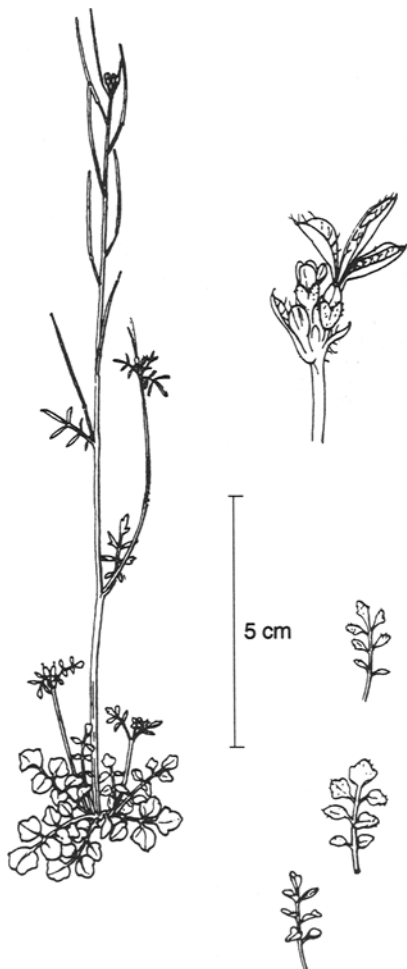


Fig. 6. *Cardamine hirsuta* L. (details of flowers and leaves enlarged).

Exsiccata visa

Fl. Hung. Exs. no. 182 (BP, BRA, CL, K, PR, PRC, SIB, W, WU) - Fl. Olten. Exs. no. 235 (BM, CGE, CL, KRA, KRAM, LTR, OXF, PRC) - Fl. Rom. Exs. no. 1707 (BP, CL, KRA, SIB, W);

Extra fines: ADAMOVIĆ Iter Graeco-Turc. 1905 no. 59 (WU) - BECK Pl. Bosn. Herceg. Exs. no. 87 (PRC, WU) - BILLOT Fl. Gall. Germ. Exs. no. 712 (BM, CGE, OXF) - BORNMÜLLER Iter Pers. Alter. 1902 no. 6116 (WU) - DÖRFLER Herb. Norm. no. 5413 (BM, PR, PRC, W, WU) - DÖRFLER Iter Turc. Sec. 1893 no. 28 (K, WU) - FEST & GENTA Fl. Stir. Exs. no. 528 (WU) - Fl. Gall. Germ. Exs. cent. 2, no. 9 (K), no. 9b (K, W) - Fl. Exs. Austro-Hung. no. 596 (BM, BRA, CL, K, PR, SIB, W, WU) - Fl. Exs. Bavar. no. 409 (PR, WU) - Fl. Lusit. Exs. no. 391 (WU) - FRIES Herb. Norm. Suec. fasc. 3, no. 20 (CGE) - HOPPE Herb. Pl. Rar. cent. 4, no. 56 (BM) - MAGNIER Fl. Select. Exs. no. 3458 (W, WU) - HAYEK Pl. Stir. Exs. no. 628 (WU) - Herb. Fl. Ross. no. 1361 (KW, PRC, WU) - Pl. Britan. Exs. ser. 2, no. 31 (CGE), ser. 3, no. 119 (CGE, KRAM, LTR, PRC) - Pl. Cataluña no. 151 (KRA) - Pl. Finl. Exs. no. 232 (CL, K, PR, W), no. 677 (K, W, WU) - Pl. Vasc. Dan. Exs. no. 533 (KRA, PR, RNG, W) - RECHINGER Iter Aegaeum 1942 no. 12346 (K) - REICHENBACH Fl. Germ. Exs. no. 76 (CGE), no. 1581 (BM, CGE, K, OXF, PR, PRC, W), no. 1582

(BM, CGE, K, OXF, PRC, W) - SAMUELSSON Pl. Suec. Exs. no. 886 (K, W), no. 887 (BM, W) - Soc. Echang. Pl. Vasc. Eur. Occ. & Bas. Medit. no. 7428 (CL, RNG), no. 7429 (RNG), no. 11254 (RNG), no. 12174 (RNG), no. 13111 (RNG), no. 8314 (RNG) - Soc. Sud.-Est. 1894 no. 22 (W) - SINTENIS Iter Transcasp.-Pers. 1900-1901 no. 1443 (PRC) - WIRTGEN Herb. Pl. Crit. Rhenan. no. 571 (W) - WIRTGEN Herb. Pl. Select. Fl. Rhenan. no. 558 (OXF).

Icones

ASSENOV in JORDANOV Fl. Reipubl. Pop. Bulg. 4: 449, tab. 82, fig. 1, 1970 (figura minus bona!). - CLAPHAM, TUTIN & WARBURG Fl. Brit. Isl. Illustr. 1: 54, fig. 209, 1957. - DOSTÁL Nová Květ. ČSSR: 363, tab. 90, fig. 8, 1989 (figura minus bona!). - HEJNÝ & SLAVÍK Květ. ČR 3: 105, tab. 23, fig. 2, 1992. - JÁVORKA & CSAPODY Icon. Fl. Part. Austro-Orient. Eur. Centr.: 199, fig. 1515, 1975. - MAŁDALSKI Fl. Polon. Terrarumq. Adiacent. Icon. 9/4: fig. 1083, 1966. - NYÁRÁDY in SÁVULESCU Fl. Reipubl. Pop. Roman. 3: 265, tab. 46, fig. 1, 1955. - REICHENBACH Icon. Fl. Germ. Helv. 2: fig. 4304, 1837-1838. - ROSS-CRAIG Drawings Brit. Pl. 1: fig. 21, 1979. - ROTHMALER Exkursionsfl., ed. 6, 3: 160, 1987.

Icon nostra: Fig. 6.

Brief description

Annual, or rarely biennial, herb, 5-50 cm tall. Root thin. Stems 1-10, erect or ascending, simple or branched above, glabrous, with rarely sparsely hairy secondary stems arising from the axils of the rosette leaves. Rosette compact; rosette-leaves pinnate, with 3-10 pairs of petiolulate, entire or crenate, glabrous or appressed hairy lateral leaflets; terminal leaflet of the same shape but larger than lateral ones. Cauline leaves 2-3, pinnatisect, lowermost rarely pinnate; segments oblanceolate to oblong, apex shortly apiculate, margin entire or rarely crenate. Inflorescence racemose, usually with 5-20 flowers; sepals oblong, 1.5-2.0 mm long, glabrous, rarely hairy, margin membranous; petals white, oblanceolate, 2.5-4.0 mm long, apex rounded; stamens 4 (rarely 5 or 6), anthers yellow; stigma not conspicuous. Pedicels erect-patent, siliquae usually divergent from axis at the same angle as pedicels, 15-25 mm long × 0.8-1.0 mm wide.

Flowering: April - May.

$2n = 16$ [tetraploids reported for this species by several authors (e.g. BORGES 1975, PODLECH & BADER 1974) belong to taxa other than *C. hirsuta* (MARHOLD 1994a: 31)].

Variation

A large number of varieties and formas have been described by various authors for this species (cf. SCHULZ 1903). These, however, reflect phenotypic variation which, in the opinion of the present author, is not considered worthy of any taxonomic recognition.

General distribution

Cardamine hirsuta occurs throughout most of Europe (except for northern Russia), North Africa, Ethiopia, Asia, North America, Australia and New Zealand. It appears, however, to be native only in Eurasia.

Distribution in the Carpathians and Pannonia

Cardamine hirsuta occurs in scattered localities throughout the area. It has not been recorded for the eastern part of Hungary.

Poland (Fig. 7)

Karpaty Zachodnie. 513.46. Kotlina Żywiecka, 513.48. Beskid Makowski, 513.51. Beskid Żywiecki, 513.54. Beskid Sądecki, 513.71. Beskid Niski, 514.52. Tatry Zachodnie.

Moravia (Fig. 7)

Mesophyticum carpaticum. 78. Bílé Karpaty lesní, 81. Hostýnské vrchy, 82. Javorníky, 84a. Beskydské podhůří. - **Oreophyticum carpaticum.** 99a. Radhošské Beskydy.

Slovakia (Fig. 7)

Pannonicum. 2. Ipeľsko-rimavská brázda, 4. Záhorská nížina, 6. Podunajská nížina, 8. Východoslovenská nížina. - **Carpaticum occidentale.** 9. Biele Karpaty (južná časť), 10. Malé Karpaty, 14a. Pohronský Inovec, 14e. Štiavnické vrchy, 15. Slovenské rudohorie, 21a. Malá Fatra (Lúčanská Fatra), 21b. Malá Fatra (Krivánska Fatra), 22. Nízke Tatry, 30a. Šarišská vrchovina, 30c. Nízke Beskydy. - **Carpaticum orientale.** 31. Bukovské vrchy.

Austria (Fig. 8)

Several localities in the vicinity of Vienna and Wiener Neustadt.

Hungary (Fig. 8)

II. Bakonyicum. 2. Pilisense, 3. Vesprimense, 4. Balatonicum. - **III. Praenoricum.** 3. Petovicum. - **IV. Eupannonicum.** 3. Praematricum. - **V. Praeillyricum.** 1. Saladiense, 2. Somogyicum, 3. Kaposense, 4. Sopianicum.

Ukraine (Fig. 9)

Carpaticum orientale. II. Schidni Beskydy j Nyz'ki Polonyny, III. Gorgany, V. Čornohora, VI. Čyvčyno-Grynjavsk'ki hory, VIII. Vulkanični Karpaty, IX. Zakarpats'ke peredhir'ja. - **Pannonicum.** X. Zakarpats'ka rivnyna.

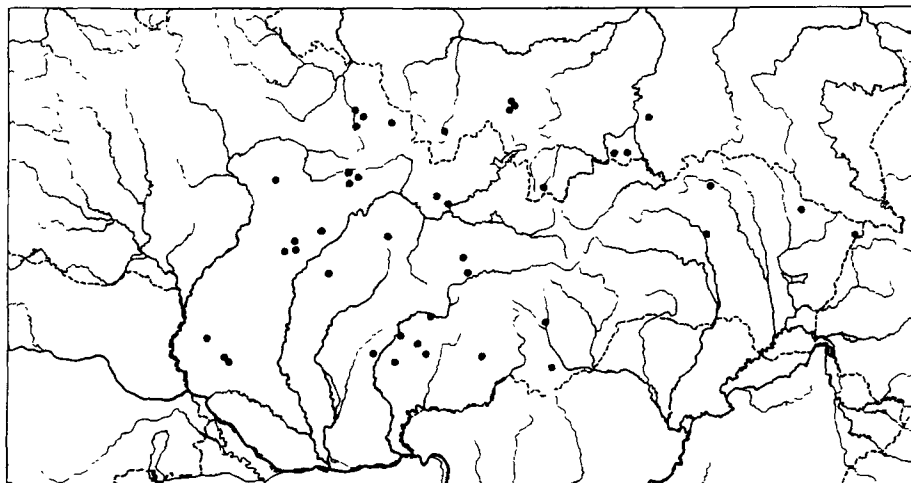


Fig. 7. Map of the distribution of *Cardamine hirsuta* L. in the Carpathian part of Poland and Moravia and in Slovakia.

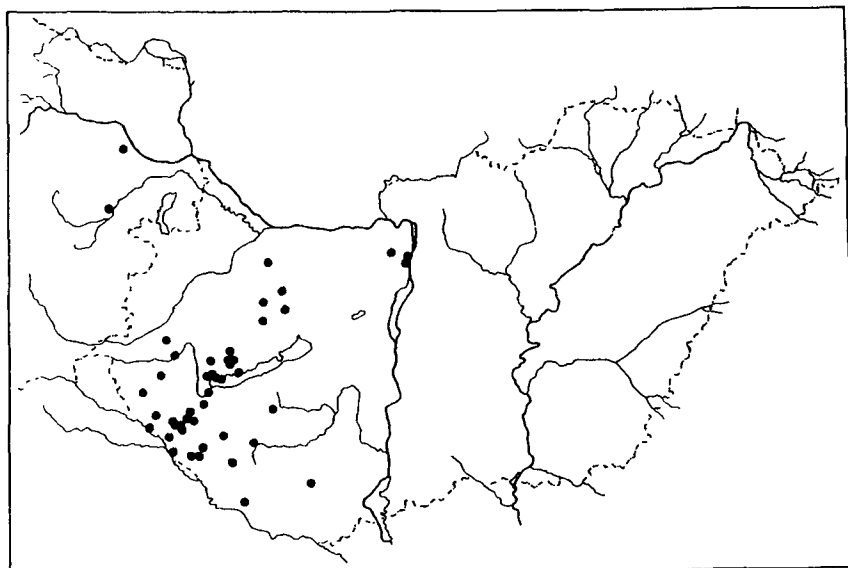


Fig. 8. Map of the distribution of *Cardamine hirsuta* L. in the Pannonian part of Austria and in Hungary.

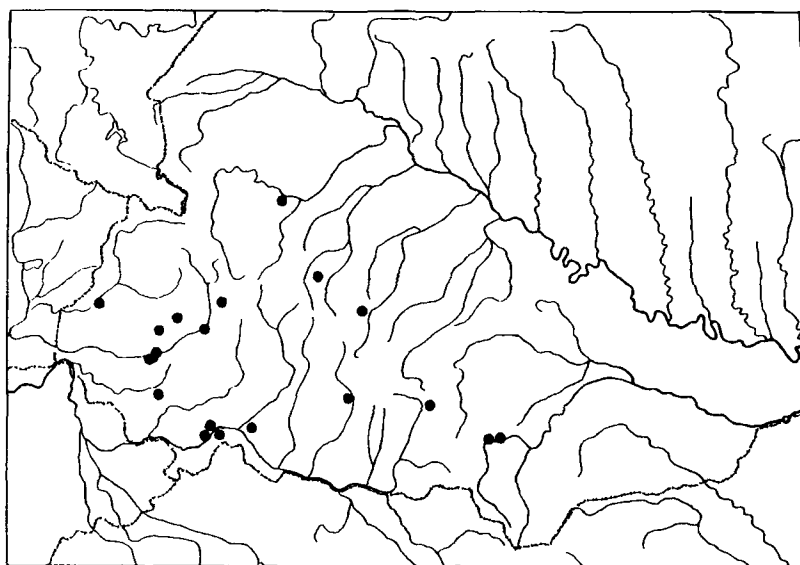


Fig. 9. Map of the distribution of *Cardamine hirsuta* L. in the Carpathian and Pannonian parts of the Ukraine.

Romania

Districts Maramureş, Suceava, Braşov, Sibiu, Hunedoara, Alba, Mehedinţi, Caraş-Severin, Arad, Bihor, Cluj, Sălaj, Satu Mare, Olt.

Maximum altitude: Tatra Zachodnie, Hala Strážyska, 1050 m, 1946, PAWŁOWSKI (KRAM).

Ecology and phytosociology

Cardamine hirsuta occurs in open, synanthropic habitats, including burnt areas of forest clearings, ditches, and the alluvia of streams and small rivers. It is found in communities of the alliances *Epilobion angustifolii* Soó 1933 em. R. TX. 1950 and *Galio-Alliarion* LOHM. et OBERD. in OBERD. et al. 1967.

***Cardamine parviflora* L.**

Cardamine parviflora L. Syst. Nat., ed. 10, 2: 1131, 1759.

Ind. loc.: sine. Lectotypus: (LINN, no. 835.10) (JONSELL 1982: 43).

Exsiccata visa

Fl. Exs. Austro-Hung. no. 2894 (BM, BP, BRA, BRNM, CL, K, OXF, PR, PRC, SIB, WU) - Fl. Exs. Reipubl. Bohem. Slov. no. 1028 (BP, BRNM, BRNU, CL, NI, OL, PR, PRC, SLO, W, WU);

Extra fines: BILLOT Fl. Gall. Germ. Exs. no. 1608 (BM, CGE, OXF) - DÖRFLER Herb. Norm. no. 5414 (BM, BRNU, LTR, PR, W, WU) - DUFFOUR Soc. Franc. Exs. no. 6066 (BM, OL) - Fl. Gall. Germ. Exs. no. 413 (K, KRAM, W) - FRIES Herb. Norm. Suec. fasc. 3, no. 21 (CGE) - Gerb. Fl. SSSR no. 5282 (BM, BRNM, CL, K, KRAM, PRC, W) - Herb. Fl. Loc. France no. 24 (K, OXF, PRC, W) - Herb. Fl. Ross. no. 2508 (BRNU) - Herb. Fl. URSS no. 2927 (BRNU, CL, K, KRA, PR, W) - MAGNIER Fl. Select. Exs. no. 1082 (PRC, W, WU), no. 3621 (W, WU), no. 9335 (W, WU) - Pl. Finl. Exs. no. 675 (K, W, WU), no. 676 (K, W, WU) - REICHENBACH Fl. Germ. Exs. no. 1071 (BM, CGE, K, OXF, PR, PRC, W, WU).

Icones

ASSENOV in JORDANOV Fl. Reipubl. Pop. Bulg. 4: 433, tab. 81, fig. 1, 1970. - DOSTÁL Nová Květ. ČSSR: 363, tab. 90, fig. 7, 1989. - HEJNÝ & SLAVÍK Květ. ČR 3: 95, tab. 20, fig. 1, 1992. - JÁVORKA & CSAPODY Icon. Fl. Part. Austro-Orient. Eur. Centr.: 199, f. 1516, 1975. - MAŁDAŁSKI Fl. Polon. Terrarumq. Adiacent. Icon. 9/4: fig. 1082, 1966. - NYÁRÁDY in SÁVULESCU Fl. Reipubl. Pop. Roman. 3: 265, tab. 46, fig. 3, 1955. - REICHENBACH Icon. Fl. Germ. Helv. 2: fig. 4301, 1837-1838. - ROTHMALER Exkursionsfl., ed. 6, 3: 159, 1987. - SCHLECHTENDAL, LANGETHAL & SCHENK Fl. Deutschl., ed. 5, 14: fig. 1362, 1883.

Icon nostra : Fig. 10.

Brief description

Annual herb, 10-30 (-40) cm tall. Root thin. Stem erect, flexuous, simple or branched above. Basal leaves not forming a rosette. Cauline leaves 6-30, pinnatisect, glabrous, with 3-11 pairs of oblanceolate to linear, apiculate, entire segments. Inflorescence racemose, with 5-150 flowers; sepals 1.0-1.3 mm long, margin membranous; petals white, oblanceolate,

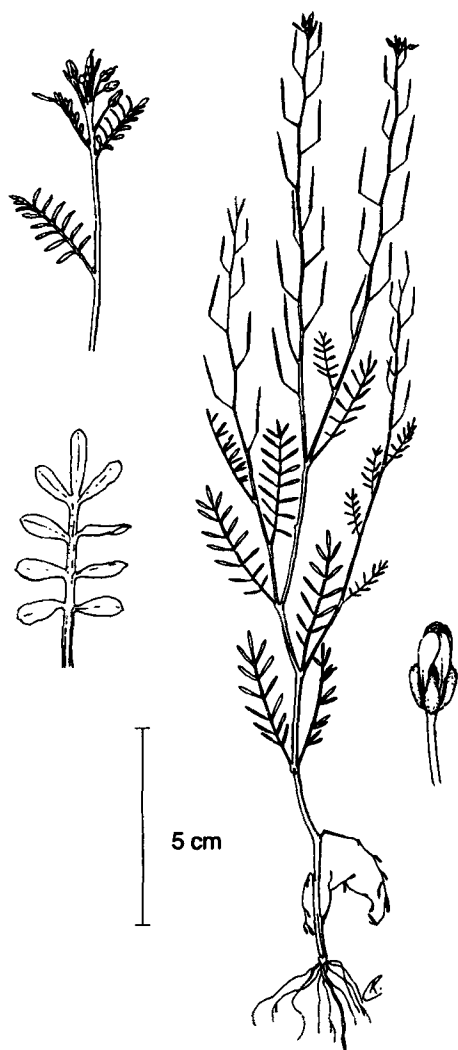


Fig. 10. *Cardamine parviflora* L. (details of flowers and leaves enlarged).

Romania, and one specimen, collected by Schur during the last century, from the vicinity of Sibiu in the Romanian Carpathians. The data referring to the occurrence of *C. parviflora* in the Ukrainian Zakarpats'ka rivnyna lowlands is based on a herbarium specimen (in BP), collected by DIETZ in 1876 from the vicinity of the village of Strumkivka. The presence of *C. parviflora* in this area has not been confirmed subsequently. The data of ČOPŮK (1977) indicating the occurrence of this species in all the phytogeographical districts of the Ukrainian Carpathians is clearly incorrect.

2.0-2.5 (-3.0) mm long, apex rounded; stamens 6, anthers yellow; stigma not conspicuous. Pedicels erect-patent, siliquae erect, 10-18 mm long \times 0.7-0.8 mm wide.

Flowering: May - June.

$2n = 16$

Variation

Throughout its European distribution *Cardamine parviflora* is rather uniform and its variation does not appear to require taxonomic recognition. In North America, however, BRITTON (1892) considered plants of sandy alluvial soils as representing a distinct species, *C. arenicola* BRITTON. SCHULZ (1903) reduced this taxon to the level of variety within *C. parviflora* as var. *arenicola* (BRITTON) O.E. SCHULZ. This position has been accepted in recent North American taxonomic literature (e.g. AL-SHEHBAZ 1988).

General distribution

Cardamine parviflora occurs locally throughout most of Europe except for parts of the Balkan Peninsula. It is also found in North Africa, Asia and North America.

The distribution in the Carpathians and Pannonia

Cardamine parviflora occurs locally throughout Pannonia in ephemeral habitats. For the area studied there are also several herbarium specimens from the Cîmpia Munteniei lowlands of southern

Moravia (Fig. 11)

Pannonicum. 18a. Dyjsko-svratecký úval, 18b. Dolnomoravský úval, 21b. Hornomoravský úval.

Slovakia (Fig. 11)

Pannonicum. 4. Záhorská nížina, 6. Podunajská nížina, 8. Východoslovenská nížina (cf. MARHOLD 1987b, ZLINSKÁ 1990, ZLINSKÁ & OŤAHELOVÁ 1992).

Austria (Fig. 12)

Three localities in the vicinity of the River Morava.

Hungary (Fig. 12)

IV. Eupannonicum. 1. Arrabonicum, 4. Crisicum, 5. Nyirsegensense, 6. Samicum.

Ukraine

Pannonicum. X. Zakarpats'ka rivnyina.

Romania

Distr. Sibiu, Bihor, Giurgiu.

Maximum altitude: Distr. Sibiu, Riu Sadului, ca. 450 m, s. a. SCHUR (LW).

Ecology and phytosociology

Cardamine parviflora occurs in open habitats, including wet depressions in fields, drained fishponds and forest fire-breaks. It is found in communities of the alliances *Nanocyperion* KOCH 1926 em. RIVAS-GODAY 1961, *Beckmanion eruciformis* SOÓ 1933, *Agropyro-Rumicion crispis* NORDH. 1940, *Phalaridion arundiaceae* KOPECKÝ 1961 and *Phragmition communis* W. KOCH 1926. For further notes on the ecology of *C. parviflora* see ZLINSKÁ (1990) and ZLINSKÁ & OŤAHELOVÁ (1992).

***Cardamine impatiens* L.**

Cardamine impatiens L. Sp. Pl.: 655, 1753.

Ind. loc.: "In Europae nemoribus ad radices montium". Lectotypus: (LINN, no. 835.9) (JAFRI 1973: 169).

= *Cardamine brachycarpa* OPIZ Naturalientausch 11: 411, 1826.

Ind. loc.: "In monte Wysoká hora ad Karlstein". Typus ignotus.

Exsiccata visa

BAENITZ Herb. Eur. no. 8320 (CL, PRC) - Fl. Rom. Exs. no. 2764 (CL, K, KRA, SIB, W) - Herb. Norm. Transsilv. no. 1189 (SIB);

Extra fines: BAENITZ Herb. Eur. no. 2 (K), no. 39 (WU), no. 54 (WU) - BILLOT Fl. Gall. Germ. Exs. no. 915 (CGE, OXF) - FEST & GENTA Fl. Stir. Exs. no. 525 (WU) - Fl. Exs. Austro-Hung. no. 3275 (BM, BRA, BRNM, CL, K, KRA, KRAM, OXF, PR, PRC, SIB, W, WU) - Fl. Exs. Bavar. no. 407 (BRNM, PR, WU) - Fl. Exs. Carniol. no. 292 (BM, CL, WU) - Fl. Exs. Reipubl. Social. Českoslov. no. 1512 (BRA, BRNU, CL, K, LIM, PR, PRC, SAV,

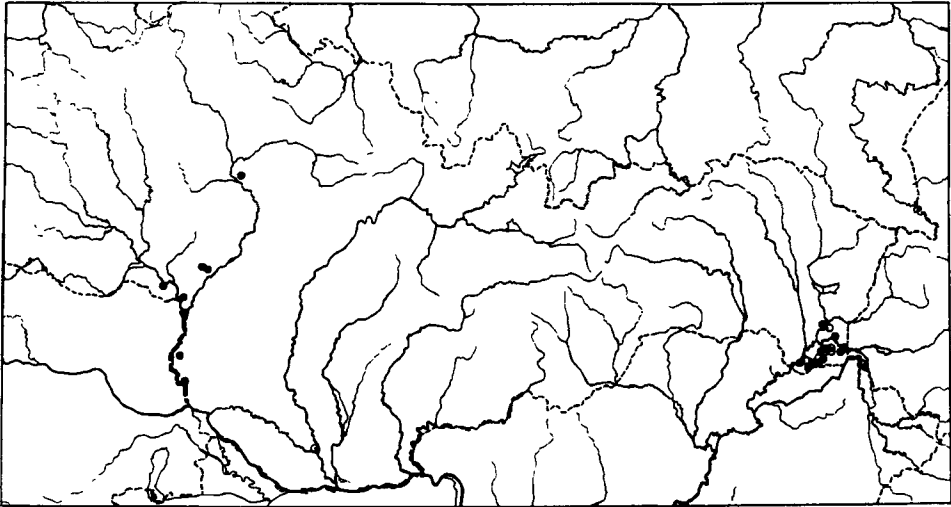


Fig. 11. Map of the distribution of *Cardamine parviflora* L. in the Pannonian part of Moravia and in Slovakia (● - herbarium specimens, ○ - data from the literature).

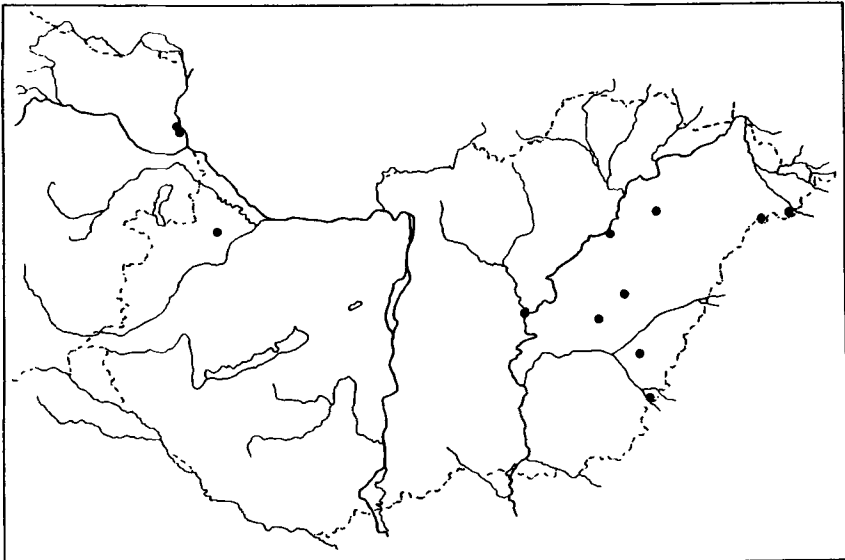


Fig. 12. Map of the distribution of *Cardamine parviflora* L. in the Pannonian part of Austria and in Hungary.

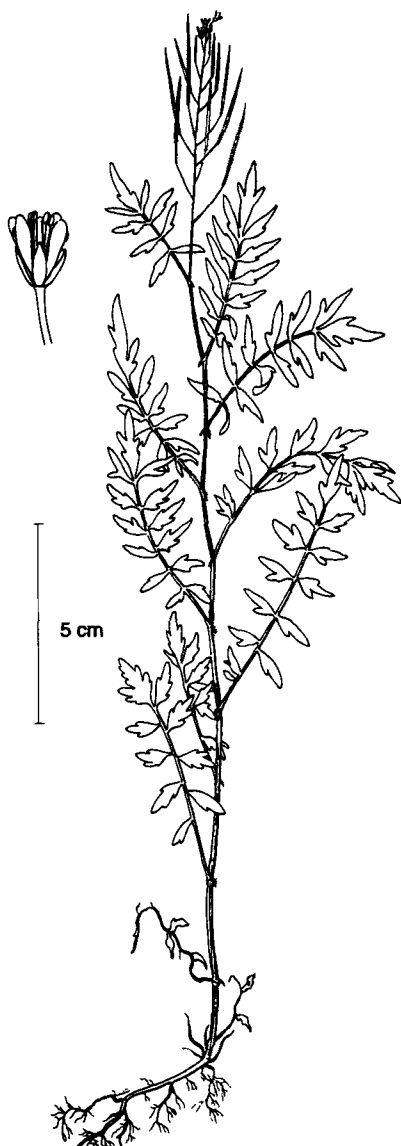


Fig. 13. *Cardamine impatiens* L. (detail of flower enlarged).

W, WU) - Fl. Gall. Germ. Exs. no. 1207 (CGE, W) - Fl. Jutl. Exs. no. 788 (ut *C. flexuosa* WITH.) (BM, CL, KRA, PR, W) - Fl. Polon. Exs. no. 555 (BRNU, CL, KRA, KRAM, PR, RNG) - Fl. Siles. Exs. no. 1057 (KRAM, PR) - HAYEK Fl. Stir. Exs. no. 627 (BM, BRNU, KRAM, W, WU) - Herb. Fl. Ingr. no. 40 (CGE, K, LWS, OXF) - Herb. Fl. Loc. France no. 61 (K, OXF, PRC, W) - Herb. Fl. Ross. no. 1455 (PRC, WU) - Herb. Pl. Crit. Belg. no. 310 (BM, CGE, CL, K) - HOPPE Herb. Pl. Rar. cent. 4, no. 57 (BM) - MAGNIER Fl. Select. Exs. no. 1081 (PRC, W, WU) - PETRAK Fl. Bohem. Morav. Exs. no. 746 (BM, BRNU, CL, PR, PRC) - Pl. Gall. Belg. no. 556 (WU) - Rel. Mailleanae no. 38 (K, PRC, W, WU) - SAMUELSSON Pl. Suec. Exs. no. 885 (BM, K, W) - SCHULTZ Herb. Norm. no. 721 (CL, OXF, PRC, W) - SENNEN Pl. Esp. no. 8632 (BRNU) - Soc. Dauphin. no. 4029b (BM), ser. 2, no. 292 (BM) - Soc. Echang. Pl. Vasc. Eur. Occ. & Bas. Medit. no. 7430 (RNG), no. 13113 (RNG) - TAUSCH Herb. Fl. Bohem. no. 125 (PRC), no. 126 (PRC) - THIELENS & DAVOS Kicxia Belg. no. 218 (CGE, CL) - WIRTGEN Herb. Pl. Crit. Select. Hybrid. Fl. Rhenan. no. 771 (BM, K) - WOŁOSZCZAK Fl. Polon. Exs. no. 504 (BM, CL, K, KRA, KRAM, LW, LWS, W, WU).

Icones

ASSENOV in JORDANOV Fl. Reipubl. Pop. Bulg. 4: 443, tab. 81, fig. 3, 1970. - CLAPHAM, TUTIN & WARBURG Fl. Brit. Isl. Illustr. 1: 53, fig. 207, 1957. - DOSTÁL Květ. ČSR: 291, tab. 95, fig. 1, 1948. - DOSTÁL Klíč Květ. ČSR: 201, fig. 341, 1954. - DOSTÁL Nová Květ. ČSSR: 359, tab. 89, fig. 2, 1989. - HORNEMANN Fl. Dan. 8: fig. 1339, 1810. - HEJNÝ & SLAVÍK Květ. ČR 3: 99, tab. 21, fig. 1, 1992. - JÁVORKA & CSAPODY Icon. Fl. Part. Austro-Orient. Eur. Centr.: 198, fig. 1511, 1975. - MAŁDAŁSKI Fl. Polon. Terrarumq. Adiacent. Icon. 9/4: fig. 1081, 1966. - NYÁRÁDY in SÁVULESCU, Fl. Reipubl. Pop. Roman. 3: 261, tab. 45, fig. 1, 1955. - POLÍVKA, DOMIN & PODPĚRA Klíč Květ. Českoslov.: 47, fig. 65, 1928. - REICHENBACH Icon. Fl. Germ. Helv. 2: fig. 4302, 1837-1838. - ROSS-CRAIG

Drawings Brit. Pl. 1: fig. 23, 1979. - ROTHMALER Exkursionsfl., ed. 6, 3: 159, 1987. - SCHLECHTENDAL, LANGETHAL & SCHENK Fl. Deutschl., ed. 5, 14: fig. 1363, 1883.

Icon nostra : Fig. 13.

Brief description

Biennial, or rarely annual, herb, 10-80 (- 100) cm tall. Stem erect, sometimes flexuous, simple or branched above, glabrous. Rosette leaves shrivelled by anthesis, pinnate, sparsely hairy, with 4-8 pairs of petiolulate, circular-ovate, lobate or sometimes pinnatipartite leaflets. Cauline leaves auriculate, pinnate or sometimes pinnatisect above, with 3-10 pairs of petiolulate or sessile, denticulate to lobed or pinnatipartite leaflets, rachis and leaflet margins sparsely hairy. Inflorescence racemose, with 15-50 flowers; sepals oblong, 1.3-1.8 mm long, margin membranous; petals white, oblanceolate, 2.4-3.0 mm long, apex rounded; stamens 6, anthers green-yellow; stigma not conspicuous. Pedicels and siliquae patent or erect-patent; siliquae 15-25 (- 30) mm long \times 1.0-1.2 mm wide.

Flowering: May - June.

$2n = 16$

Variation

SCHULZ (1903), ZAPALOWICZ (1912) and others recognized a number of varieties and formas for *Cardamine impatiens*. As in the cases of *C. flexuosa* and *C. hirsuta*, the variation exhibited by this species in the area studied does not justify the recognition of subordinate taxa. The only European taxon closely related to *C. impatiens* is *C. pectinata* PALL. ex DC. from the Balkans. This species is easily distinguished from *C. impatiens* by its secund siliquae.

General distribution

Cardamine impatiens is widespread throughout most of Europe except in parts of the south-east. It is also found in Siberia, the Himalayas, India, China, Taiwan, Korea, Japan and has been introduced into North America.

Distribution in the Carpathians and Pannonia

Cardamine impatiens is generally widespread in the Carpathians and Pannonia. There are no records for some higher altitude phytogeographical districts (e.g. Tatra Wschodnie), where this species either does not occur, or is very rare. On the other hand the lack of evidence concerning this species from other districts (e.g. Turčianska kotlina, Pohronský Inovec, and Zakarpats'ke peredhir"ja) most probably reflects a lack of knowledge about these areas, rather than the actual absence of this species.

Poland (Fig. 14)

Karpaty Zachodnie. 513.32. Pogórze Śląskie, 513.47. Beskid Mały, 513.48. Beskid Makowski, 513.49. Beskid Wyspowy, 513.51. Beskid Żywiecki, 513.53. Kotlina Sądecka, 513.54. Beskid Sądecki, 513.61. Pogórze Rożnowskie, 513.64. Pogórze Dynowskie, 513.65. Pogórze Przemyskie, 513.66. Obniżenie Gorlickie, 513.69. Pogórze Bukowskie, 513.71. Beskid Niski, 514.11. Kotlina Orawsko-Nowotarska, 514.12. Pieniny, 514.13. Pogórze Spisko-Gubałowskie, 514.52. Tatra Zachodnie. - **Wschodnie Podkarpacie.** 521.1. Płaskowyz Sansko-Dniestrzanski. - **Beskidy Wschodnie.** 522.12. Bieszczady Zachodnie.

Moravia (Fig. 14)

Pannonicum. 18a. Dyjsko-svratecký úval, 18b. Dolnomoravský úval, 21b. Hornomoravský úval. - **Mesophyticum carpaticum.** 76a. Moravská brána vlastní, 77a. Ždánický les, 77c. Chřiby, 78. Bílé Karpaty lesní, 79. Zlínské vrchy, 80a. Vsetínská kotlina, 81. Hostýnské vrchy, 82. Javorníky, 84a. Beskydské podhůří.

Slovakia (Fig. 14)

Pannonicum. 1. Burda, 2. Ipeľsko-rimavská brázda, 3. Slovenský kras, 4. Záhorská nížina, 5. Devínska Kobyla, 6. Podunajská nížina, 7. Košická kotlina, 8. Východoslovenská nížina. - **Carpaticum occidentale.** 9. Biele Karpaty (južná časť), 10. Malé Karpaty, 11. Považský Inovec, 12. Trábeč, 13. Strážovské a Súľovské vrchy, 14b. Vtáčnik, 14c. Kremnické vrchy, 14d. Poľana, 14e. Štiavnické vrchy, 14f. Javorie, 15. Slovenské rudohorie, 16. Muránska planina, 17. Slovenský raj, 18. Stredné Pohornádie, 19. Slanské vrchy, 20. Vihorlatské vrchy, 21a. Malá Fatra (Lúčanská Fatra), 21b. Malá Fatra (Krivánska Fatra), 21c. Veľká Fatra, 21d. Chočské vrchy, 22. Nízke Tatry, 23a. Západné Tatry, 23b. Vysoké Tatry, 23c. Belianske Tatry, 24. Pieniny, 26a. Liptovská kotlina, 26b. Spišské kotliny, 27a. Biele Karpaty (severná časť), 27b. Javorníky, 28. Západné Beskydy, 29. Spišské vrchy, 30a. Šarišská vrchovina, 30b. Čergov, 30c. Nízke Beskydy. - **Carpaticum orientale.** 31. Bukovské vrchy.

Austria (Fig. 15)

Several localities in the vicinity of the Rivers Danube and Leitha.

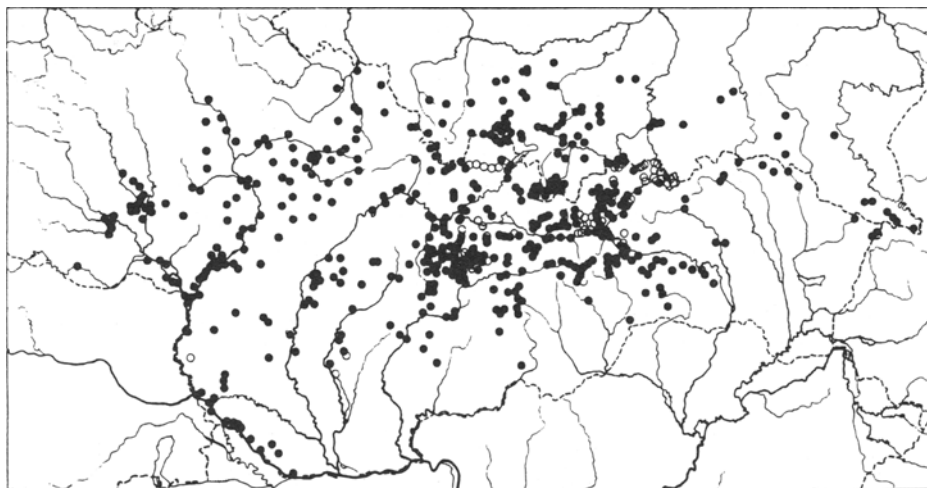


Fig. 14. Map of the distribution of *Cardamine impatiens* L. in the Carpathian and Pannonian part of Poland and Moravia and in Slovakia (● - herbarium specimens, ○ - data from the literature).

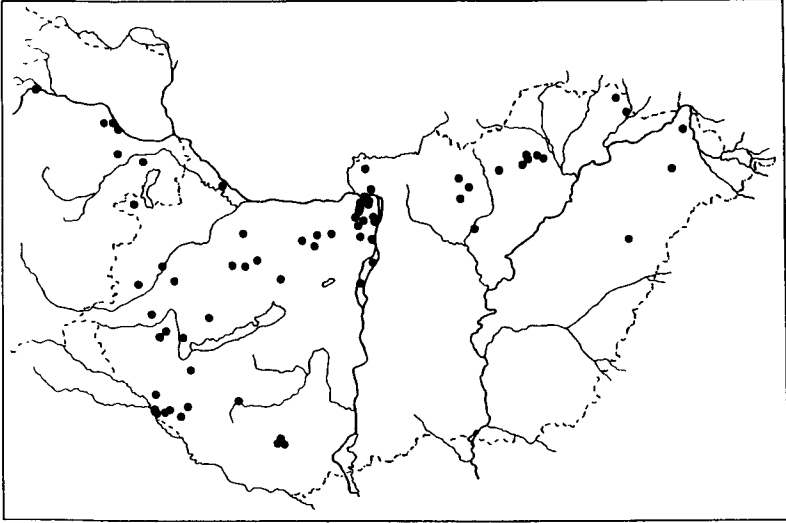


Fig. 15. Map of the distribution of *Cardamine impatiens* L. in the Pannonian part of Austria and in Hungary.

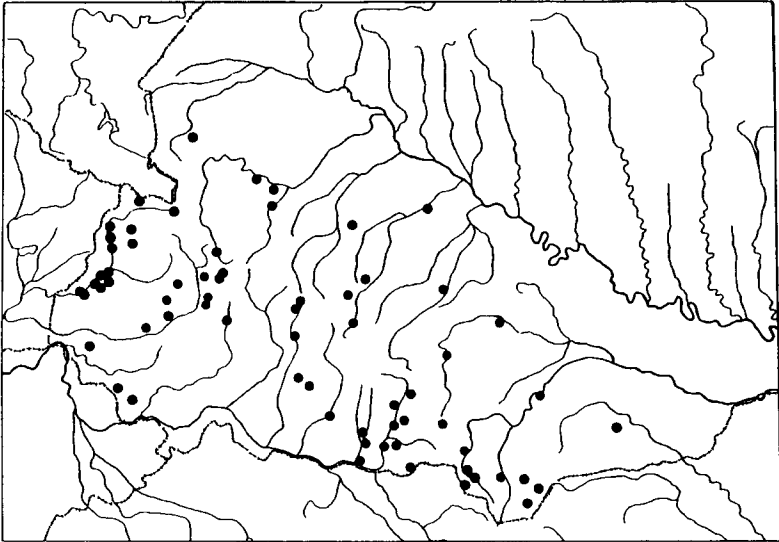


Fig. 16. Map of the distribution of *Cardamine impatiens* L. in the Carpathian and Pannonian part of the Ukraine.

Hungary (Fig. 15)

I. Matricum. 1. Tokajense, 2. Tornense, 3. Borsodense, 4. Agriense, 5. Neogradense. - **II. Bakonyicum.** 1. Visegradense, 2. Pilisense, 3. Vesprimense, 4. Balatonicum. - **III. Praenoricum.** 1. Laitaicum, 2. Castriferreicum. - **IV. Eupannonicum.** 1. Arrabonicum, 2. Colocense, 3. Praematricum, 4. Crisicum, 5. Nyirsegensense. - **V. Praeillyricum.** 1. Saladiense, 2. Somogyicum, 4. Sopianicum.

Ukraine (Fig. 16)

Carpathicum orientale. I. Prykarpattja, II. Schidni Beskydy j Nyz'ki Polonyny, III. Gorgany, IV. Svydovec', VI. Čyvčyno-Grynjavs'ki hory, VII. Marmaros'ki Al'py, VIII. Vulkanični Karpaty. - **Pannonicum.** X. Zakarpats'ka rivnyna.

Romania

Districts Maramureş [?], Bistrița-Năsăud, Mureş, Harghita, Covasna, Prahova, Dîmbovița, Braşov, Vâlcea, Sibiu, Hunedoara, Alba, Mehedinți, Caraş-Severin, Arad, Bihor, Cluj.

Maximum altitude: Belianske Tatry, Kotlina Siedmich prameňov, 1520 m (PAWŁOWSKI 1956: 335).

Ecology and phytosociology

Cardamine impatiens occurs in deciduous forests and forest clearings on slightly acid nutrient rich soils. It belongs to the group of characteristic species of the alliance *Tilio-Acerion* KLIKA 1955, but also frequently occurs in communities of the alliances *Fagion* LUQUET 1926, *Carpinion betuli* ISSLER 1931 em. MAYER 1937, and *Alno-Ulmion* BR.-BL. et R. TX. ex TSCHOU 1948 em. TH. MÜLLER et GÖRS 1958, and it is found in communities of the alliances *Salicion eleagni* MOOR 1958, *Salicion albae* (OBERD. 1933) TH. MÜLLER et GÖRS 1958, *Salicion cinereae* TH. MÜLLER et GÖRS ex. PASS. 1961, *Abietion albae* BŘEZINA et HADAČ in HADAČ 1962, and *Corylo-Populion tremulae* BR.-BL. 1961 and the class *Epilobietea angustifolii* R. TX. et PREISING in R. TX. 1950.

***Cardamine glauca* SPRENG. ex DC.**

Cardamine glauca SPRENG. ex DC. Syst. Nat. 2: 266, 1821.

Ind. loc.: "In aspero monte prope Reggio in Calabria". Lectotypus (**hoc loco designatus**): E Calabria, 1819, SPRENGEL (G-DC).

Exsiccata visa

Extra fines: BECK Pl. Bosn. & Herceg. no. 29 (WU) - DÖRFLER Herb. Norm. no. 3903 (BM, CL, OXF) - FIORI, BÉGUINOT & PAMPANI Fl. Ital. Exs. no. 442 (OXF) - RIGO Iter Ital. Quart. 1898 no. 221 (WU).

Icones

ASSENOV in JORDANOV Fl. Reipubl. Pop. Bulg. 4: 439, tab. 80, fig. 2, 1970. - NYÁRÁDY in SÁVULESCU Fl. Reipubl. Pop. Roman. 3: 271, tab. 47, fig. 3, 1955. - STRID Mount. Fl. Greece: 259, tab. 16, fig. C, 1986.

Icon nostra: Fig. 17.

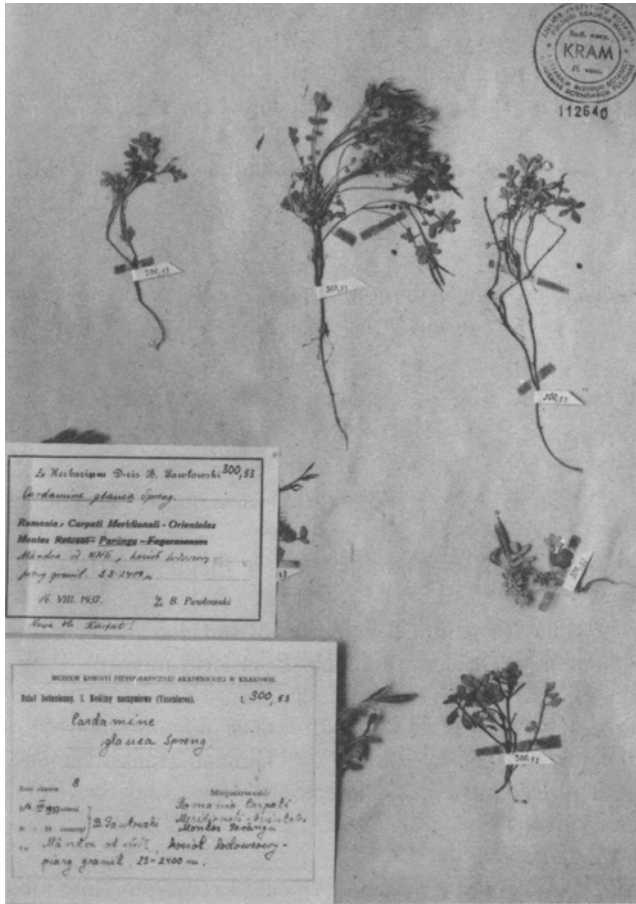


Fig. 17. *Cardamine glauca* SPRENG. ex DC.

and smaller in all parts, with leaves in perennial rosettes and strict infrutescences". According to him, these plants "may warrant subspecific status". However, it seems that no such plants have been collected from the South Carpathians.

General distribution

Cardamine glauca occurs in southern Europe, from Sicily and northern Greece to the South Carpathians.

Distribution in the Carpathians and Pannonia

Cardamine glauca is known from the Mții Parîngului and Mții Căpățîni.

Brief description

Annual or biennial, rarely perennial, herb, 5-10 (- 15) cm tall, glabrous. Rootstock usually many-headed, root to 15 cm long \times 1-3 mm wide. Stems simple or caespitose, erect or ascending, flexuous. Leaves not forming rosette; lower cauline leaves entire, lobate or pinnatisect, the upper ones pinnatisect, with 1-3 (- 5) pairs of obovate to oblong, entire segments. Inflorescence racemose, with 8-15 flowers; sepals oblong, 2.5-3.5 mm long, margin membranous; petals white, obovate, emarginate, 4-5 mm long; stamens 6, anthers yellow; stigma conspicuous. Pedicels and siliquae secund, siliquae 15-25 mm long \times 1.5-1.8 mm wide.

Flowering: July - August.

$2n = 16$ [there are no data for the area studied; cited number is known from Greece (STRID & ANDERSSON 1985), and former Yugoslavia (VAN LOON & KIEFT 1980)]

Variation

JONES (1964) noted that "some of the alpine plants [of *Cardamine glauca*] are dwarf

Romania

Mții Parîngului, Vf. Mîndra NNE, 1937, PAWŁOWSKI (CL, KRA, KRAM), 1937, SULMA (KRAM) - Mții Parîngului, between the Valea Cîrga and Vf. Groapa Mîndri, 1956, PÓCS (SIB, BP). - Mții Parîngului, Vf. Cîrga, 1961, Vicol (CL). - Mții Căpătîinii, on the path between Novaci and Sugag, on the mountain ridge, 1971, FRASER-JENKINS (BM, LTR).

Minimum and maximum altitude: 2000 - 2400 m (above-mentioned data from the Mții Parîngului).

Ecology and phytosociology

PAWŁOWSKI (1939) reported *C. glauca* as growing in the community *Oxyrio digynae-Poetum contractae* HORVAT, PAWŁOWSKI et WALAS 1937 in the Mții Parîngului. A typical habitat of this species is wet, acid scree.

Cardamine resedifolia L.

Cardamine resedifolia L. Sp. Pl.: 656, 1753.

Ind. loc.: "In alibus Helveticis, Pyrenaeis". Lectotypus: to be designated (MARHOLD, in press).

≡ *Cardamine heterophylla* HOST Syn. Pl. Austr.: 366, 1797 (nom. illegit. superfl. - Art. 52).

= *Cardamine gelida* SCHOTT Oesterr. Bot. Wochenbl. 5: 145, 1855. Ind. loc.: "Cacumina alpium in confinio Tyrolis occidentalis (Orteles) (a Celeb. Boissierio missa)". Typus ignotus.

= *Cardamine resedifolia* var. *dacica* HEUFF. Verh. K. K. Zool.-Bot. Ges. Wien 8: 53, 1858. Ind. loc.: "In alpe Skarisora Banatus; in alpis Retezat in Cottu Hunyad Transsilvaniae". Lectotypus vel neotypus (**hoc loco designatus**): In glareosis et rupestribus Skarisora, Banatus, s. a., HEUFFEL (BP, no. 199448).

= *Cardamine nivalis* SCHUR Enum. Pl. Transsilv.: 46, 1866. Ind. loc.: "In Felsenritzen des Podruschel der Arpascher Alpen". Lectotypus (**hoc loco designatus**): In glareosis sum. alpium Transsilv. in monte Podruschel Alp. Arpas, VIII.1847, SCHUR (LW).

- *Cardamine alpina* auct. non WILLD.: SCHUR Sert. Fl. Transsilv.: 7, 1853; id. Enum. Pl. Transsilv.: 46, 1866.

Exsiccata visa

Fl. Rom. Exs. no. 957 (BM, CL, K, KRA, PRC, W);

Extra fines: BAENITZ Herb. Eur. no. 1293 (CL), no. 5543 (WU) - BILLOT Fl. Gall. Germ. Exs. no. 3017 (CGE, OXF) - BOURGEAU Pl. Alp. Marit. no. 34 (W) - BOURGEAU Pl. Espagne no. 1037 (CL) - BOURGEAU Pyren. Espagnol. no. 677 (ut *C. bellidifolia* L.) (W) - FEST & GENTA Fl. Stiriaca Exs. no. 875 (WU) - Fl. Exs. Austro-Hung. no. 3276 (BM, CL, K, KRA, OXF, PRC, SIB, W, WU) - Fl. Ital. Exs. no. 553 (BM, OXF, WU) - MARET Exs. Fl. Valais & Alp. Leman. no. 348 (OXF) - PETRAK Fl. Bohem. Morav. Exs. no. 342 (BM, PRC) - REICHENBACH Fl. Germ. Exs. no. 1070 (BM, K, OXF, PR, PRC, W, WU) - Rel. Maillleanae no. 114 (ut *C. alpina* WILLD.) (W), no. 719 (K, PRC, W, WU) - Soc. Dauphin. no. 4824 (BM)

- Soc. Echang. Pl. Vasc. Eur. Occ. & Bas. Medit. no. 6594 (PR, KRAM) - TAUSCH Herb. Fl. Bohem. no. 121 (PRC).

Icones

ASSENOV in JORDANOV Fl. Reipubl. Pop. Bulg. 4: 439, tab. 80, fig. 3, 1970. - DOSTÁL Květ. ČSR: 294, tab. 96, fig. 3, 1948. - DOSTÁL Klíč Květ. ČSR: 201, fig. 351, 1954. - DOSTÁL Nová Květ. ČSSR: 359, tab. 89, fig. 1, 1989. - HEJNÝ & SLAVÍK Květ. ČR 3: 105, tab. 23, fig. 3, 1992. - JÁVORKA & CSAPODY Icon. Fl. Part. Austro-Orient. Eur. Centr.: 198, fig. 1510, 1975. - MAŁAŁSKI Fl. Polon. Terrarumq. Adiacent. Icon. 9/4: 1080a, 1966. - NYÁRÁDY in SÁVULESCU Fl. Reipubl. Pop. Roman. 3: 271, tab. 47, fig. 2, 1955. - REICHENBACH Icon. Fl. Germ. Helv. 2: fig. 4300, 1837-1938. - ROTHMALER Exkursionsfl., ed. 6, 3: 158, 1987. - SCHLECHTENDAL, LANGETHAL & SCHENK Fl. Deutschl., ed. 5, 14: fig. 1361, 1883.

Icon nostra : Fig. 18.

Brief description

Perennial herb, 4-10 cm tall, glabrous. Rootstock many-headed, root to 12 cm long \times 1-2 mm wide. Stems 1-10, arising from the leaf rosette, erect or ascending, flexuous, simple or branched. Rosette leaves simple, entire, lobate or pinnatifid. Cauline leaves auriculate, pinnatisect with 2-4 pairs of oblanceolate to linear and entire lateral segments, or rarely lobate, coarsely dentate or entire. Inflorescence racemose, with 5-12 flowers; sepals oblanceolate to oblong, 1.8-3.0 mm long, margin membranous; petals white, oblanceolate, 4.5-6.5 mm long, apex rounded or truncate; stamens 6, anthers yellow. Pedicels and siliquae patent or erect-patent. Siliquae 12-20 mm long \times 1.2-1.4 mm wide.

Flowering: May - August.

$2n = 16$ [there are no data for the area studied; cited number is known from the Czech Republic (KRAHULCOVÁ 1988), former Yugoslavia (GADELLA & KLIPHUIS 1972), and France (GADELLA & KLIPHUIS 1970, POLATSCHEK 1983)]

Variation

Plants possessing entire or coarsely dentate cauline leaves from the Tirol and south Romania were described as separate species, namely *Cardamine gelida* SCHOTT and *C. nivalis* SCHUR. HEUFFEL (1858), describing his variety *C. resedifolia* var. *dacica* from south Romania, also stressed as the character distinguishing it from var. *resedifolia* the dentate, not pinnatisect, lower

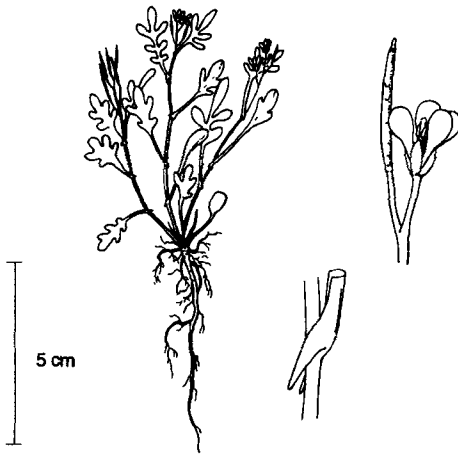


Fig. 18. *Cardamine resedifolia* L. (details of flower, fruit, and leaf base enlarged).

cauline leaves. Plants with coarsely dentate to lobate cauline leaves, as well as those with pinnatisect leaves, occur within most populations of *C. resedifolia* throughout the South Carpathians and elsewhere. This kind of variation is not considered worthy of formal taxonomic recognition.

General distribution

Cardamine resedifolia occurs in the mountains of southern and central Europe, extending from the Sierra Nevada and Apennines to the South and East Carpathians and northwards to the Sudeten mountains.

Distribution in the Carpathians and Pannonia

Cardamine resedifolia is confined to the highest mountains of the Romanian East and South Carpathians in the area studied.

Two herbarium specimens are labelled as having been collected in the West Carpathians. The first of these (in PRC) is labelled as “Moravské Beskydy: v údolí potoka Mohyla směrem k Martiňáku [Moravské Beskydy Mts., valley of Mohyla stream, towards Martiňák]”, and was collected by E. HEJNÝ in 1940 at 700 m. Taking in to account the altitude, ecology and isolated position of this locality the natural occurrence of this species has been excluded by HENDRYCH (1986, 1987). The second specimen (in BRNU) was collected by PICBAUER, and is labelled “Montes tatrensis: Květnice ve Velické dolině ... 1913”. Although the Velická dolina Valley in the Vysoké Tatry Mts. is a well collected locality, the occurrence of *C. resedifolia* has not been confirmed subsequently. Hence it appears that the most probable explanation of PICBAUER's annotation accompanying this specimen is the result of misplaced herbarium label. HACQUET (1796) provided undocumented information concerning the occurrence of *C. resedifolia* below Mt. Kriváň in the Vysoké Tatry Mts. This record was repeated by REUSS (1853) and NEILREICH (1866), but UECHTRITZ (1866) and SAGORSKI & SCHNEIDER (1891) expressed doubts concerning its accuracy. HRUBY (1925) reported the occurrence of this species from the Ukrainian East Carpathians (mountains of Hoverla and Petros), but these records have not been confirmed by later authors and no herbarium specimens have been located.

Romania

Districts Bistrița-Năsăud, Dîmbovița [?], Prahova [?], Brașov, Sibiu, Vâlcea, Arges, Hunedoara (in the mountains of Rodnei, Bucegi, Făgărașului, Iezer, Cibinului, Godeanu, Retezatului, Parîngului).

Minimum altitude: Distr. Brașov, Mții Făgărașului, Vf. Piscului, ca. 1800 m, 1930, E.I. NYÁRÁDY (CL); Distr. Sibiu, Mții Făgărașului, Valea Bîlea, 1700-1800 m, 1914, TUZSON (BP).

Maximum altitude: Distr. Sibiu, Mții Făgărașului, Vf. Negoiu, 2540 m, 1953, POP (CL).

Ecology and phytosociology

Cardamine resedifolia occurs on wet, acid scree, in communities of the alliance *Androsacion alpinae* BR.-BL. 1926 (e.g. *Oxyrio digynae-Poetum contractae* HORVAT, PAWŁOWSKI et WALAS 1937 and *Oxyrietum digynae transsilvanicum* CSÜRÖS 1957).

***Cardamine trifolia* L.**

Cardamine trifolia L. Sp. Pl.: 654, 1753.

Ind. loc.: "In Alpihus Helveticis, Lapponicis". Lectotypus: to be designated (MARHOLD, in press).

Exsiccata visa

Fl. Exs. Reipubl. Bohem. Slov. no. 1025 (BP, BRNM, BRNU, CL, K, OL, NI, PR, PRC, SLO, W, WU) - Fl. Polon. Exs. no. 22 (BM, CGE, CL, JE, KRA, KRAM, W), no. 420 (BM, BRNU, CL, KRA, KRAM, PR, PRC, RNG) - REHMAN Pl. Polon. Exs. no. 854 (CL, KRA, KRAM, LW, LWS);

Extra fines: BAENITZ Herb. Eur. no. 7341 (CL, PRC) - BRAUN-BLANQUET Fl. Raet. Exs. no. 435 (W) - FIORI & BÉGUINOT Fl. Ital. Exs. no. 2056 (BM, K, KRA, OXF, WU), no. 2056b (BM, K, KRA, OXF, WU) - Fl. Exs. Austro-Hung. n. 855 (BM, BRA, BRNM, BRNU, CL, K, PR, PRC, SIB, W, WU) - Fl. Exs. Bavar. no. 264 (BRNM, PR, WU), no. 264a (PR) - Fl. Exs. Carniol. no. 294/I (BM, CL, WU), no. 294/II (BM, CL, WU) - Fl. Gall. Germ. Exs. no. 508 (BM, CGE, OXF), no. 810 (CL, K, W), no. 810b (CGE, W) - Fl. Sequaniae Exs. no. 409 (CGE) - Fl. Siles. Exs. no. 156 (BM, BRNU, CL, KRAM, PR, W, WRSL) - HAYEK Fl. Stir. Exs. no. 22 (BM, BRNU, W, WU), no. 23 (BM, KRAM, W, WU) - HOPPE Herb. Pl. Rar. cent. 3, no. 55 (BM) - PETRAK Fl. Bohem. Morav. Exs. no. 343 (BM, BRNU, CL, PR, PRC) - Pl. Graec. no. 15 ((BM, PR, W) - REICHENBACH Fl. Germ. Exs. no. 1069 (BM, CGE, K, OXF, W, WU) - SCHULTZ & WINTER Herb. Norm. no. 10 (BM, BRNU, CGE, OXF, PRC, W) - Soc. Echang. Pl. Vasc. Eur. Occ. & Bas. Medit. no. 9224 (RNG), no. 9225 (RNG) - TAUSCH Herb. Fl. Bohem. n. 120 (PRC).

Icones

DOSTÁL Květ. ČSR: 288, tab. 94, fig. 2, 1948. - DOSTÁL Klíč Květ. ČSR: 201, fig. 340, 1954. - DOSTÁL Nová Květ. ČSSR: 359, tab. 89, fig. 5, 1989. - HEJNÝ & SLAVÍK Květ. ČR 3: 109, tab. 24, fig. 2, 1992. - JÁVORKA & CSAPODY Icon. Fl. Part. Austro-Orient. Eur. Centr.: 200, fig. 1520, 1975. - MAŁAŁSKI Fl. Polon. Terrarumq. Icon. 9/4: fig. 1080, 1966. - Polívka, DOMIN & PODPĚRA Klíč Květ. Českoslov.: 47, fig. 64, 1928. - REICHENBACH Icon. Fl. Germ. Helv. 2: fig. 4298, 1837-1838. - ROTHMALER Exkursionsfl., ed. 6, 3: 160, 1987. - SCHLECHTENDAL, LANGETHAL & SCHENK Fl. Deutschl., ed. 5, 14: fig. 1370, 1883.

Icon nostra : Fig. 19.

Brief description

Perennial herb, 10-25 cm tall. Rhizome prostrate, long, branched, usually 2-3 mm wide, rooting at the nodes. Stem erect, simple or branched, leafless or with 1 (-3), ternate leaves, glabrous. Basal leaves arising from rhizome, ternate, long petiolate, coriaceous; leaflets shortly petiolulate, circular-obovate, cuneate, irregularly to sharply crenate (teeth shortly apiculate), dark green with sparse short hairs above, grey- to blue-green and glabrous beneath, margin ciliate. Inflorescence racemose, with 10-20 flowers; sepals 2.5-3.5 mm long, margin white to membranous; petals snow-white, 7-11 mm, margin undulate; stamens 6, anthers yellow; stigma not conspicuous. Pedicels and siliquae patent to erect-patent. Siliquae 15-32 mm long × 1.5-2.5 mm wide, style remnant to 2 mm long.

Flowering: May - June.

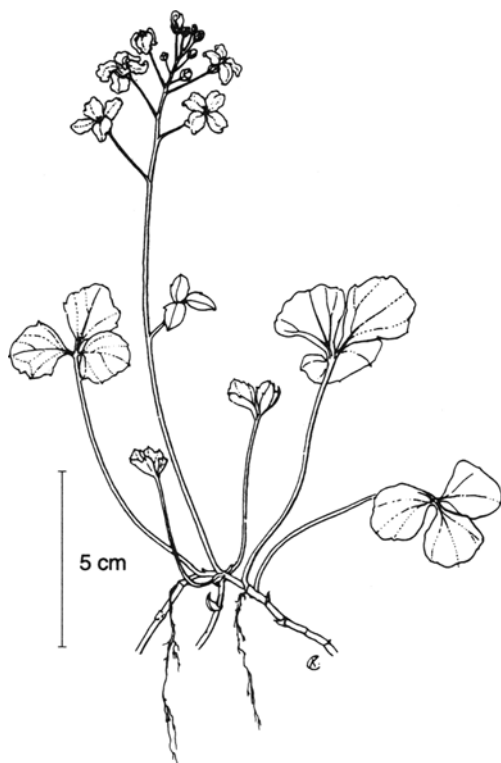


Fig. 19. *Cardamine trifolia* L.

$2n = 16$

Variation

Cardamine trifolia is an evolutionarily and morphologically isolated diploid species lacking variation requiring formal taxonomic recognition. The only infraspecific taxon to have been described for this species is var. *bijuga* O.E. SCHULZ. This variety was described as having bijugal instead of ternate cauline leaves. Such variation does not appear to be worthy of formal taxonomical recognition.

General distribution

Cardamine trifolia has its center of the distribution in the Eastern Alps. In the west it occurs in Switzerland, in isolated localities in the valley of the Rhine, in the Alps and Prealps of Bern, and in the Jura. In the south it is found in the northern Apennines, Istria, Slovenia, Croatia and Dalmatia. It also occurs in Hercynian Bohemia, and in the West Carpathians.

Distribution in the Carpathians and Pannonia

In this area *Cardamine trifolia* only occurs in the West Carpathians of Moravia, Slovakia and Poland. The reported occurrence of this taxon in Romania and the Ukraine can be definitely disregarded.

There are two published records which are documented by herbarium specimens from Romania. The first of these was published by PAX (1898-1908: 198, 256) from material collected in Gîrda de Sus in the Mții Bihorului (district of Alba). The specimen, in BP, documenting this information belongs to *Cardamine amara* subsp. *amara*. The second record, published by BAUMGARTEN (1816), is documented by a specimen of *C. trifolia*, now housed at CL, labelled as having been collected in the Mții Harghita. Bearing in mind the absence of later collections of *C. trifolia* from Romania (BARTH 1903) the most probable explanation of the distributional information affixed to this specimen is a misplaced label or romantic effort of BAUMGARTEN to make the local flora more interesting. Other data concerning the occurrence of *C. trifolia* in Romania, but not documented by herbarium specimens

(BAUMGARTEN 1816, FUSS 1866, SCHUR 1866), are probably the result of misidentifications of *C. amara* subsp. *amara* (MARHOLD 1987a).

There are also two published records for *C. trifolia* from the Ukraine. The first of these (ŠMARDÁ 1938) is based on information provided by VULTERIN from material he collected in the vicinity of the source of the river of Čorna Tysa. According to VULTERIN (pers. comm.) this specimen was destroyed in 1939. He has, however, been able to provide very precise information about the locality where the above-mentioned plant was collected. During a field trip to this area in 1989 with A. KAHALO and N. SYČAK the present author was able to find there only plants of *C. amara* subsp. *amara*. The forest in this vicinity is well preserved and probably has not been seriously disturbed since 1938. It may thus be concluded that *C. trifolia* never occurred there. The second record from the Ukraine is that of FODOR (1974). According to him (FODOR, pers. comm. cited in MARHOLD 1987a: 2) a voucher specimen was deposited in UU. Several attempts to locate this specimen were unsuccessful and it may be concluded that the specimen is probably lost. Taking into account other misidentifications published by this author (see p. 426), the most probable explanation of this record is again a misidentification of *C. amara* subsp. *amara*.

Among the Slovakian localities of *C. trifolia*, those in the Veľká Fatra and Spišské vrchy Mts. have not been confirmed in recent years.

Poland (Fig. 20)

Karpaty Zachodnie. 513.47. Beskid Mały, 513.48. Beskid Makowski, 513.51. Beskid Żywiecki, 513.52. Gorce, 514.11. Kotlina Orawsko-Nowotarska, 514.12. Pieniny, 514.13. Pogórze Spisko-Gubałowskie, 514.14. Rów Podtatrzski, 514.52 Tatry Zachodnie (cf. KOTAŃSKA 1967a).

Moravia (Fig. 20)

Mesophyticum carpaticum. 81. Hostýnské vrchy. - **Oreophyticum carpaticum.** 99a. Radhošské Beskydy.

Slovakia (Fig. 20)

Carpaticum occidentale. 21b. Malá Fatra (Krivánska Fatra), 21c. Veľká Fatra, 21d. Chočské vrchy, 22. Nízke Tatry, 23a. Západné Tatry, 23c. Belianske Tatry, 24. Pieniny, 27b. Javorníky, 28. Západné Beskydy, 29. Spišské vrchy (cf. MARHOLD 1987a).

Minimum altitude: Chočské vrchy, Dierová, 460 m, 1976, HUBOVÁ (SAV).

Maximum altitude: Západné Tatry, Dlhá Jama, between Mt. Predný Salatín and elevation point 1712, ca. 1550 m, 1950, SOUČKOVÁ (BRNM).

Ecology and phytosociology

Cardamine trifolia occurs chiefly in deciduous and mixed forests, but also in natural forests and plantations of *Picea abies*. It is found up to the timberline on soils rich in humus on various substrates, in communities of the suballiance *Eu-Fagenion* OBERD. 1957 em. R. TX. in R. TX. et OBERD. 1958 (e.g. *Dentario glandulosae-Fagetum* W. MATUSZKIEWICZ 1964) and the alliance *Piceion excelsae* PAWŁOWSKI in PAWŁOWSKI et al. 1928 (mostly in *Vaccinio*

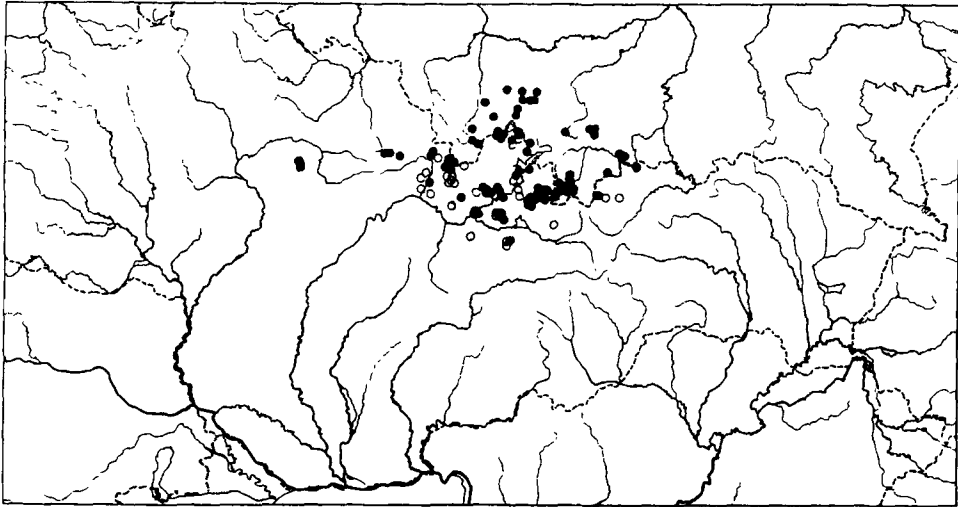


Fig. 20. Map of the distribution of *Cardamine trifolia* L. in the Carpathian part of Poland and Moravia and in Slovakia (● - herbarium specimens, ○ - data from the literature).

myrtilli-Piceetum (SZAFER et al. 1923) ŠOLTÉS 1976 and *Piceo-Abietetum albae* SZAFER et al. 1923), and less often in the association *Alnetum incanae* LÜDI 1921 of the suballiance *Alnenion glutinoso-incanae* OBERD. 1953. A detailed study of the autecology of *C. trifolia* in the Polish Tatra Mts. was published by KOTÁNSKA (1967b).

***Cardamine graeca* L.**

Cardamine graeca L. Sp. Pl.: 655, 1753.

Ind. loc.: "In Sicilia, Corsica, insulis Graeciae". Lectotypus: to be designated (MARHOLD, in press).

≡ *Pteroneurum graecum* (L.) DC. Syst. Nat. 2: 270, 1821.

= *Pteroneurum rochelianum* RCHB. Deutschl. Fl. 1: 69, 1837-1838.

Ind. loc.: "Im Banat bei Szviniza (ROCHEL)". Typus ignotus.

≡ *Cardamine rocheliana* (RCHB.) BORBÁS Math. Természettud. Közlem. 15: 168, 1878.

= *Cardamine longirostris* JANKA Math. Természettud. Közlem. 12: 164, 1876.

Ind. loc.: "In umbrosis silvarum vallis Kazan inferioris inter pag. Dubova et Ogradina ad Danubium inferiorem Banatus". Lectotypus (**hoc loco designatus**): In umbrosis silvarum vallis Kazan inferioris inter pagum Dubova et Ogradina ad Danubium inferiorem, Banatus, 10. V. 1870, JANKA (BP, no. 185741).

Exsiccata visa

BAENITZ Herb. Eur. no. 8318 (CL, PRC), no. 8319 (PRC) - Fl. Exs. Austro-Hung. no. 2896 (BM, BRA, CL, OXF, PR, PRC, SIB), no. 2897 (BM, BP, BRA, CL, K, OXF, PR, PRC, SIB)

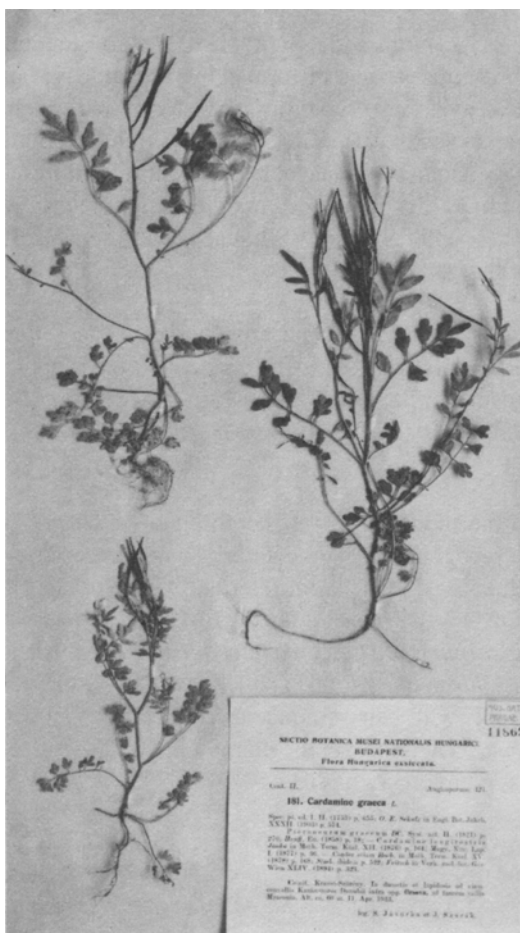


Fig. 21. *Cardamine graeca* L.

Centr.: 199, fig. 1514, 1975. - NYÁRÁDY in SÁVULESCU Fl. Reipubl. Pop. Roman. 3: 271, tab. 47, fig. 1, 1955. - REICHENBACH Icon. Bot. Pl. Crit. 4: tab. 581, 582, 1826. - REICHENBACH Icon. Fl. Germ. Helv. 2: fig. 4309, 1837-1838.

Icon nostra: Fig. 21.

Taxonomic history

CANDOLLE (1821) considered the genus *Pteroneurum* DC. distinct from *Cardamine* L. He stated that this genus differed from *Cardamine* by lanceolate siliquae, winged placenta, two-edged style, widened funicle, and thick cotyledons. Within the genus *Pteroneurum* he recognized two species, *Pteroneurum graecum* (L.) DC. and *P. carnosum* (WALDST. et KIT.) DC. This genus has been accepted by some authors (e.g. REICHENBACH 1826, 1830-1832, 1837-1838), but is usually treated only as a section of *Cardamine*.

- Fl. Hung. Exs. no. 181 (BRA, CL, K, PR, PRC, SIB) - Fl. Rom. Exs. no. 958 (BM, CL, K, PRC, SIB), no. 959 (BM, CL, K, PR, PRC, SIB) - SCHNEIDER Iter Balcan. 1907 no. 34 (K) - SCHULTZ & WINTER Herb. Norm. no. 11 (BM, CGE, CL, OXF);

Extra fines: BORNMÜLLER Lydiae & Chariae Pl. Exs. no. 9038 (PRC) - DÖRFLER Pl. Cret. no. 111 (PRC) - DÖRFLER Reisen Nord Alban. 1918 no. 418 (K) - FIORI & BÉGUINOT Fl. Ital. Exs. no. 2673 (BM, K, OXF) - Fl. Dalm. Exs. no. 75 (CGE) - Fl. Graeca Exs. no. 630 (K, OXF) - HELDREICH Herb. Graec. Norm. no. 167 (K, OXF) - HELDREICH Pl. Exs. Ins. Cephalon. no. 225 (K) - Herb. GOULANDRIS no. 16867 (RNG) - ROSS Herb. Sicul. no. 803 (CL) - SCHULTZ Herb. Norm. n. ser. no. 437 (OXF, PRC) - SINTENIS Iter Thessal. 1896 no. 63 (K) - TODARO Fl. Sicul. Exs. no. 363 (CGE) - WIŚNIEWSKI Iter Bulg. Tert. 1931 no. 1908 (K).

Icones

ASSENOV in JORDANOV Fl. Reipubl. Pop. Bulg. 4: 439, tab. 80, fig. 1, 1970. - JÁVORKA & CSAPODY Icon. Fl. Part. Austro-Orient. Eur.

Brief description

Annual herb, 8-25 (- 30) cm tall. Root 1.5-2.0 mm wide. Stem erect, flexuous, simple or branched, glabrous or sparsely hairy. Rosette either absent or formed by several leaves of the same shape as the cauline ones. Cauline leaves 5-10, glabrous or margin sparsely hairy, auriculate, pinnate, the uppermost rarely pinnatisect. Leaflets in 2-5 pairs, petiolulate, obovate, pinnatipartite; leaflets of the uppermost leaves sometimes lanceolate and entire. Inflorescence racemose, with 5-8 flowers; sepals oblong, 2.5-3.5 mm long, margin membranous; petals white, 4-6 mm long, apex rounded; stamens 6, anthers yellow. Siliquae usually secund, 35-50 mm long \times 3.0-4.5 mm wide, glabrous or hairy.

Flowering: March - April.

No chromosome number of this species is known for the area studied. The following numbers were reported from the other parts of its area: $2n = 16$ [Greece (STRID & FRANZÉN 1981, MONTMOLLIN 1984), former Yugoslavia (SZ.-BORSOS 1970)]; 18 [Russia, Crimea (SPASSKAJA 1979), Italy (CHICHIRICÓ et al. 1979), Greece (PERSOON 1971)].

Variation

Cardamine graeca shows variation in the indumentum of the siliquae which are either glabrous or hairy. This variation has been recognized by some authors who have ascribed to it varietal status. For example, plants with hairy siliquae were referred by CANDOLLE (1821) to *Pteroneurum graecum* var. *eriocarpum* DC. ["*eriocarpa*"], by BOISSIER & HELDREICH (BOISSIER 1849) to *P. graecum* var. *lasiocarpum* BOISS. et HELDR. ["*lasiocarpa*"], and by REICHENBACH (1826) to *P. graecum* var. *trichocarpum* RCHB. The lectotype of *C. graeca* has glabrous siliquae (MARHOLD, in press). Plants with hairy siliquae are rather rare, but usually occur with those possessing glabrous siliquae. Therefore, in the opinion of the present author, this variation does not warrant formal taxonomic recognition.

General distribution

Cardamine graeca is a south European species, occurring from Corsica to Turkey and the Crimea. In the north it extends from Italy to former Yugoslavia, Albania and west Romania.

Distribution in the Carpathians and Pannonia

Cardamine graeca occurs only at several localities in the most south-western part of the South Carpathians, near the River Danube (district of Mehedinți).

FODOR (1974) published a record for this species from near Uhol'ka in the Ukrainian East Carpathians, based on a specimen collected in 1960. It was probably on the basis of this record that ČOPYK (1977) reported the occurrence of *C. graeca* from the phytogeographic districts of Čornohora, Čyvčyno-Grynjavs'ki hory and Marmaros'ki Al'py (without mentioning exact localities). As in the case of FODOR's record of *Cardamine trifolia* from the Ukrainian Carpathians, there are no relevant herbarium specimens in UU. The only specimen labelled as "*Cardamine graeca* ?" in this herbarium is from "Dilove, Tisnyj Hrun" in the Ukrainian East Carpathians (without collector's name). This is a sterile plant of *Cardamine impatiens*. Because of FODOR's rather imprecise information concerning the collection locality of *C. graeca*, it has not proved possible to examine this area thoroughly. Taking into account the very different ecological conditions found at the south Romanian localities of *C. graeca* compared with those in the East Carpathians, the records of FODOR (1974) and ČOPYK (1977) for this species ought to be considered very doubtful.

Romania

Distr. Mehedinți.

Maximum altitude: Distr. Mehedinți, Dubova, Cazane, 100 m, 1885, BAENITZ (BAENITZ Herb. Eur. no. 8318).

Ecology and phytosociology

Cardamine graeca occurs on calcareous substrates in forest margins and forest communities most probably belonging to the alliance *Quercion pubescentis-petraeae* BR.-BL. 1931.

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Appendix

APPENDIX

Selected specimens

(for numbers and names of phytogeographic districts see "Distribution")

Cardamine flexuosa WITH.

Poland

Karpaty Zachodnie. 513.45. Brenna, Stary Gron (1967 BRODA KRA). - 513.46. Lipowska (1895 WOŁOSZCZAK KRAM, W). - 513.47. Wzg. Żurawnica (1963 BŁASZCZYK KRA). - 513.48. Góra Jaronowicka (1967 BŁASZCZYK KRA). - 513.49. Luboń Wielki (1966, 1967 DZWONKO KRA). - 513.51. Rezerwat Romanka (1965 BIAŁECKA KRA). - 513.52. Zaryte (1952 KORNAŚ KRA). - 513.53. Stary Sącz - Nowy Sącz (1936 SŁOWIKOWSKI KRA). - 513.54. Pasma Radziejowej, Złamany Wierch (1919 PAWŁOWSKI KRAM). - 513.62. Gromnik, Jodłówka Tuchowska (1968 TRZCIŃSKA-TACIK KRA). - 513.64. Poręby (1972 BOBER KRA). - 513.65. Przemyśl, Panieński Czub (1877 KOTULA KRAM). - 513.71. Jodłowa Góra (1919 PAWŁOWSKI KRAM, 1920 MICZYŃSKI KRAM). - 514.11. Podsmarnia (1966 M. & J. GUZIK KRAM). - 514.12. Czorstyn (1880 GUSTAWICZ KRAM). - 514.13. Magura Witowska (1962 KOTEJA KRAM). - 514.14. Zakopane (1915 MICZYŃSKI KRAM). - 514.52. Czerwony Wierch (1875 KULCZYŃSKI KRAM). - 514.53. Dolina Rybiego potoka pod Polaną Opaloną (1926 PAWŁOWSKI KRAM). - **Beskidy Wschodnie.** - 522.12. Berdo - Durna (1961 JASIEWICZ hb. Jas., KRAM).

Moravia

Mesophyticum carpaticum. 77a. Haluzice - Jestřabice (s.a. CHURÝ BRNM). - 78. Starý Hrozenkov, les Javor (1927 STANĚK BRNM). - 79. Pozděchovice, údolí Trubiska (1944 TOMÁŠEK BRNM, PRC). - 80a. Vsetín (1879 ÚLEHLA PRC, 1882 BUBELA PRC). - 80b. Vsetín, Hovézsko (1932 ŘÍČAN BRNU). - 81. Obřany (1956 ZAVŘEL BRA). - 82. Valašské Klobouky, Mladý háj (1926 STANĚK BRNM). - 84a. Frýdlant (1901 TEUBER BRNM). - **Oreophyticum carpaticum.** - 99a. Čertův mlýn, nad Prostřední Bečvou (1949 KAVKA BRA). - 99b. Nýdek, Velká Čantoryje (1975 DEYLOVÁ PR).

Slovakia

Pannonicum. 3. Zádiel, Hačavská planina (1934 DEYL PR). - **Carpaticum occidentale.** 9. Lopeník (1892 HOLUBY BRA). - 10. Horáreň Horvátka (1925 SCHEFFER SLO). - 13. Strážov (1930 SCHEFFER SLO). - 14b. Podhradie (1924 SCHEFFER SLO). - 14c. Kremnica, Kremnický štôš (1984, 1985 MARHOLD SAV). - 14d. Zvolen, Červený medokýš (1961 MITSKE PR). - 15. Čierny Balog, Veľká Prostredná dolina (1987 MARHOLD SAV). 16. Zbojská (1939 SCHIDLAY BRA). - 17. Stratená (1953 MARVAN BRNU). - 19. Červenica, Oltárne (1972 KOLLÁR herb. Prešov Museum). - 20. Montrogon (1922 NOVÁK PRC). - 21a. Dolina pod Reváňom (1949 KLIKA PR). - 21b. Kriváň - Suchý (1926 KLIKA PRC). - 21c. Kráľova Studňa (1953 SCHIDLAY SAV, 1987 MARHOLD SAV). - 21d. Choč (1899 PAX BP, 1926 KLIKA PRC). - 22. Špania Dolina, Pánsky diel (1967 MÁJOVSKÝ SLO). - 23a. Osobitá (1935 KLIKA PR). - 23b. Kôprová dolina, Temné smrečiny (1883 KOTULA KRAM). - 23c. Muráň (1929 DOMIN PRC, 1943 FUTÁK SLO). - 24. Červený Kláštor - Lesnica (1953 MICHALKO SLO). - 25. Budiš (1915 MARGITTAI BP). - 26a. Liptovský Hrádok (1977, 1982 HORNÍČKOVÁ BRA). - 27a. Zubák, Uhlisko (1926 STANĚK BRNM). - 28. Horelica S (1964 CHRTEK & ŽERTOVÁ PRC). - 29. Vyšné Ružbachy (1971 GALLO BRA). - 30a. Prešov (s.a. HAZSLINSZKY BP). - 30b. Čergov (1947 MÁJOVSKÝ SLO). - 30c. Bardejovské kúpele (1943 SCHIDLAY BRA). - **Carpaticum orientale.** 31. Ďurkovec (1957 SOJÁK PR).

Hungary

II. Bakonyicum. 3. Bakonybél, Gella völgy, near the lake Kövestető (1954 BOROS BP). - **III. Praenoricum.** 3. Barsszentmihályfalva (1960 KÁROLYI BP). - **V. Praeillyricum.** 1. Szentpéterföldre (1957 KÁROLYI BP). - 4. Mecsek (1873 SIMKOVICS BP).

Ukraine

Carpaticum orientale. I. Oblasť L'vivs'ka, Rajon Drohobyc'kyj, Boryslav N (1986 VOLGYN LW). - II. Oblasť L'vivs'ka, Rajon Starosambirs'kyj, Topilnycja (1990 MARHOLD & KHALO SAV). - III. Oblasť Ivano-Frankivs'ka, Rajon Dolyns'kyj, Ljudvykivka (1890 WOŁOSZCZAK W). - IV. Oblasť Zakarpats'ka, Rajon

Rachivs'kyj, Apšynec' (1960 FODOR UU). - V. Oblasť Zakarpats'ka, Rajon Rachivs'kyj, Petros (1895 PACZOSKI LW). - VI. Oblasť Ivano-Frankivs'ka, Rajon Verchovyns'kyj, Hnetesa (1936 PAWŁOWSKI KRAM). - VII. Oblasť Zakarpats'ka, Rajon Rachivs'kyj, Dilove, Tisnyj (1958 TOVŠ UU). - VIII. Oblasť Zakarpats'ka, Rajon Perečyns'kyj, Voročevo (1966 TOVŠ UU).

Romania

Distr. Maramureș. Botiza, Vf. Seculuj (1910 THAISZ BP). - **Distr. Bistrița-Năsăud.** Mții Rodnei, Vf. Saca (1941 E.I. NYÁRÁDY CL). - **Distr. Suceava.** Poiana Stampei (1911 RACIBORSKI Pl. Polon. Exs. no. 636). - **Distr. Mureș.** Băile Sovata, "Hunyadi szálló" (1943 E.I. NYÁRÁDY CL, SIB). - **Distr. Harghita.** Corund, "Sólyomkő patak" (1929 E.I. NYÁRÁDY CL, SIB). - **Distr. Neamt.** Vf. Ceahlău, Mfnastirea Durăn (1924 E.I. NYÁRÁDY CL). - **Distr. Brașov.** Brașov, Tîmpa (1959 HELTMANN SIB). - **Distr. Sibiu.** Mții Făgărașului, Valea Bîlea (1914 TUZSON BP). - **Distr. Vîlcea.** Calimanești, Caciulata, Valea Oltul (1969 DEYL PR). - **Distr. Hunedoara.** Mții Retezatului, Cîmpu lui Neag, Vf. Buta (1935 SCHEFFER SLO). - **Distr. Caraș-Severin.** Băile Herculane, Vf. Suskuluj (1905 THAISZ BP). - **Distr. Bihor.** Mții Bihorului, Hălmăgel (1887 SIMONKAI BP). - **Distr. Cluj.** Cluj-Napoca, Ciucea (1906 E.I. NYÁRÁDY SIB). - **Distr. Sălaj.** Mții Meseșului, Vf. Meseș, Valea Poeniția (1941 BALÁZS & FELFOLDY CL).

Cardamine hirsuta L.

Poland

Karpaty Zachodnie. 513.46. Żywiec, Miłówka (1980 SZEWCZYK KRAM). - 513.51. Babia Góra, near the Skawica Stream (1878 ZAPALOWICZ KRAM). - 513.54. Pasma Radziejowej, dolina Sopotnicy (1916 PAWŁOWSKI KRAM). - 513.71. Jodłowa Góra (1919 PAWŁOWSKI KRAM). - 514.52. Hala Strażyska (1945 PAWŁOWSKI KRAM).

Moravia

Mesophyticum Carpathicum. 78. Starý Hrozenkov, les Javor (1935 STANĚK BRNM). - 81. Rusava (1926 STANĚK BRNM). - 82. Velké Karlovice, Příslop (1941 POSPÍŠIL BRNM, PRC). - 84a. Frýdek-Místek (1928 WEEBER PRC). - **Oreophyticum carpathicum.** 99a. Pod Javorovým, údolí Tyry (1956 VICHEREK BRNU).

Slovakia

Pannonicum. 2. Šuľa (1984 MÁJOVSKÝ SLO). - 4. Malacky - Rohožník (1937 VALENTA BRA). - 6. Modra (1921 HOLUBY PRC). - 8. Veľký Kamenec, Tarbucka (1933 MARGITAI CL). - **Carpathicum occidentale.** 9. Lopeník (1865 HOLUBY BP). - 10. Modra, Harmónia (1936 V. NÁBĚLEK BRA, SAV). - 14a. Tekovské Nemce, Chyžištie (1877 KMEŤ BRA). - 14e. Pukanec (1899 KUPČOK PR). - 15. Likier (1885 RICHTER BP). - 21a. Fačkov, Gajdel (1937 VALENTA BRA). - 21b. Vrátna dolina (1950 SKŘIVÁNEK BRNM). - 22. Moštenica, valley of the Kyslá Stream (1982 HROUDA & KRAHULEC PR). - 30a. Prešov (s.a. HAZSLINSZKY BP). - 30c. Bardejov, Kalvária (1929 BERGANSKÝ BRA). - **Carpathicum orientale.** 31. Zboj, Pofanka (1960 SOJÁK PR).

Austria

Wien, Wien XIII., Steinhof (1919 KORB W). - Wien, Zwischenbrücken Au (1866 J. B. [sic!] WU). - Wiener Neustadt (1896 MERGL SAV). - Wiener Neustadt, Stadtpark (1917 HUBER W).

Hungary

II. Bakonyicum. 2. Pilisszentiván, Ördögtorony (1951 Z. KÁRPÁTI BP, SZ). - 3. Ravazd (1928 POLGÁR BP). - 4. Sümeg, Ursapuszta, Lesence patak (1939 JÁVORKA & ZÓLYOMI BP). - **III. Praenoricum.** 3. Hemyék (1949 KÁROLYI BP). - **IV. Eupannonicum.** 3. Budapest, Római fürdő (1919 BOROS BP). - **V. Praeillyricum.** 1. Vonyarc (1920 LENGYEL BP). - 2. Kiskomárom, Kápolna (1956 PÉNZES BP). - 3. Felsőmocsolád (1947 BÁNÓ BP). - 4. Mecsek (1873 SIMKOVICS BP).

Ukraine

Carpathicum orientale. II. Oblasť L'vivs'ka, Rajon Skolivs'kyj, Korčín (1990 KAHALO SAV). - III. Oblasť Ivano-Frankivs'ka, Rajon Rožnjativs'kyj, valley of the Limycja Stream (1990 MARHOLD & KAHALO SAV). - V. Oblasť Zakarpats'ka, Rajon Rachivs'kyj, Lazeščina (1937 PULCHART PRC). - VI. Oblasť Ivano-Frankivs'ka, Rajon Verchovyns'kyj, Verchovina (1881 ZAPALOWICZ KRAM). - VIII. Oblasť Zakarpats'ka, Rajon

Perečyns'kyj, Nevyc'ke (1937 MARGITTAI CL). - IX. Oblasť Zakarpats'ka, Rajon Chusts'kyj, Chust, Zamkova hora (1957 VOJNAGIJ LWS). - **Pannonicum**. X. Oblasť Zakarpats'ka, Rajon Mukačivs'kyj, Mukačeve, "Vereshegy" (1924 MARGITTAI CL).

Romania

Distr. Maramureș. Sighetu Marmăției (1852 WÄGNER BP). - **Distr. Suceava**. Putna, Valea Putnei (1901 WOŁOSZCZAK W). - **Distr. Brașov**. Brașov, Valea Zizin (1880 BARTH BP). - **Distr. Sibiu**. Avrig (1914 BARTH BM, BP). - **Distr. Hunedoara**. Orăștie (s.a. UNVERRICHT SIB). - **Distr. Alba**. Alba-Iulia, "Bilak" (1882 SIMKOVICS BP). - **Distr. Mehedinți**. Svinița, Glavcina (1930 E.I. NYÁRÁDY CL). - **Distr. Caraș-Severin**. Teregova (1879 BOHATSCH BP). - **Distr. Arad**. Chisindia, Valea "Hurjecz" (1886 BP). - **Distr. Bihor**. Valea Mișid (1985 GROZA CL). - **Distr. Cluj**. Mușca, Piatra Sedului (1953 SORAN CL). - **Distr. Sălaj**. Mții Mezesului, Crasua, "Oláhkecel", Vf. Terbete (1941 BALÁZS & FELFÖLDY CL). - **Distr. Satu Mare**. Turt (1977 POP CL). - **Distr. Olt**. Cioroi (1963 BUIA, PAUN, CASANOVA & CÎRTU FI. Olt. Exs. no. 235).

Cardamine parviflora L.

Moravia

Pannonicum. 18a. Lednice na Moravě, Janohrad (1975 WEBER BRNM). - 18b. Hodonín, Červené domky, Doubrava (1956 F. ŠMARDA BRNM). - 21b. Chropyňský rybník (1932 ZAVŘEL PRC, 1966 ZAVŘEL BRNM).

Slovakia

Pannonicum. 4. Devínske jazero N (1991 HODÁLOVÁ SAV). - 8. Veľký Kamenec SE (1982 HUSÁK MMI).

Austria

Baumgarten (1960 NEUMANN W). - Marchegg (1960 MELZER W). - Marchegg NW (1986 GUTERMANN WU-G).

Hungary

IV. **Eupannonicum**. 1. Barbacs, Barbacsi tó (1932 POLGÁR BP). - 4. Hajdunánás, Veresnád (1938 IGMÁNDY BP). - 5. Vállaj, Bodvai erdő (1927 BOROS BP). - 6. Csengerújfalu, Ecsedi lap (1900 MÁGOCSY BP).

Ukraine

Pannonicum. Oblasť Zakarpats'ka, Rajon Užhorods'kyj, Strumkivka (1876 DIETZ BP).

Romania

Distr. Sibiu. Riu Sadului (s.a. SCHUR LW). - **Distr. Bihor**. Oradea, Pădurea Rădvani (1955 POP CL). - **Distr. Giurgiu**. Comana (1967 TOMA BM).

Cardamine impatiens L.

Poland

Karpaty Zachodnie. 513.32. Cieszyn (1911 ŻMUDA KRAM). - 513.47. Wzg. Marcówki, Zawila (1967 BŁASZCZYK KRA). - 513.48. Góra Jaroszowicka (1967 BŁASZCZYK KRA). - 513.49. Luboń Wielki (1967 DZWONKO KRA). - 513.51. Racza Hala (1898 KRUPA KRAM). 513.52. Bukowinka (1952 A. & J. KORNAŚ KRA). - 513.53. Marcinkowice (1919 PAWŁOWSKI KRAM). - 513.54. Pasma Radziejowej, Jaworzyna (1919 PAWŁOWSKI KRAM). - 513.61. Janowicą Dolnie (1971 OCHYRA KRAM). - 513.64. Lutcza (1972 BOBER KRA). - 513.65. Panieński Czub (1877 KOTULA KRAM, W). - 513.66. Biecz, Załawin, nad Ropą (1870 KOTOWICZ KRAM). - 513.69. Sanok, Rymanow-Zdrój (1925 PIECH KRAM). - 513.71. Jodłowa Góra (1919 PAWŁOWSKI KRAM). - 514.11. Zagrody, dolina Czarnego Dunajca (1955 PANCER KRA). - 514.12. Czorstyn, Dolina Harczy Grunt (1965 STENGL KRA). - 514.13. Biały Dunajec (1956 PANCER KRA). - 514.52. Dolina Chochołowska (1961 PACYNA KRA). - **Wschodnie Podkarpacie**. 521.1. Przemyśl, Szybenice (1877 KOTULA W). - **Beskidy Wschodnie**. 522.12. Oslawa - Ostawica (1961 JASIEWICZ hb. Jas.).

Moravia

Pannonicum. 18a. Vranovice (1921 CEJP PRC). - 18b. Hodonín, Hovoranská cesta (1984 GRULICH MMI). - 21b. Kroměříž, Plešovský les (1934 ZAVŘEL BRNM, PR). - **Mesophyticum carpaticum.** 76a. Kotoň (1908 LAUS BRNU). - 77a. Bučovice SE (1976 F. DVOŘÁK BRNU). - 77c. Koryčany (1921 BÍLÝ BRNM). - 78. Velká nad Veličkou, Háj (1915 BÍŇA BRNU). - 79. Chrastěšov (1975 DAREBNÍKOVÁ BRNU). - 80a. Huslenky (1927 ŘÍČAN BRNU). - 81. Holešov, Ráztoka, hrad Lukov (1921 POLÁŠEK BRNU). - 82. Zděchov (1967 SMEJKAL BRNU). - 84a. Sviadnov, Štandel, břeh Olešné (1945 TALPA PRC).

Slovakia

Pannonicum. 1. Burda (1973 ČVANČARA LIM). - 2. Trnové, Selce (1932 FUTÁK SLO). - 3. Koniar, Hrad Zásuky (1978 VAŠÁK BRA). - 4. Lozomo (1925 PTAČOVSKÝ SAV). - 5. Devínska Kobyla (1963 KALETA BRA). - 6. Šamorín, Dobrohošť (1889 MERGL SAV). - 7. Košice, near the Hornád River (1908 RAPAICS BP). - 8. Kráľovský Chlmec, near the oxbow lake Tica (1932 DOMIN & SILLINGER PRC). - **Carpaticum occidentale.** 9. Zemianske Podhradie (1877 HOLUBY K). - 10. Bratislava, Koliba (1937 KŘÍSTEK PRC). - 11. Stará Lehota (1927 SCHEFFER SLO). - 13. Uhrovske Podhradie, Zrubisko (1960 FUTÁK SAV). - 14c. Hronská Breznica, Boky (1985 MARHOLD SAV). - 14d. Banská Bystrica, Urpín (1949 ŠVEC LTM). - 14e. Kmišov (1876 KMEŤ BRA). 14f. Ábelová, Budiná (1870 RELL BP). - 15. Fabova hoľa (1895 PAX BP). - 16. Tisovec, Suché doly (1985 MARHOLD SAV). - 17. Dobšiná Hrabušice (1934 J. DOSTÁL & NOVÁK PRC). - 18. Ružín, Sivec (1931 DOMIN PRC). - 19. Hanušovská dolina, Delňanský potok (1971 KOLLÁR herb. Prešov Museum). - 20. Dupna (1975 HUDÁKOVÁ SLO). - 21a. Reváň (1933 NOVÁCKÝ BRA). - 21b. Strečno (1903 PAX KRA). - 21c. Drienok (1924 KLIKA PRC). - 21d. Stankovany, Šíp (1919 DOMIN PRC). - 22. Špania Dolina, Pánsky diel (1967 MÁJOVSKÝ SLO). - 23a. Spálený žľab (1974 F. DVOŘÁK BRNU). - 23b. Zámky (1925 KRAJINA PRC). - 23c. Kýčera, dolina Medzisteny (1939 PAWŁOWSKI KRAM). - 24. Kláštomá hora, Borštík (1932 DOMIN PRC). - 26a. Vavrišovo, Sihof (1975 VARTÍKOVÁ SLO). - 26b. Spišské Podhradie (1938 DEYL PR). - 27a. Zubák (1927 SILLINGER PR, PRC). - 28. Lokca (1959 KOPECKÝ PR). - 29. Ruskinovce, Ruskinovský chodník (1971 FELBER herb. Spišská Nová Ves Museum). - 30a. Prešov, Kalvária (1870 DIETZ BP). - 30b. Čergov (1947 MÁJOVSKÝ SLO). - 30c. Bardejov, Moliterka (1927 BERGANSKÝ BRA). - **Carpaticum orientale.** 31. Ulič (1968 MÁJOVSKÝ SLO).

Austria

Mautern, Donauauen (1900 HANDEL-MAZETTI WU). - Wien, Prater (1889 KELLER PRC). - Breitenbrunner Tal (1875 BECK PRC).

Hungary

I. Matricium. 1. Sátoraljaújhely, Magashegy (1879 CHYZER BP). - 2. Cserehát, Radvány, Nagy erdő (1952 JAKUCS BP). - 3. Görömböly, Tapolca, Nagy Kőmász hegy (1906 BUDAI BP). - 4. Galya hegy (1870 JANKA BP). - 5. Nagymaros, Leiter hegy (1902 FILARSZKY BP). - **II. Bakonyicum.** 1. Dömös, Dobogókő (1893 PERLAKY BP). - 2. Pomáz, Oszuluj hegy (1926 DEGEN BP). - 3. Ravazd (1912 POLGÁR BP). - 4. Sümeg - Tapolca (1905 STIEBER BP). - **III. Praenoricum.** 1. Sopron, Fáberrét (1933 Z. KÁRPÁTI BP). - 2. Sárvár, Sítikai erdő (1931 RECHINGER SLO). - **IV. Eupannonicum.** 1. Asványráró, Őntei Sziget (1927 POLGÁR BP). - 2. Szigetszentmiklós (1933 LENGYEL BP). - 3. Budapest, Margitsziget (1865 s.coll. BP). - 4. Tarnaörs (1863 TAUSCHER BP). - 5. Nyirbakta, Nagy erdő (1949 UJHELYI & BAKSAY BP). - **V. Praeillyricum.** 1. Göfsa (1952 KÁROLYI BP). - 2. Szőkedencs, Szőkedencsi erdő (1943 KELLER BP). - 4. Orfű, Remeterét (1922 BOROS BP).

Ukraine

Carpaticum orientale. I. Oblasť Ivano-Frankivs'ka, Rajon Dolyns'kyj, Dolyna (1990 MARHOLD & KAHALO SAV). - II. Oblasť L'vivs'ka, Rajon Starosambirs'kyj, Topil'nycja (1990 MARHOLD & KAHALO SAV). - III. Oblasť Zakarpats'ka, Rajon Mižhirs'kyj, near the lake Synevyr (1990 MARHOLD & KAHALO SAV). - IV. Oblasť Zakarpats'ka, Rajon Tjačivs'kyj, Pidpysna (1970 BILANYČ UU). - V. Oblasť Zakarpats'ka, Rajon Rachivs'kyj, Lazeščina (1937 PULCHART PR, PRC). - VI. Oblasť Ivano-Frankivs'ka, Rajon Verchovyns'kyj, Zelene, Skunava Hill (1962 ARTEMČUK KW). - VII. Oblasť Zakarpats'ka, Rajon Rachivs'kyj, Vuryč (1948 KOVAL'SKA UU). - VIII. Oblasť Zakarpats'ka, Rajon Perečyns'kyj, Voročeve (1966 TOVŠ UU). - **Pannonicum.** X. Oblasť Zakarpats'ka, Rajon Užhorods'kyj, Užhorod (1971 BLANAR UU).

Romania

Distr. Bistrița-Năsăud. Mții Rodnei, Rodna Nuova, Valea Someșului (1932 SCHEFFER SLO). - **Distr. Suceava.** Cirlibaba (1896 PAX BP). - **Distr. Mureș.** Tîrgu-Mureș (1913 E.I. NYÁRÁDY SIB). - **Distr. Harghita.** Casinu Nou (1941 KÖFARAGÓ-GYELNIK BP). - **Distr. Covasna.** Covasna (1914 JÁVORKA BP). - **Distr. Prahova.** Mții Bucegi, Vf. Cerdor (1953 POP CL). - **Distr. Dîmbovița.** Valea Ialomița (1854 SCHUR LW). - **Distr. Brașov.** Măgura Codlei (1963 MORARIU, ULARU & RADU CL). - **Distr. Vîlcea.** Valea Călinești, Tîrnicioara (1970 CIURCHEA CL). - **Distr. Sibiu.** Tălmăciu (1864 FUSS SIB). - **Distr. Hunedoara.** Mții Retezatului, Gura Zlata, Rîul Mare (1933 E.I. NYÁRÁDY CL). - **Distr. Alba.** Valea Pociovaliștei (1969 HODIȘAN CL). - **Distr. Mehedinți.** Cazane (1902 PAX BP). - **Distr. Caraș-Severin.** Băile Herculane (1873 BORBÁS BP). **Distr. Arad.** Lipova (1971 TAUBER CL). - **Distr. Bihor.** Mții Bihorului, Crisana, Sfîna de Vale (1955 HODIȘAN CL). - **Distr. Cluj.** Săcuien, Vf. Vlădeasa (1958 RESUMENTA CL).

Cardamine resedifolia* L.*Romania**

Distr. Bistrița-Năsăud. Mții Rodnei, Ineu (s.a. s.coll. BP). - **Distr. Dîmbovița / Prahova.** Mții Bucegi (s.a. SCHUR LW). - **Distr. Brașov.** Mții Făgărașului, Urlea Lac (1939 E.I. NYÁRÁDY SIB). - **Distr. Argeș.** Mții Făgărașului, Valea Capra (1989 MARHOLD SAV). - Mții Iezer (1850 FUSS SIB). - **Distr. Sibiu.** Mții Făgărașului, Arpașul Mic (1989 MARHOLD SAV). - **Distr. Vîlcea.** Mții Făgărașului, Ciortea (1857 FUSS SIB). - Mții Cibinului, Frumoasa (s.a. SCHUR LW). - **Distr. Hunedoara.** Mții Godeanu, Vf. Gugu (1935 SCHEFFER SLO). - Mții Retezatului, Sfîna Borescu Mare (1924 E.I. NYÁRÁDY CL). - **Distr. Hunedoara / Vîlcea.** Mții Parîngului, Mîndra (1937 PAWŁOWSKI KRAM, KRA).

Cardamine trifolia* L.*Poland**

Karpaty Zachodnie. - 513.47. Żurawnica (1963 BŁASZCZYK KRA). - 513.48. Wzg. Mioduszyna (1965 BŁASZCZYK KRA). - 513.51. Peweł Mała, Janikówka (1978 GRAZYŃSKA KRA). - 513.52. Obidowec Średni, Dolina Olszowego Potoku (1951 A. & J. KORNAŚ KRA). - 514.11. Lipnica Wielka, W of Polana Piaskowa (1965 M. & J. GUZIK KRAM). - 514.12. Czorstyn, Kurzejówka (1966 STENGL KRA). - 514.13. Gubałówka (1955 PANCER KRA). - 514.14. Zakopane (1843 BALL K). - 514.52. Nosal, N-NE slopes (s.a. CZECZOTOWA KRAM).

Moravia

Mesophyticum carpaticum. 81. Držková, Lhota (1927 STANEK BRNM). - **Oreophyticum carpaticum.** 99a. Bílá, valley of the Černá River (1955 J. ŠMARDÁ BRNU).

Slovakia

Carpaticum occidentale. 21b. Terchová, Štefanová (1986 TOPERCER & VÁGENKNECHT herb. Dr Vágenknecht, Bratislava). - 21c. Raková (1927 KLIKA PRC). - 21d. Dierová (1956 SCHIDLAY SAV). - 22. Lupčianska Magura, S of Mt. Preslovec (1985 ZAHRADNÍKOVÁ & MARHOLD SAV). - 23a. Brestová (1952 J. DOSTÁL PRC). - 23c. Javorina, near the settlement (1955 DEYL PR). - 24. Lesnická Huta (1986 MARHOLD SAV). - 28. Klokočov (1960 SCHIDLAY SAV). - 29. Spišská Magura (1813 WAHLENBERG UPS).

Cardamine graeca* L.*Romania**

Distr. Mehedinți. Drenkova (1835 ROCHEL BP). - Svinița (1910 RICHTER CL). - Tîsovița (1913 SEYMANN BP). - Dubova, Cazanale Mari (1968 BOȘCAIU CL). - Orsova, Allion (1874 SIMKOVICS PRC).