Phyton (Horn, Austria)	**Vol. 33**	Fasc. 1	51–76	6. 8. 1993

Systematics and Chorology of *Aconitum* ser. *Toxicum (Ranunculaceae)* in Europe

By

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With 8 Figures

Received September 2, 1992

Keywords: *Aconitum, Ranunculaceae.*- Chorology, systematics, taxonomy. – Flora of Europe.

Summary

MUCHER W. 1993. Systematics and chorology of *Aconitum* ser. *Toxicum (Ranunculaceae)* in Europe. – Phyton (Horn, Austria) 33 (1): 51–76, 8 figures. – English with German summary.

Aconitum subgenus *Aconitum* sectio *Aconitum* subsectio *Aconitum* is divided into two series: ser. *Aconitum* and ser. *Toxicum* (RCHB.) MUCHER stat. nov. *Aconitum degenii* is regarded as a species with three subspecies in Europe: *A. d.* subsp. valesiacum (GÁYER) MUCHER comb. nova in the Western Alps, *A. d.* subsp. *paniculatum* (ARCANGELI) MUCHER comb. nova in the Alps and south of it [with its two varieties *A. d.* subsp. *p.* var. *laxiflorum* (RCHB.) MUCHER comb. nova, and *A. d.* subsp. *p.* var. *turrachense* (MUCHER) MUCHER comb. nova], *A. d.* subsp. *degenii* in the Carpathians. *A. d.* nsubsp. *gandogeri* MUCHER nsubsp. nova is the hybrid between *A. d.* subsp. *paniculatum* and *A. d.* subsp. *valesiacum. Aconitum toxicum* comprises three subspecies: *A. t.* subsp. *toxicum* occurs in Bosnia, Montenegro and in the Carpathians, *A. t.* subsp. *crispulum* (NYÁRÁDY) MUCHER stat. nov. is endemic in the Southern Carpathians and *A. t.* subsp. *bucegiense* (NYÁRÁDY) MUCHER stat. nov. just spreads from the Bucegi-mountains in the Southern Carpathians a little to the North. *A. t.* nsubsp. *nyaradyanum* MUCHER nsubsp. nova includes hybrids between *A. t.* subsp. *crispulum* and subsp. *toxicum*. The hybrid between *A. degenii* and *A. toxicum* is described as *A.* x *dragulescuanum* MUCHER hybr. nov.

Zusammenfassung

MUCHER W. 1993. Systematik und Chorologie von *Aconitum* ser. *Toxicum (Ranunculaceae)* in Europa. – Phyton (Horn, Austria) 33 (1): 51–76, 8 Abbildungen. – Englisch mit deutscher Zusammenfassung.

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Aconitum subgenus *Aconitum* sectio *Aconitum* subsectio *Aconitum* wird in zwei Series geteilt: ser. *Aconitum* und ser. *Toxicum* (RCHB.) MUCHER stat. nov. *Aconitum degenii* wird als eine Art mit drei Unterarten in Europa angesehen: *A. d.* subsp. *valesiacum* (GÁYER) MUCHER comb. nova in den Westalpen, *A. d.* subsp. *paniculatum* (ARCANGELI) MUCHER comb. nova in den Alpen und südlich davon [mit seinen zwei Varietäten *A. d.* subsp. *p.* var. *laxiflorum* (RCHB.) MUCHER comb. nova und *A. d.* subsp. *p.* var. *turrachense* (MUCHER) MUCHER comb. nova], *A. d.* subsp. *degenii* in den Karpaten. *A. d.* nsubsp. *gandogeri* MUCHER nsubsp. nova ist die Hybride zwischen *A. d.* subsp. *paniculatum* und *A. d.* subsp. *valesiacum*. *Aconitum toxicum* wird in drei Unterarten gegliedert: *A. t.* subsp. *toxicum* kommt in Bosnien, Montenegro und in den Karpaten vor, *A. t.* subsp. *crispulum* (NYÁRÁDY) MUCHER stat. nov. ist ein Endemit in den Südkarpaten und *A. t.* subsp. *bucegiense* (NYÁRÁDY) MUCHER stat. nov. ist vom Butschetsch-Gebirge aus nur wenig nach Norden verbreitet. *A. t.* nsubsp. *nyaradyanum* MUCHER nsubsp. nova umfaßt Hybriden zwischen *A. t.* subsp. *crispulum* und subsp. *toxicum*. Die Hybride zwischen *A. degenii* und *A. toxicum* wird als *A.* x *dragulescuanum* MUCHER hybr. nov. beschrieben.

1. Introduction

Under the name of the toxicoid Aconites all species in *Aconitum* sect. *Aconitum* subsect. *Aconitum* with glandular hairs are comprehended (GÁYER 1906). REICHENBACH 1819, 1820 treated this taxonomic group in the rank of a sectio for the first time, but the separation of sect. *Aconitum* happened mainly by the morphology of the nectaries. The occurence of glandular hairs in the inflorescence is one of the main characteristics for the distinction of species and species groups by morphological pecularities. In *A.* sect. *Napellus* there are two species well distinguished by its glandular pubescence: *A. pentheri* HAYEK 1917 and *A. burnatii* GÁYER 1909. In *A.* sect. *Lycoctonum* the two European taxa with blue flowers, *A. lycoctonum* L. s.str. (LINNÉ 1753) [syn. *A. septentrionale* KOELLE 1788] and *A. moldavicum* HACQUET 1790 show a clear difference by long rigid glandular hairs in the indumentum of the inflorescence of the northern species. Glandular hairs occur as a result of parallel evolution in all subgenera and sections of the genus. Especially *A.* sect. *Aconitum,* which came to Europe on the way across the Caucasus can be seen as a good example, how closely related taxa become rather different in ecological means as well as in morphology when they spread over longer distances. In *A.* sect. *Aconitum* subsect. *Aconitum* the toxicoid group (the group with glandular hairs) must have been separated from *A. variegatum* L. (LINNÉ 1753) very early, undoubtedly at the beginning of the developement of the secondary center of genus *Aconitum,* which is the primary center in Europe, namely the Carpathians. *A. variegatum* und *A. degenii* could spread from there over Europe at the same time. Therefore both species have the same geographical distribution throughout big parts of Central Europe. *A. variegatum* then spread far more to the west, reaching the Pyrénées (VIVANT 1974, VIVANT & DELAY 1981). I couldn't find any specimen

of *A. degenii* from the Pyrénées as indicated by MOUILLARD 1907, GAUSSEN & LE PRUN 1961 and DESCIMON 1972; thus the indication for the occurence of A. degenii in Spain (GARCIA ROLLAN 1985) is certainly wrong. Furthermore *A. degenii* did not spread in northern direction, like *A. variegatum*. So the area of the toxicoid Aconites is far smaller than that of the cammaroid Aconites (GÖTZ 1967, JALAS & SUOMINEN 1989). Publications, that covered the genus *Aconitum* of total Europe, always used plant material mainly from Central Europe and mainly from Central European herbaria. Therefore the taxa of the Alps and adjacent areas are well known and almost completely mentioned in these papers (TUTIN & MERXMÜLLER 1964, GÖTZ 1967), but not so the taxa of Eastern Europe, from where plant material is much more difficult to receive. The genus *Aconitum* when it spread from Asia to Europe, created at first its European center in the Carpathians. In this area the number of taxa is about as high as throughout the rest of Europe. Most of the morphological characteristics can already be found in Carpathian plants. Even the introgressive variation can be found in most cases in this place, because there are so many taxa in a relatively small area.

2. Materials and Methods

Specimens of the following herbaria have been investigated (abbreviations according to Index Herbariorum): P, LY, NICE, BERN, LAU, G, Z, RUEB, ZT, NMLU, LUG, M, BREG, IB, IBF, SZU, LI, GJO, GZU, KL, W, WHB, WU, MFU, TSB, LJU, BP, CL, SIB. – Herbarium G.H. LEUTE (Herb. LEUTE), herbarium W. MAURER (Herb. MAURER), herbarium W. MUCHER (Herb. MUCHER), herbarium B. WALLNÖFER (Herb. WALLNÖFER).

Populations in the Eastern Alps, Southern Alps and in the Western and Southern Carpathians have been visited and investigated in summer 1989 to 1992.

Annotation for the maps: All signs mark specimens seen by myself. The frontiers in fig. 5 and 6 have its origin in some special literature (GRINTESCU 1953, JASIEWICZ 1965, GÖTZ 1967) and border the expected area or the assumed way of wandering from the Carpathians to the Alps.

3. *Aconitum* subg. *Aconitum* sect. *Aconitum* subsect. *Aconitum* ser. *Aconitum*

SHTEINBERG in KOMAROV 1937, Fl. U.S.S.R. 7 places *A. variegatum* and *A. nasutum* in two different series: ser. *Variegatum* (publ. invalid) and ser. *Nasutum* (publ. invalid). *A.* sect. *Aconitum* ser. *Variegatum* includes the typus of the genus (DAMBOLDT & ZIMMERMANN 1974), therefore it has to have the autonyme as it is ordered in Art. 22 of the Code (GREUTER & al. 1988).

Type species: *Aconitum variegatum* LINNÉ 1753.

Description: Hood distinctively higher than long, spur of the nectary curved backward, pedicel and tepals externally glabrous or pubescent with short, curved, appressed hairs, never glandular pubescent.

4. *Aconitum* subg. *Aconitum* sect. *Aconitum* subsect. *Aconitum* ser. *Toxicum* (RCHB.) MUCHER stat. nov.

Basionym: *Aconitum* sect. *Toxicoidea* REICHENBACH in Uebers. *Acon.* (1819): 14; *Aconitum* sect. *Toxicoidea* REICHENBACH in Monogr. *Acon.* (1820): 32, 34.

Type species: *Aconitum toxicum* RCHB.

Nomenclature: REICHENBACH used *-oidea* as a wrong suffix for a sectio. Art. 32.5 of the Code orders to treat this mistake as an error of orthography, which is to be corrected without changing the name of the author.

Later REICHENBACH 1823-27 recognized the close relationship between sect. *Cammaroidea* (sect. *Aconitum*) and sect. *Toxicoidea* and includes the toxicoid Aconites then in sect. *Cammaroidea*. Finally REICHENBACH 1838-39 used the right orthography *Toxicum* as a subdivision of sect. *Cammarum* to comprehend *A. molle* RCHB., *A. paniculatum* LAM., *A. cernuum* WULF., *A. toxicum* RCHB. and *A. acuminatum* RCHB. in one group.

Description: Hood about as high as long or just a little higher, spur of the nectary half round or little bent backward, never curved, tepals mostly glandular pubescent outside, pedicel mostly ± densely glandular pubescent.

4.1. *Aconitum degenii* GÁYER
Mag. bot. Lap. 5 (1906): 123 *("A. degeni")*

Diagnosis: Radix globosa, caulis elatus, cernuus, flexuosus, folia caulina macrophylla laciniis latis vel angustis, inflorescentia laxa diffusa multiflora vel pauciflora, fere ramosa, pedunculi ± dense glanduloso-pilosi, bracteolae 3–8 (–15) mm, filares, lineares, lanceolatae aut spathulatae, lamina glanduloso-ciliata, margo aeque, tepala caerulea vel pallide lilacina, externe glanduloso-pilosa, cassis lata ut alta, nectarii stipes curvatus, glabrus vel pilosus, nectarii labium rare pilosum, nectarium apicem cassidis semper attingens, filamenta superne pilosa vel glabra, carpella glabra vel pilosa.

Lectotypus: [Transsilvania], Comit. Besterce-Naszód, in lapidosis umbrosis ad cacumen montes Craciunel ad Rodnam, 11.8.1902, leg. A. DEGEN (CL-Soó). The specimen was determined by GÁYER himself as *Aconitum degeni* m.

Icones: h. l. Fig. 1a-d, 2a-d, 3a-d, 4a-d.

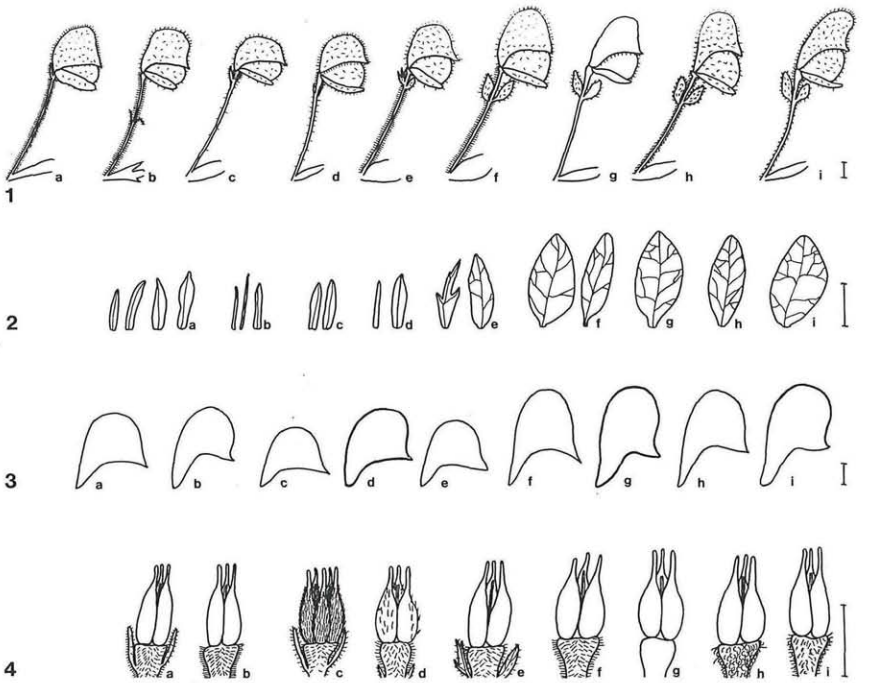

Fig. 1. Position of the bracteoles on the pedicels and the pubescence of the pedicels. – a *A. degenii* subsp. *degenii*, b *A. degenii* subsp. *paniculatum*, c *A. degenii* subsp. *valesiacum*, d *A. degenii* nsubsp. *gandogeri*, e *A.* × *dragulescuanum*, f *A. toxicum* subsp. *toxicum*, g *A. toxicum* subsp. *bucegiense*, h *A. toxicum* subsp. *crispulum*, i *A. toxicum* nsubsp. *nyaradyanum*. – Scale bar = 5 mm.

Fig. 2. Form and size of the bracteoles. – a *A. degenii* subsp. *degenii*, b *A. degenii* subsp. *paniculatum*, c *A. degenii* subsp. *valesiacum*, d *A. degenii* nsubsp. *gandogeri*, e *A.* × *dragulescuanum*, f *A. toxicum* subsp. *toxicum*, g *A. toxicum* subsp. *bucegiense*, h *A. toxicum* subsp. *crispulum*, i *A. toxicum* nsubsp. *nyaradyanum* – Scale bar = 5 mm.

Fig. 3.: Shape and size of the hood. – a *A. degenii* subsp. *degenii*, b *A. degenii* subsp. *paniculatum*, c *A. degenii* subsp. *valesiacum*, d *A. degenii* nsubsp. *gandogeri*, e A. × *dragulescuanum*, f *A. toxicum* subsp. *toxicum*, g *A. toxicum* subsp. *bucegiense*, h *A. toxicum* subsp. *crispulum*, i A. *toxicum* nsubsp. *nyaradyanum*. – Scale bar = 5 mm.

Fig. 4. Number and pubescence of the carpels. – a *A. degenii* subsp. *degenii*, b A. *degenii* subsp. *paniculatum*, c *A. degenii* subsp. *valesiacum*, d *A. degenii* nsubsp. *gandogeri*, e *A.* × *dragulescuanum*, f *A. toxicum* subsp. *toxicum*, g *A. toxicum* subsp. *bucegiense*, h *A. toxicum* subsp. *crispulum*, i *A. toxicum* nsubsp. *nyaradyanum*. – Scale bar = 5 mm.

Description: Root globose; stem high, cernous, flexuous; cauline leaves large with broad or lanceolate lacinias; inflorescence loose, diffuse, mostly multiflorous, ramose; pedicels ± densely glandular pilose; bracteoles 3–8 (–15) mm, filamentous, linear, lanceolate or spatulate, lamina and margin glandular ciliated; tepals blue or pale-lilac, externally glandular pilose; hood about as high as long; claw of the nectary curved, pilose or glabrous, lip of the nectary rarely pilose, nectary always reaching the top of the hood; filaments in the upper part pilose or glabrous; carpels glabrous or pilose.

Nomenclature: For more than two hundred years *Aconitum paniculatum* LAMARCK (Fl. Fr. 3: 646 [1778]) has been the name for this taxon sensu lato. GREUTER & RAUS 1989 found that this is a nomen illegitimum and combined the taxon as *A. variegatum* L. subsp. *paniculatum* (ARCANGELI) GREUTER & BURDET. They haven't been the first, who combined *A. paniculatum* under *A. variegatum* (ARCANGELI 1882, FIORI & PAOLETTI 1898, SACCARDO 1909), but they regarded *A. toxicum* RCHB. as a separate species beside *A. variegatum* subsp. *paniculatum* (GREUTER & al. 1989); this is not in accordance with the relationship of the taxa; it would have been correct if both, *A. toxicum* and *A. paniculatum*, would have been placed under *A. variegatum* as subspecies. GÖTZ 1967 has explained exactly, why he treates *A. variegatum* and *A. paniculatum* as different species and I agree. So do also JALAS & SUOMINEN 1989 and they chose *A. degenii* GÁYER as the oldest substitute for *A. paniculatum* LAMARCK.

Geographic distribution (Fig. 5): The range of *A. degenii* is indicated in GÁYER 1906 as East-Hungaria (today Romania), district Bestercze-Naszód (in the Rodnei-Mountains), district Csik (in the mountains Öcsém and Nagy-Hagymás), districts Mármaras, Torda-Aranyos and Kolozs. The distribution of *A. degenii* s.l. extends to the areas of following countries in Europe: France, Switzerland, Liechtenstein, Italy, Germany, Austria, Slovenia, Croatia, Bosnia, Poland, Slovakia, Ukraine, Romania.

4.1.1. *Aconitum degenii* GÁYER subsp. *degenii*

Diagnosis: Pedunculi supra et infra bracteolas ± dense glanduloso-pilosi, bracteolae 4–8 (–15) mm, lanceolatae aut spathulatae, glanduloso-pilosae, in parte supra medium pedunculi vel fere ipse infra flos sitae, cassis fornicato-ampliata rotundata, nectarium glabrum vel rare paule pilosum, filamenta superne pilosa vel glabra, carpella 3, glabra vel rare pauce diffuse glanduloso-pilosa.

Lectotypus: See sub 4.1. *A. degenii*.

Icones: h. l. Fig. 1a, 2a, 3a, 4a.

Description: Pedicel above and below the bracteoles ± densely glandular pilose, bracteoles 4–8 (–15) mm, lanceolate or spatulate,

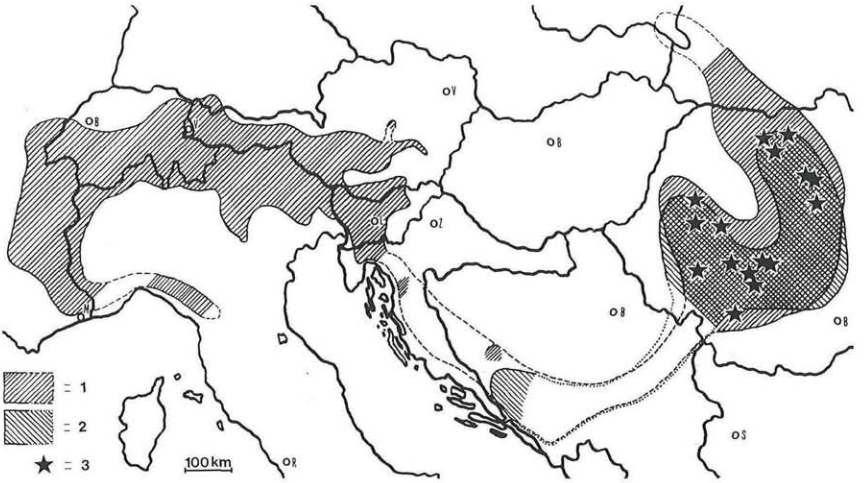

Fig. 5. Distribution of *Aconitum* series *Toxicum* in Europe. – 1 *A. degenii*, 2 *A. toxicum*, 3 *A.* × *dragulescuanum*.

glandular pilose, situated in the upper half of the pedicel, mostly directly near the flower, hood fornicate ampliate rounded, nectary glabrous or rarely a little pilose, filaments in the upper part pilose or glabrous, carpels 3, glabrous or rarely sparsely glandular pilose.

Morphology: *Aconitum degenii* in Eastern Europe is well separated from the Central European taxon by its characteristic form of the hood (Fig. 3a) as well as by the form of the bracteoles (Fig. 2a) and their position on the pedicel (Fig. 1a). From *A. degenii* subsp. *valesiacum* it is clearly different by its mostly totally glabrous carpels (Fig. 4a), which are mostly 3, and by the glandular pubescence of the whole pedicel (Fig. 1a).

Geographic distribution (Fig. 6): This subspecies is endemic in the Carpathians. It does not get in contact with the Central European *A. d.* subsp. *paniculatum* (Fig. 6), therefore there is no area of introgression. *A.degenii* s.str. occurs in Poland (MICHALKO 1955, JASIEWICZ 1965, FREY & al. 1977, ZEMANEK 1989), Czechoslovakia (PRESL & PRESL 1819, DOMIN 1936, DOSTAL 1950, HOLUB 1966, DOSTAL 1982, DOSTAL 1989, SKALICKÝ 1990), Ukraine (GÖTZ 1967, CZOPYK 1976, PROKUDIN & al. 1987) and Romania.

Specimina selecta: Ukraine: Flora Hungarica, cott. Mármaros, ad marg. piceetarum vallis Talabor pr. pag. Felsöszinever; 13. 8. 1939; M. UJVAROSI (CL-Soó). – Flora hungarica, Mármaros, in dumetis ad Apsinec in valle fluvinis Fekete Tisza prope pag. Körösnezö, alt. cca. 900 m; 26. 7. 1939; Z. KARPATI (CL-Soó). – Plantae Hungariae exsiccatae, comit. Máramaros, ad latera torrentis montis Breskul sub monte Hoverla prope Tiszabogdány, 1500-1600 m; 24. 7. 1939; A. BOROS (BP). – Flora Hungarica, cott. Mármaros, mt. Czaruakora, in dumetis vallis rivi Hoverla ad Klausuram Hoverla; 18. 8. 1939; R. Soó (CL-Soó). – Romania: Transsilvania, in

montibus Bihoriensibus supra pagum Vidra, Nr. 48583; 18. 7. 1888; SIMKOVICS (SIB-Barth). – Bihor v. Bihorfüred, alt. 1100 m; 6. 7. 1936; V. BORZA (SIB-Nyárády). – Crisana, distr. Bihor, in silvis circa stationem climaticam "Stana de vale", alt. cca 1100 m s.m.; 7. 1936; V. BORZA (SIB-Nyárády, LAU, Z). – Hung. boreali-orientalis, com. Máramaros, in alpe Piatra-Rei, supra pagum Borsa; 1. 9. 1909; L. THAISZ (BP). – Comit. Beszterce-Naszód, in lapidosis umbrosis ad cacumen montes Craciunel ad Rodnam; 11. 8. 1902; A. DEGEN (CL-Soó), Lectotypus. – Beszterce-Naszód, montes Rodnenses, in pratis alpinis et in jugo montis Craciunel supra balneas Rodnaborberek, alt. cca. 1400–1600 m, solo calc.; 15. 8. 1918; E. NYÁRÁDY (SIB-Nyárády). – Überall in den Rodnaer Alpen, Urkalk, Nr. 44207; – ; A.P. ALEXI (SIB-Soc.). – Distr. Turda, in declivibus silvaticus supra pagum Garda desus versus Ghetarul scarisoara, alt. cca. 900–1200 m s.m.; 25. 8. 1946; M. GHIUTA (SIB-Nyárády). – Lothriorathal, Nr. 44228; 15. 8. 1858; REISSENBERGER (SIB-Soc.). – Henyul bei Borgó, Nr. 38172; – ; SIGERUS (SIB-Ungar). – Distr. Cluj, in graminosis mt. Vladeasa, Nr. 613444; 10. 7. 1968; – (CL). – Oacsem, Nr. 44226; 10. 8. 1868; – (SIB-Soc.). – Mirasa, 1800 m, Nr. 44229; –; A. P. ALEXI (SIB-Soc.). – Duscher Paß im ..., Nr. 44225; 5. 8. 1850; – (SIB-Soc.). – Muntii Cibin, valea Danesii, Nr. 96459; 9.8.1960; M.I. DOLTU (SIB-Doltu). – Stîna de Vale, Reg. Crisana, Prin padure de molid; 9.7.1961; I. POP (SIB-Pop). – Mtii Fagarasului, Valea Arpasului, marginea padurlei; 22.8.1953; I. POP (SIB-Pop). – Mtii Fagarasului, Vf. Nagoiul spre lacul Caltun, alt. cca. 2300-400 m.s.m.; 18.8.1953; I. POP (SIB-Pop). – Piatra Craiului, jud. Brasov; 26.9.1959; H. HELTMANN (SIB-Schneider-Binder). – Oltenia, distr. Gorj, in silvis Alno-Carpinion ad vallem rivuli Gilort, alt. cca. 950 m s.m.; 9.7.1973; D. et M. CIRTU (WU).

4.1.2. *Aconitum degenii* GÁYER subsp. *paniculatum* (ARCANGELI) MUCHER comb. nova

Basionym: *Aconitum cammarum* L. subsp. *paniculatum* ARCANGELI in Comp. Fl. Ital., p. 21 (1882)

Diagnosis: Pedunculi supra et infra bracteolas ± dense glanduloso-pilosi, bracteolae 3-6 mm, filares aut lineares, glanduloso–pilosae, in media parte pedunculi, cassis semicircularis fere rostrata, nectarium glabrum vel pilosum, filamenta glabra vel superne pilosa, carpella 3 (–5), glabra.

Lectotypus: The typus GÖTZ 1967 incorrectly chose for *Aconitum paniculatum* LAMARCK subsp. *paniculatum,* which is a synonym for *A. cammarum* L., in herbarium LAMARCK at Paris (P), exactly (P-La), can also be the typus for this new combined taxon. I have not found any specimen sampled or signed by ARCANGELI. Because *A. degenii* subsp. *paniculatum* is just a nomen novum for *A. paniculatum* subsp. *paniculatum,* Art. 7.11 of the Code states that the new name is typified by the typus of the old (illegitimate) name.

Icones: h. l. Fig. 1b, 2b, 3b, 4b.

Description: Pedicel above and below the bracteoles ± densely glandular pilose, bracteoles 3-6 mm, filamentous or linear, glandular pilose, situated about in the middle of the pedicel, hood halfround, beaked, nectary glabrous or pilose, filaments glabrous or pilose, carpels 3 (–5), glabrous.

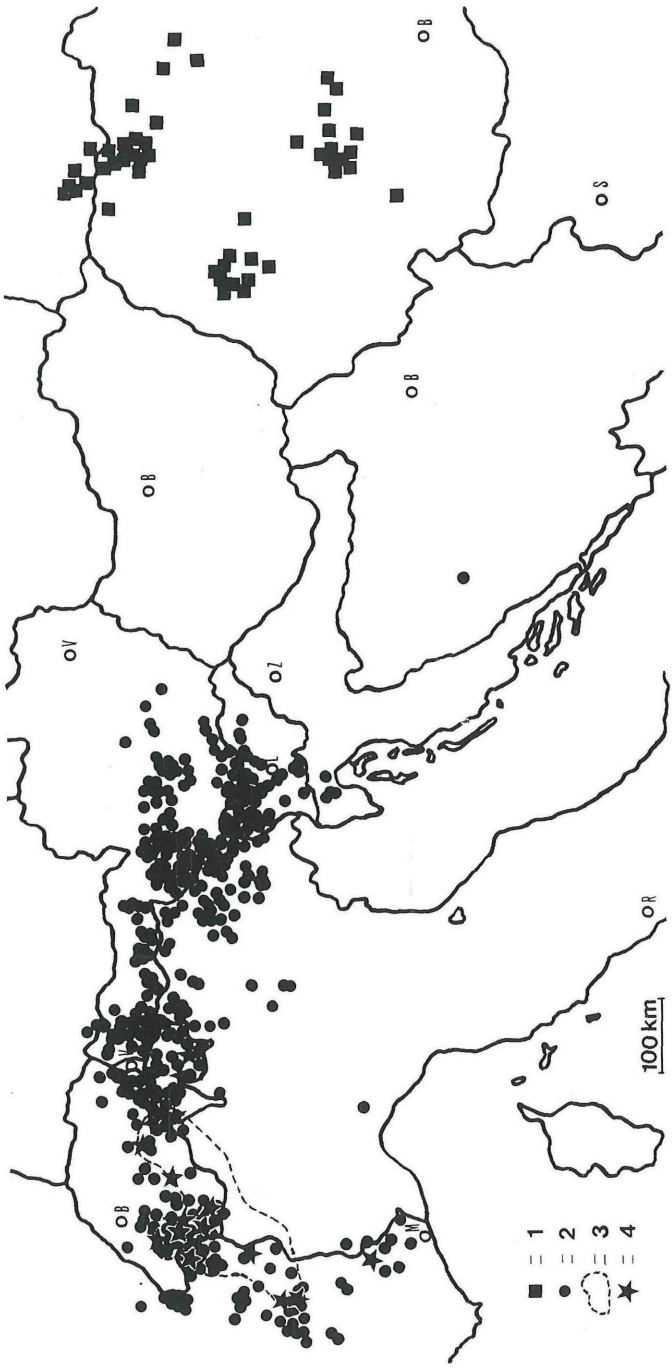

Fig. 6. Distribution of *Aconitum degenii* in Europe. – 1 *A. d.* subsp. *degenii*, 2 *A. d.* subsp. *paniculatum*, 3 *A. d.* subsp. *valesiacum*, 4 *A. d.* nsubsp. *gandogeri*.

Nomenclature: *Aconitum degenii* GÁYER subsp. *paniculatum* (ARCANGELI) MUCHER is the valid synonym for *A. paniculatum* LAMARCK subsp. *paniculatum* (GÖTZ 1967). *A. paniculatum* is a nomen illegitimum, but in the rank of a subspecies it is valid as an epithet for a new taxon, which excludes *A.* × *cammarum* L. (the valid synonym for *A. paniculatum*). As GREUTER & BURDET (GREUTER & RAUS 1989) found out, ARCANGELI 1882 was the first author of such a name. Therefore in the rank of a subspecies the epithet *paniculatum* ARCANGELI has priority for the Central European taxon. Unfortunately because of art. 48.1 in the Code it is possible to pick up a nomen illegitimum in a different rank and in fact, it is mandatory to use this name, as Prof.Dr. W. GREUTER told me in a letter and as it is explained in art. 72, ex. 3 of the Code.

Annotation: GÖTZ 1967 has characterized this taxon very exactly. MUCHER 1990 has divided it into two varieties, which are significantly different by the pubescence of the filaments.

Geographic distribution (Fig. 6): This subspecies has got the largest area of all subspecies of *A. degenii:* France, Switzerland, Liechtenstein (SEITTER 1977), Germany, Austria, Italy, Slovenia, Croatia, Bosnia. From the Sea-Alps in the south-west of its area it spreads over the Alps in and then in south-eastern direction to the Balcan.

4.1.2.1. *Aconitum degenii* GÁYER subsp. *paniculatum* (ARCANGELI) MUCHER var. *laxiflorum* (RCHB.) MUCHER comb. nova

Basionym: *Aconitum cernuum* REICHENBACH non WULFEN [var.] α *laxiflorum* REICHENBACH in "Uebersicht der Gattung *Aconitum*" p. 43 (1819)

Diagnosis: Nectarium glabrum, filamenta glabra.

Lectotypus: See sub 4.1.2. *A. d.* subsp. *paniculatum.*

Icones: h. l. Fig. 1b, 2b, 3b, 4b.

Description: Nectary glabrous, filaments glabrous.

Nomenclature: *Aconitum degenii* subsp. *paniculatum* var. *laxiflorum* is the valid synonym for *A. paniculatum* subsp. *paniculatum* var. *paniculatum* (MUCHER 1990). Art. 68(2) of the Code states, that the epithet *laxiflorum* is legitimate, although *A. cernuum* auct. non WULFEN and its autonym in the rank of a variety are illegitimate.

Geographic distribution (Fig. 7): This variety is distributed almost all over the whole area of the subspecies *paniculatum.* In my opinion it isn't necessary for a variety in the genus *Aconitum* to have a strictly separated area of its own, but there must be a center of distribution. *A. d.* subsp. *p.* var. *laxiflorum* occurs in mixed populations with var. *turrachense,* but in pure populations mainly at the margin of the area of the subspecies, especially in the west of its area. Total range:

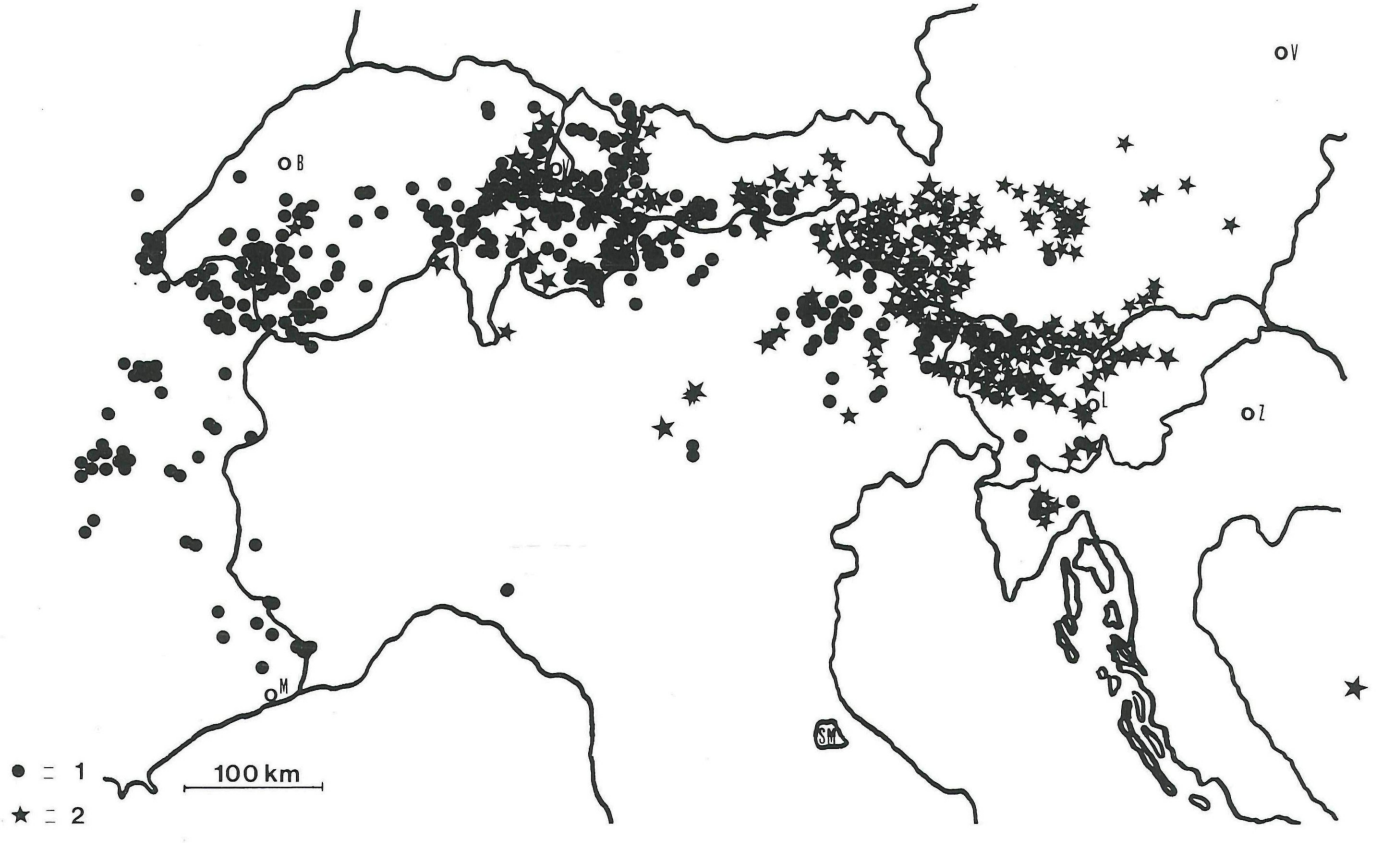

Fig. 7. Distribution of *Aconitum degenii* subsp. *paniculatum* in Europe. – 1 *A. d.* subsp. *p.* var. *laxiflorum,* 2 *A. d.* subsp. *p.* var. *turrachense.*

France, Switzerland, Liechtenstein, Germany, Austria, Italy, Slovenia, Croatia.

Specimina selecta: France: Flora Gallica, Drome, Foret de Lente, a la Gorge du Brudour, alt. 1150 m; 28. 8. 1956; R. BARBEZAT (W). – Jura francais, en Faueille, Dept. Ain; 8. 1880; – (W). – Bois de la Faucille, Jura; 8. 9. 1850; REUTER (P). – Pentes buissonneuses du Colombier de Gex, près du Chalet des Platières, Ain, 1400 m, débris calcaires; 16. 8. 1856; E. MICHALET (G). – Flora Genevensis, Montagne de Collanges, Ain; 18. 8. 1861; J.-C. DUCOMMUN (LAU). – Bois des Oreienes au dessus de Renet [Isère] sur terrain granitique; 14. 9. 1891; B. RHAYOT (GZU). – Voirons, Buchers au dessous de couvers; 8.1852; C. FAUCONET (G). – Dans un bois pierreux et peu épais au dessus du Reposoir et au dessous de la glaciere du Mt. Vergi; 17. 9. 1823; A. DE CANDOLLE (G). – Dans les bois sur le néocomien supérieur, sous les dents de Nivolet près Chambéry, Savoie; – ; HUGUENIN (WU). – La Grand-Combe, entre Mèaudre et Lans, les Gorges de la Bourne [Isère], dans les bois; 8.–9. 1878; RAVAUD (G, LY-Bonaparte, LY-Gandoger, LY-Rouy). – Bois et Brousailles du piets. du meri; 7. 1895; J. SIMOTHEE (W). – Breson, montagne de Savoie près Bonneville; – ; SÉRINGE (G). – Hautes-Alpes, Foret de Boscodon près d'Embrun, alt. 1600–1700 m; 11. 9. 1899; F. BRACHET (G, LY-Bonaparte, M, P). – Le Lautaret, Htes-alpes, alt. 1990; 4. 8. 1893; BRACHET (G). – Provence, Clarion; – ; Herb. VENTURAT (G). – Pl. des Alpes maritimes, bords de la rivière et lisière des bois au Col de la Madonna de Fenestre; 13. 8. 1861; E. BOURGEAU (G, LY-Bonaparte). – Alpes maritimes, St. Martin, Lantosque aux Sagnes; 4. 8. 1888; G. VIDAL (NICE). – Switzerland: Flora helvetica, Fribourg, alpes calcaires, Varvalannaz, 1650 m; 18. 8. 1905; F. JAQUET (LY-Bonaparte, W). – Alpes calc., Le Pilaz, Fribourg, 1750 m; 31. 8. 1908; JAQUET (G). – Prés Gulac de Lauenen, Cant. Berne, Suisse; 21. 9. 1915; ST-LAGER (G, W). – Waalt, tout de Naut; 8. 1905; VONCINA (GZU). – Combe de Choumaley, sous les Arpilles, 1500 m, Alpes de l'Etivaz, Vaud; 6. 8. 1915; BEAUVERD (G). – tailles du Col de Jaman, C'de Vaud; 15. 8. 1876; A. SCHMIDELY (G). – Alpes vaudoises, Saturages au piece Lurte Lavanchy, 1400 m; 19. 8. 1879; R. MASSON (GZU). – Valais, Allmendwald, Bainsale Rouéche; 15.9.1930; E. WILCZEK (CL-Soó). – In jugo vaudense in nemoribus subalpinis "le Ravauchy" supra Bex, ca. 1500 m; 23. 8. 1925; WILCZEK (CL-Soó). – Fornigen, Meienthal, Uri; 27. 8. 1923; G. KOHLER (G).-Clairières, Weisstannen, St. Gall.; 2. 8. 1913; G. KOHLER (G). – Kt. Glarus, Walchen am Zillibach bei Braunwald, ca. 1200 m; 31. 8. 1938; L. ZOBRIST (GZU). – Sandalpe, Ct. Glarus; – ; FROKEL (G). – Davos, im Wald unterhalb der Ischaalpen, 1730 m; 8. 1918; M. NOAK (BERN, GZU, LAU, LY-Bonaparte, WU, ZT). – Val Lerentina, gegenüber Piotta am Tessin, l. Ufer, Kl. Kanal, Bachlauf, Ufergebüsch, einige Stöcke; 22. 8. 1955; – (LUG-Dübi). – Ober-Engadin, Silvaplana; –; E. PRITZEL (B). – Liechtenstein: Lavenatal, Wälder, ca. 1300 m; 7. 9. 1941; E. LANDOLT (Z). – Germany: Flora von Bayern, 864 m hoch am Hirschsprung bei Tiefenbach im Allgäu; 17. 8. 1910; O. HECHT (SIB-Nyárády, W). – Flora von Bayern, Allgäuer Alpen, am Weg z. Sperrbachtobel b. Spielmannsau unw. Obersdorf, rd. 1100 m; 25. 8. 1916; GINSTL (W). – Austria: Bregenz, Hohe Kugel; 1839; HEIMERL (GZU). – Salzburg, am Wege vom Anlaufthal zum Hierkar-See, zwischen 15–1600 m, Schiefer; 18. 9.; M. ESYN (GZU). – Tirolia centr., in fruticetis subalpinis inter Trins et Gschnitz, 4000–5000', Nr. 44222; – ; A. KERNER (SIB-Soc.). – Osttirol, Virgen, unter Gebüsch bei Welzelaich; 23. 8. 1862; GANDERT (IBF). – Steiermark, Wälder auf den Westhängen des Eisenhutes bei Turrach; 7. 7. 1931; J. VETTER (W). – Kärnten, Oberdrautal, Oberdrauburg-N, im inneren Wurnitz-Graben, Hochstaudenflur, 9243/2; 2. 9. 1976; S. WAGNER (KL). –

Italy: Col de Fenestre; 2. 8. 1858; E. AYASSE (G). – Chartreuse de Pesio, Piemont; 3. 6. 1861; G. THURET (P). – Boschi del Finizza, 71883; 7. 8. 1886; A. FIORI (CL). – Tirol, Trafoi; 8.8.1897; K. FRITSCH (GZU). – Südtirol, Dolomiten, in Bergwäldern des Schlern oberhalb Bad Ratzes; 12. 8. 1902; E. KORB (W). – Südtirol, Aufstieg von Plan im Grödnertal zum Grödnerjoch; 5. 8. 1912; K. RONNIGER (W). – Südtirol, am Sextenbache bei Moos im Sextentale; 8. 8. 1902; J. VETTER (W). – Südtirol, Seisseralpe, unter der . . .; 12. 8. 1911; P. STARK (IB). – Flora von Italien, Felsränder bei Conazi, Fleimsthal; 12. 8. 1929; V. ENGELHARDT (W). – Von den Alpen bei Agordo im südlichen Tyrol; – ; FUCHS (W). – Süd-Tirol, im Val Lagorai bei Cavalese im Fleimstal, Matten, Quarzporphyr, ca. 1400 m; 25. 8. 1906; H. HANDEL-MAZZETTI (WU). – Mte. Baldo, Tirol méridional; 19. 8. 1890; SAINT-LAGER (G). – Flora Veneta, Boschi di Ciauta M. Pelmo, Alpe Carniche, 1500 m; 10. 8. 1899; R. PAMPANINI (LAU, MFU-Gen.). – Slovenia: Krain, Wochein, Cerna prst; 31. 8. 1912; VONCINA (GZU). – Carniolica, Zerkossicerk . . . bei Idria; 1827; FREYER (W). – . . . Weissenfels, Kr.; 19. 8. 1901; J. SCHNEIDER (W). – Krain, Alpe Komna, im Krummholz; 6. 8. 1890; K. RECHINGER (WU). – Am Abhang eines Schneetrichters, Pecana, 1500 m; 27. 8. 1888; V. DOLENZ (WU). – Slovenija, Iska, pod Bukovem, ob gozdu, apnenec, 540 m s.m., 0153/1, Nr. 02587; 23. 8. 1935; M. ZALOKAR (LJU).

4.1.2.2. *Aconitum degenii* GÁYER subsp. *paniculatum* (ARCANGELI) MUCHER var. *turrachense* (MUCHER) MUCHER comb. nova

Basionym: *Aconitum paniculatum* LAM. subsp. *paniculatum* var. *turrachense* MUCHER in Phyton (Horn, Austria) 30 (1): 83-88.

Diagnosis: Nectarii stipes sparse pilosus vel glabrus, nectarii labium rare pilosum, filamenta superne pilosa.

Holotypus: Ostalpen, Steiermark, Gurktaler Alpen, 2 km südlich von Predlitz, Gebüschsaum, 1020 m, 26. 8. 1989, leg. W. MUCHER (GZU). Isotypes: GJO, GZU, W (all plants with pilose filaments and pilose nectaries).

Icones: In MUCHER 1990, h. l. Fig. 1b, 2b, 3b, 4b.

Description: Claw of the nectary little pilose, lip of the nectary rarely pilose, filaments in the upper part pilose.

Geographic distribution (Fig. 7): The center of distribution extends from the "Hohe Tauern" and "Radstädter Tauern" to the region around Turrach in Styria (MUCHER 1990). Within this area one can find pure populations of var. *turrachense* with pilose nectaries and pilose filaments and populations where plants with pilose nectaries and plants with glabrous nectaries occur together. General distribution: Switzerland, cf. Liechtenstein, Germany, Austria, Italy, Slovenia, Croatia, Bosnia.

Specimina selecta (additions to MUCHER 1990 only): Switzerland: Commun dans les sous Alpes de Chateau d'Oex, vallous de Gérignoz de l'Etivaz, de la Chuse, des Mortais etc.; – ; LERESCHE (W). – Hochstaudenflur, Val Largina, Vrin, Gr.; 8. 8. 1970; O. HALLER (BERN). – Zentralalp., Davos, im Wald unterhalb Ischaalpen, 1730 m; 8. 1918; M. NOAK (G). – In Engadina inferiori; 7. 1844; – (G). – Germany: Bayern, Algäuer Alpen b. Oberstdorf, am Bärgründelebach unterhalb der Pointhütte

gegen Hinterstein, halbschattig, ca. 1300 m; 7. 9. 1963; W. Seitz (M). – Flora von Bayern, Allgäuer Alpen, Ostrachtal S-lich Hinterstein bei Hindelang, nahe dem Giebelhaus, ± 1000 m; 20. 8. 1966; H. HERTEL (M). – Austria: Flora von Vorarlberg, Hl. Schlucht oberh. Partenen, Grünerlengebüsch, 1360 m, Silikat; 12. 9. 1967; A. NEUMANN (W). – Bei Trins im Gschnitztale; 1874; J. SEEGER (IB). – Radstädter Tauern, Schwabalm im Kleinarltal; 22. 8. 1967; H. WAGNER (SZU). – Pyrgas; – ; E. SAXINGER (LI). – Nord-Kärnten, Nockberge, Bachau am Globatschbach NW Kaning b. Radenthein, 1030 m; 21. 7. 1988; G.H. LEUTE (Herb. LEUTE). – Kärnten, Kreuzeck-Gruppe, Gragraben, waldige, schattige Stellen, Glimmerschiefer, 800 m, vereinzelt; 7. 1924; T. GLANTSCHNIG (KL). – Petzen, in Unterkärnten; 22. 7. 1869; J. KRISTOF (LI). – Kärnten, Steiner Alpen, Kotschnatal, Waldrand, 975 m; 20. 8. 1990; W. MUCHER (GZU, KRA). – Italy: Brennerbad; 8. 1877; J. PASQUALI (W). – Süd-Tiroler Dolomiten, Umgebung von Pedraces im Val Badia [Abteital], im Bereich steiler Kalkfelsen seitlich der Straße, ca. 1450 m; 18. 8. 1972; H. BECKER (LI). – Wälder in Schwarzenbach bei Luttach, 12-1800 m; 17. 8. 1895; G. TREFFER (GZU). – Pian dei Morti, 1207 m. s. l. d. m.; 28. 8. 1970; O. PAOLA (TSB). – Prov. Udine, Frioul, rocailles humides monte Cimolais – Rio Pordenone, vallée de la Cimoliana, ca. 900 m; 25. 8. 1968; A. CHARPIN (G). – Flora Bellunensis et circumstantium alpium Forojulii, Belluno; – ; VENZO (WU). – Slovenia: Krain, am Ausgange des Krmatales bei Mojstrana in den Julischen Alpen, im Gebüsch, 840 m; 13. 8. 1893; DOLENZ (WU). – Krain, Sanntaler Alpen, Grintovíc, unter Krummholz am Wege vom Suhadalniktal zur Eggeralpe; 5. 8. 1931; E. KORB (W). – Im Voralpenthale Smerkova Draga des Zernover Gebirges; 22. 8.; TOMMASINI (W). – Trnovski gozd, in silvis, ass. Fagetum subalpinum, supra locum Hudo polje dictum, solo calcareo, 1200 m s.m., 0049/1, nr. 98677; 17. 8. 1980; T. WRABER (LJU). – Nanos, ad orientem a refugio alpino Vojkova koca dicto ad margines silvarum, 1240 m s. m., 0250/1, Nr. 117682[2]; 4. 10. 1987; A. PODOBNIK (LJU). – Croatia: N-Istrien, Planik-Gipfel; 23. 8. 1928; G. CUFODONTIS (W). – Istrien, Gebiet des Monte Maggiore, Felsen und steinige Waldlichtung dicht unterhalb der Kuppe „Plas" bei Vela Ucka, 1309 m, norwestlich von Plas; 1. 9. 1909; A. GINZBERGER (WU, Z). – Bosnia: Vlasic, c. 1600 m; 21. 7. 1894; R. KELLER (Z).

4.1.3. *Aconitum degenii* GÁYER subsp. *valesiacum* (GÁYER) MUCHER comb. nova

Basionym: *Aconitum valesiacum* GÁYER in Mag. bot. Lap. 8: 197 (1909), pro hybr.

Diagnosis: Pedunculi supra bracteolas dense glanduloso-pilosi, infra bracteolas disperse glanduloso-pilosi vel glabri, bracteolae 4–8 mm, lineares vel lanceolatae, fere glabrae, in parte supra medium pedunculi, fere ipse infra flos sitae, cassis semicircularis aut latior quam alta, parve rostrata, nectarium glabrum, filamenta fere glabra, carpella (3–) 5, ± completa stricte adpresse pubescentes.

Holotypus: Mauvoisin, vallée de Bagnes [Suisse, Valais] (BP, Götz 1967).

Icones: In GÖTZ 1967, h. l. Fig. 1c, 2c, 3c, 4c.

Description: Pedicel above the bracteoles densely glandular pilose, below the bracteoles dispersed glandular pilose or glabrous, bracteoles

4–8 mm, linear or lanceolate, mostly glabrous, situated in the upper half of the pedicel, hood half-round or longer than high, little beaked, nectary glabrous, filaments mostly glabrous, carpels (3–) 5, ± completely strictly appressed pubescent.

Nomenclature: GÁYER in HEGI 1912 places *A. valesiacum* as a subspecies under *A. paniculatum*. So it is the only combination of this taxon in the rank of a subspecies (GÖTZ 1967).

Morphology: This subspecies is very well separated by its pubescent carpels (Fig. 4c), which are mostly five. The hood (Fig. 3c) which is not as high as in subsp. *paniculatum* and subsp. *degenii* has a characteristic form too. It's the only subspecies of *A. degenii* with mostly glabrous bracteoles.

Geographic distribution (Fig. 6): *A. degenii* subsp. *valesiacum* is just distributed over a small area in the South-Western Alps (GÖTZ 1967, JALAS & SUOMINEN 1989). It is surrounded by the area of *A. d.* subsp. *paniculatum*, so that there are a lot of hybrids between those two subspecies. France: Dép. Savoie, Ht. Savoie (GÖTZ 1967). – Switzerland: Ct. Vaud, Ct. Fribourg, Ct. Bern, Ct. Valais, Ct. Ticino, Ct. Uri, Ct. Unterwalden (GÖTZ 1967), Ct. Obwalden, Ct. Graubünden. – Italy: Piemonte-Aoso to Lago Maggiore (GÖTZ 1967).

Specimina selecta: France: Chatillon, Bovonnaz; 8. 1885; P. ANEX-REY (LAU). – Bois, Cascade de l'Oursière à Uriage, Isère, alt. 1500-1600 m; 19. 8. 1880; P. TILLET (LY-Bonaparte). – M. Cenis, 11. 8. 1839; AUNIER (LY-Rouy). – Cette espèce croit dans l'ile du lac du Mont-Cenis; 1804; SÉRINGE (LY-Gandoger). – Switzerland: Alpes au dessus de Montbovon, canton de Fribourg; 7. 1858; CAVIN (LAU). – Grindelwald; – ; FISCHER-OOSTER (LAU). – Zinal, Valais, fond de la vallée et alpe de la Bex pentes inferieures; 1. 9. 1942; B. P. G. HOCHREUTINER (G). – Mt. Cubit, Grd. St. Bernard, alt. 2400 m; 30. 8. 1879; F.G. WOLF (G). – Valais, Saturages la Baux, 2400 mt., St. Bernard; 20. 8. 1873; A. WETEGHTES (WU-Kerner). – Wallis, Simplon-Süd, felsige Hänge ob der Alp Porcarescia, Zwischenbergental, ca. 2100 m; 27. 7. 1945; A. BECHERER (G). – Valais, entre l'hotel Mauvoisin et Gétroz, Vallée de Bagnes; 29. 7. 1886; SAINT-LAGER (G). – Münstertal bei Münster, Ober-Wallis; 30. 7. 1942; E. RILCHER (G). – Region d'Aletsch, Vs, Fischertal, "Stock" 2100 m, silice, ...; 4. 8. 1982; BEGUIN & THEURILLAT (G). – Helvetia, Meiringen; – ; O. ALTLEHRER (W). – Kt. Obwalden, Sörenberg – Marienthal, Umgebung des Emmensprungs; 23. 8. 1959; E. BERGER (BERN). – Flore des Grisons, Oberalppass, ..., ca. 2050 m, Fläche 929; 6. 8. 1979; R. SUTTER (BERN). – Monte: val Bavona, Tessin, ca. 1500 m; 7. 8. 1904; J. BRAUN (G). – Kt. Graubünden, Präsanz, am Weg zur Säge; 7. 8. 1923; H. SCHINZ (ZT). – Italy: Val Ferret; 8. 1864; MERMOUD (G). – Valle Formazza, Pascolie ruscelli lungo il sentiere Merasce Brunni; 3. 9. 1914; M.O. BOGGIANI (W).

4.1.4. *Aconitum degenii* GÁYER nsubsp. *gandogeri* MUCHER hybr. nov.

Diagnosis: Pedunculi supra bracteolas dense glanduloso-pilosi, infra bracteolas disperse vel dense glanduloso-pilosi, bracteolae 4–8 mm, lineares vel lanceolatae, fere glanduloso-pilosae, fere in parte superiore

pedunculi sitae, cassis semicircularis, nectarium glabrum, filamenta fere pilosa, carpella 3–5, glabra vel pilosa.

Holotypus: Suisse, Vaud, Pays d'Enhaut, Vallée de Gérignoz, La Montagnette, alt. 1445 m, cs. 579/143; 17. 8. 1952; leg. A. MAILLEFER, LAU (as A. *paniculatum* LAM.).

Eponymy: This new hybrid is dedicated to Dr. Michel GANDOGER (1850–1926), who has tried to find a new system for the classification of the genus *Aconitum* in the genera *Anthora, Lycoctonum* and *Napellus*.

Icones: Fig. 1d, 2d, 3d, 4d.

Description: Pedicel above the bracteoles densely glandular pilose, below the bracteoles dispersed or densely glandular pilose, bracteoles 4-8 mm, linear or lanceolate, mostly glandular pilose, mostly situated in the upper half of the pedicel, hood half-round, nectary glabrous, filaments mostly pilose, carpels 3–5, glabrous or pilose.

Nomenclature: *A. degenii* GÁYER nsubsp. *gandogeri* MUCHER is the hybrid between *A. degenii* GÁYER subsp. *paniculatum* (ARCANGELI) MUCHER and *A. degenii* GAÝER subsp. *valesiacum* (GÁYER) MUCHER.

Morphology: The filaments of the hybrid are in most cases pilose, although both parents have glabrous filaments. There is no more main character special for the hybrid. The characteristics of the parents are numerous and a lot of different combinations is possible, which are different to the parents and different among each other.

Geographic distribution (Fig. 6): The hybrid occurs in the introgressive areas of its parents in France and Switzerland.

Specimina selecta: France: Dans les Alpes d'Annecy, Haute Savoie, vallée du Reposoir; – ; J. TIMOTHÉE (G). – Savoie, Bourg, St. Maurice; 8. 1861; CHOLIN (LY-Gandoger). – Htes Alpes, St André d'Embrun, dans le foret de Saluces; 26. 8. 1898; BRACHER (LY-Bonaparte). – Mt. Cenis; -; M. BORJEAN (G). – Switzerland: Sur Pesternetze, Alpes de Grandvillard, Gruyére; 12. 8.; F. BOURGEOIS (LAU). – Vaud, Ormont-Dessus, cirque de Creux de Champ, vers Champ, alt. 1330 m, cs. 579/130; 20. 8. 1947; A. MAILLEFER (LAU). – Bois pierreux à la base de Chateau Chamais, Alpes de Chateau d'Oex, Cton de Vaud; 15. 9. 1854; LERESCHE (LAU). – Vaud, Alpes de Bex, mégaphorbiée sous la Combe, alt. 1220 m, cs. 574/123; 18. 8. 1944; A. MAILLEFER (LAU). – Vaud, Alpes, Vallée de la Tinière, entre Haut Feruz et Chalet du Petit Tour, alt. env. 1280 m; 22. 8. 1948; J.-L. PFISTER (LAU). – BE, Gasterntal, Selden, 1700 m. ü. M., S-exp. Festucetum variae; – ; GILOMEN (BERN). – Flora Valesiaca, autour du lac de Derborence; 21. 7. 1865; J.-C. DUCOMMUN (LAU). – Valais, Mauvoisin; 6. 8. 1909; GOUDET (G). – Taillis, en montant de chalets aux lacs de Ferret, 1900-2000 m; 28. 7. 1915; F. BOURGEOIS (G, LAU). – Unter Sandalp., Cton de Glaris; 7. 1840; KUMMER (M).

4.2. *Aconitum toxicum* RCHB.

REICHENBACH 1819. Uebersicht *Acon.*, p. 43, nom. nud.
REICHENBACH 1823-27. Ill. *Acon.*, t. 37

Diagnosis: Radix globosa, caulis elatus, cernuus, flexuosus, folia caulina macrophylla laciniis latis, inflorescentia laxa, diffusa, mutiflora,

ramosa, pedunculi ± dense glanduloso-pubescentes vel glabri, bracteolae late ovatae, rare divisae, semper ramificate venosae, nonnumquam pauce petiolatae, lamina et margo glanduloso-pubescens, tepala caerulea, externe glanduloso-pubescentes vel glabra, cassis lata ut alta vel pauce altior quam lata, nectarii stipes vix curvatus, nectarium non semper apicem cassidis attingens, glabrum, filamenta superne pilosa, rare paene glabra, carpella 3, glabra vel rare pauce diffuse glanduloso-pilosa.

Lectotypus: GÖTZ 1967 chose the illustration in REICHENBACH, Ill. *Acon.*, t. 37 as the typus. I regard it as an iconotypus. Then GÖTZ 1967 mentioned a plant cited by REICHENBACH with the same data, which is in W and could be chosen as a lectotypus. I've searched for this specimen and marked it to be the lectotypus now:

Transsylv., in graminosis alpestris, [1] 827, leg. BAUMGARTEN, W (as *Aconitum neomontanum*, rev. E. GÖTZ 1966 as *Aconitum toxicum* RCHB.).

Icones: In REICHENBACH 1823–27, t. 37; h. l. Fig. 1f-i, 2f-i, 3f-i, 4f-i.

Description: Root globose, stem high, cernous, flexuous, caulinar leaves large with broad lacinias, inflorescence loose, diffuse, multiflorous, ramose, pedicel ± densely glandular pubescent or glabrous, bracteoles broad-ovate, rarely divided, always with branching veins, sometimes a little petiolate, lamina and margin glandular pubescent, tepals blue, externally glandular pubescent or glabrous, hood about as high as long or a little higher than long, claw of the nectary hardly curved, nectary not always reaching the top of the hood, glabrous, filaments in the upper part pilose, rarely almost glabrous, carpels 3, glabrous or rarely a little diffuse glandular pubescent.

Nomenclature: REICHENBACH 1819 first published *A. toxicum* as a nomen nudum and cited it from Austria (Salisburg, in monte Untersberg). So it's not sure if at first he meant *A. variegatum* or if just the area was wrong. In REICHENBACH 1823-27 the description (bracteolis ovato-ellipticis, membranaceis, nervosis, supra medium suboppositis suffulti) and the area (Hab. in Transylvaniae alpibus) made it absolutely clear, which plant is meant.

Geographic distribution (Fig. 5): GÖTZ 1967 states the taxon to be endemic to Bosnia, Montenegro (ROHLENA 1942), Bihar-Mountains and Eastern Carpathians, but it also occurs in the Southern Carpathians (JALAS & SUOMINEN 1989).

4.2.1. *Aconitum toxicum* RCHB. subsp. *toxicum*

Diagnosis: Pedunculi ± dense glanduloso-pilosi, lamina bracteolarum glanduloso-pilosa, margo aeque, tepala externe glanduloso-pilosa.

Lectotypus: See sub 4.2. *A. toxicum*.

Icones: In Reichenbach 1823–27, t. 37; h. l. Fig. 1f, 2f, 3f, 4f.

Description: Pedicel ± densely glandular pilose, lamina and margin of the bracteoles glandular pilose, tepals externally glandular pilose.

Geographic distribution (Fig. 8): This subspecies occurs in almost the whole area of the species: Bosnia, Montenegro (in dumetis reg. subalp. montis Ranisava prope montem Durmitor; mons Balj supra Andrijevica) and Romania.

Specimina selecta: Bosnia: Waldränder am Trebevic bei Sarajevo, ca. 1600 m. s. m.; 7. 9. 1902; K. MALY (W). – Kreis Sarajevo, Voralpenregion Treskavica, ca. 1500 m; 30. 7. 1896; F. FIALA (W). – Romania: Im Trnyasthale bei Negros am Eingange in d. Valea Lepusului im Bihargebirge; – ; KERNER (WU). – Postavasee, – ; 29. 8. 1961; H. HELTMANN (SIB-Schneider-Binder). – Pormbacher Voralpen in Siebenbürgen, Nr. 29715; 8. 1871; G.A. KAYSER (SIB-Kayser). – Königstein, Nr. 38188; 16. 8. 1908; UNGAR (SIB-Ungar). – Comit. Csik, in lapidosis humosis montis Nagy Hagymás pr. Balánbáya; 28. 7. 1911; A. DEGEN (BP). – Siebenbürgen, Kronstadt, Rütlizinne auf dem Schuler; 21. 8. 1887; J. Römer (SIB-Untchj). – Flora transsilvanica, cott. Csik, mt. Hargita in humidis medii sphagneti Lucsmelléke supra p. Csikszentkirály; 5. 8. 1941; R. SOÓ (CL-Soó). – In alpibus Transsilvaniae, Duscher Paß, Nr. 44206; 5. 8.; M. FUSS (SIB-Soc.). – In graminosis alpestris sub montis Krejuhy, Nr. 6467; 8. 1827; BAUMGARTEN (CL-Baumgarten). – Dumbavitschoare Thal in der Walachei, Nr. 44218; 13. 8. 1851; – (SIB-Soc.).

4.2.2. *Aconitum toxicum* RCHB subsp. *bucegiense* (NYÁRÁDY) MUCHER stat. nov.

Basionym: *Aconitum toxicum* RCHB. var. *bucegiense* NYÁRÁDY in BORZA 1946, Bul. Grad. Bot. Cluj. 26: 179.

Diagnosis: Pedunculi glabri, tepala externe glabra.

Holotypus: Transsilvania, distr. Brasov, ad pedem montium Bucegi, prope Valea Toplitei, versus pagum Rasnov, in quercetis, una cum typo, alt. cca 700 m s.m., Nr. 601109, 22.9.1940, leg. P. CRETZOIU, det E.I. NYÁRÁDY (CL). – Isotypes: CL, SIB.

Icones: h. l. Fig. 1g, 2g, 3g, 4g.

Description: Pedicel glabrous, tepals externally glabrous.

Morphology: Glandular pubescence is a very constant character. In *A. degenii* subsp. *paniculatum* it happens very rarely, that the indumentum mainly of the pedicel is largely or totally lacking, as it was described by GÁYER 1909 as f. *calvum*. But in most cases this f. *calvum* is just a hybrid of *A. degenii* with *A. variegatum* with a lot of other intermediate characteristics. Not so in A. toxicum subsp. *bucegiense*. There is indeed no influence of *A. variegatum,* so that I have no doubts to interprete it as a new race of *A. toxicum*. The lack of glandular pubescence is unique in *A.* ser. *Toxicum* and gives this subspecies a separate state at all.

Geographic distribution (Fig. 8): Especially because within this small area in the Bucegi-mountains all three subspecies of *A. toxicum* can

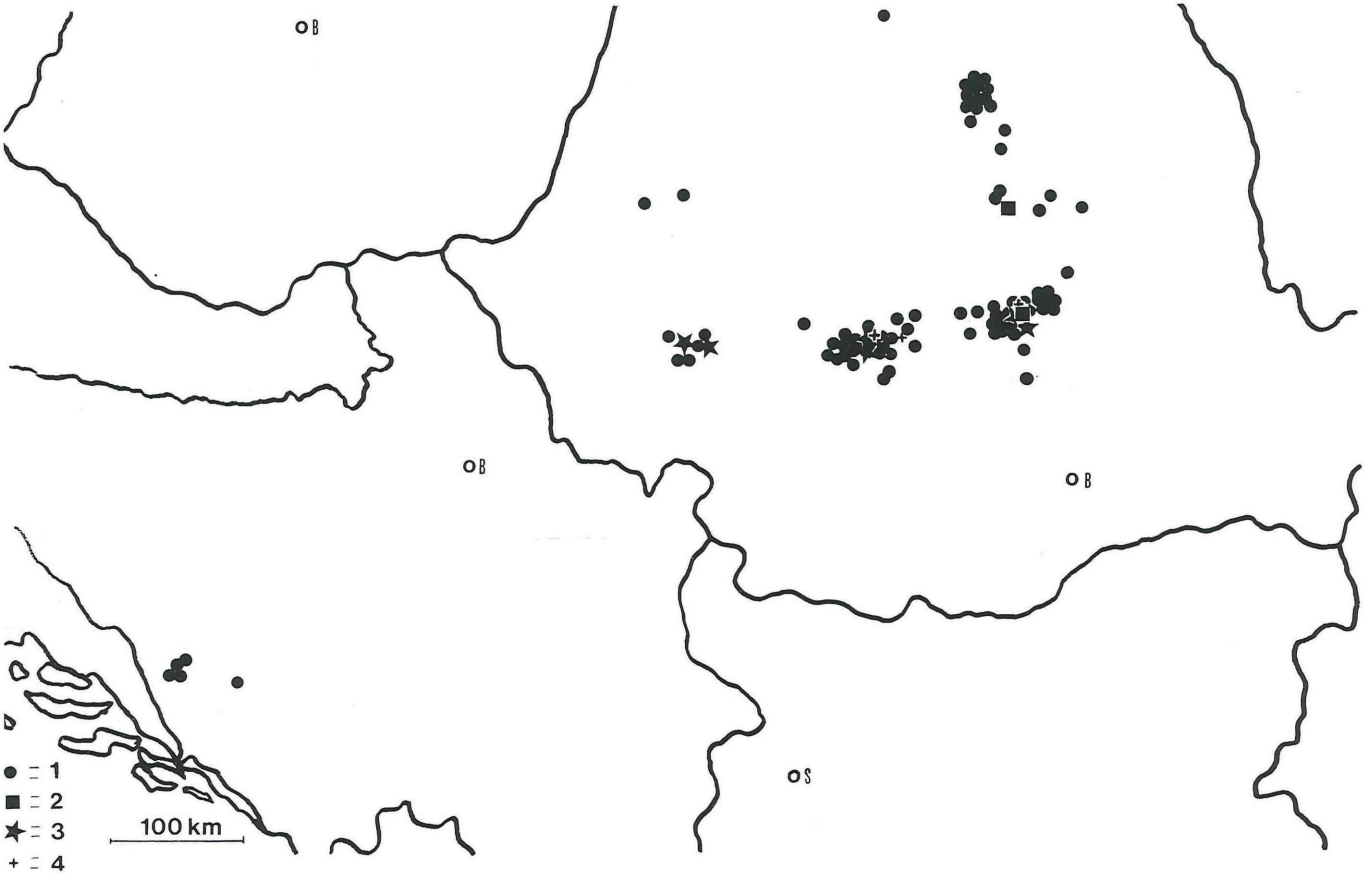

Fig. 8. Distribution of *Aconitum toxicum* in Europe. – 1 *A. t.* subsp. *toxicum*, 2 *A. t.* subsp. *bucegiense*, 3 *A. t.* subsp. *crispulum*, 4 *A. t.* nsubsp. *nyaradyanum*.

be found and spread from there in different directions (subsp. *bucegiense* to the north, subsp. *crispulum* to the west and subsp. *toxicum* to all directions) here must be the center of origin of *A. toxicum*. *A. toxicum* subsp. *bucegiense* is endemic to Romania.

Specimina selecta: Romania: Transsilvania, jud. Harghita, Tusnad Bai; 8./9. 1937; M. SERBAN (CL). – Transsilvania, distr. Brasov, ad pedem montium Bucegi, prope Valea Toplitei, versus pagum Rasnov in quercetis, una cum typo, alt. cca 700 m s.m.; 22. 9. 1940; P. CRETZOIU (CL, SIB-Nyárády, types).

4.2.3. *Aconitum toxicum* RCHB. subsp. *crispulum* (NYÁRÁDY) MUCHER stat. nov.

Basionym: *Aconitum toxicum* RCHB. var. *crispulum* NYÁRÁDY in BORZA 1946, Bul. Grad. Bot. Cluj. 26: 179.

Diagnosis: Pedunculi pilis glandulosis curvatis ± dense obsiti, lamina bracteolarum pilis glandulosis curvatis, tepala externe pilis glandulosis curvatis sparsim pilis strictis intermixtis.

Lectotypus: Transsilvania, distr. Brasov, ad rivum Gr. Weidenbach sub mtbus Bucegi prope pagum Rasnov, alt. cca. 720 m.s.m., 12.8.1929, leg. E.I. NYÁRÁDY (SIB-Nyárády). The second specimen in the same herbarium can be chosen to be a paratypus.

Icones: h. l. Fig. 1h, 2h, 3h, 4h.

Description: Pedicel ± densely covered with curved glandular hairs, the lamina of the bracteoles with curved glandular hairs, tepals externally with curved glandular hairs mixed with few strict hairs.

Nomenclature: NYÁRÁDY published this taxon as *A. toxicum* RCHB. var. *crispulum* NYÁRÁDY. On the labels he always writes *A. toxicum* f. *crispulum*.

Morphology: Glandular hairs are a morphological characteristic of the indument, which occurs in different sections and subsections of the genus *Aconitum*. But in all other cases, there are strict glandular hairs. The formation of curved glandular hairs is unique for *Aconitum* in this European taxon. It's a new mutation in the evolution of *Aconitum*. In the Carpathians, where also the mutation of broad-ovate bracteoles took its origin, which has developed in a species of its own *(A. toxicum)*, there must be a center of this series. There is so much variability and different taxa exist on a small area, at least more than in big parts of Europe, where only little distant taxa are well separated. Not so in the Carpathians, where plants with all those morphological characteristics grow together in one locality. As I have seen at the locus classicus and in the Bulea-Valley this subspecies occurs in big populations, separated from the other subspecies within the same area. So the occurence of curved glandular pubescence is not an unimportant variation (GÖTZ 1967), but a very special new formation.

Geographic distribution (Fig. 8): This subspecies is endemic in the Southern Carpathians.

Specimina selecta: Romania: Transsilvania, ditr. Hunedoara, Retezat, in valle Zlatuia, alt. 1200-1500 m. s. m.; 13. 8. 1950; E. J. NYÁRÁDY (SIB-Nyárády). – Transsilvania, montes Fagarasenses, penes viam ad lacum Bulea in Abietis, alt. 1150 m; 15. 8. 1936; E. J. et A. NYÁRÁDY (SIB-Nyárády). – Transsilvania, distr. Brasov, ad rivum Gr. Weidenbach sub mtbus. Bucsecs, prope pagum Rozsnyó (Rasnov), alt. cca. 720 m. s. m.; 12. 8. 1929; E. NYÁRÁDY (SIB-Nyárády, types).

4.2.4. *Aconitum toxicum* RCHB. nsubsp. *nyaradyanum* MUCHER hybr. nov.

Diagnosis: Pedunculi supra bracteolas glandulosis pilis curvatis strictisque ± dense obsiti, infra bracteolas maxime glandulosis pilis curvatis, lamina superior bracteolarum crispule pubescens, margo crispule ciliatus, lamina inferior bracteolarum fere glabra, tepala externe maxime glandulosis pilis strictis obsita.

Holotypus: Transsilvania, distr. Brasov, ad rivum Gr. Weidenbach sub mtibus Bucegi prope pagum Rasnov, alt. cca. 720 m s.m., Nr. 195107; 12. 8. 1929; leg. E. I. NYÁRÁDY (CL).

Eponymy: This nothosubspecies is dedicated to Dr. Erasmus Julius NYÁRÁDY (1881-1966), who has described several infraspecific taxa of *Aconitum* from Transsilvania.

Icones: Fig. 1i, 2i, 3i, 4i.

Description: Pedicel above the bracteoles ± densely covered with curved and strict glandular hairs, below the bracteoles mainly with curved glandular hairs, lamina of the bracteoles above with curved hairs, margin curved ciliate, lamina below mostly glabrous, tepals outside mainly with strict glandular hairs.

Nomenclature: *A. toxicum* RCHB. nsubsp. *nyaradyanum* MUCHER is the hybrid between *A. toxicum* RCHB. subsp. *crispulum* (NYÁRÁDY) MUCHER and subsp. *toxicum*.

Morphology: The main characteristic of this hybrid is the mixture of strict and curved glandular hairs in the indumentum of the pedicel. Therfore this hybrid congruetes with *A. toxicum* f. *parcecrispulum* NYÁRÁDY.

Geographic distribution (Fig. 8): *A. toxicum* nsubsp. *nyaradyanum* is distributed in the introgressive area of its parents in the Southern Carpathians. It's endemic to Romania.

Specimina selecta: Romania: Sub Mt. Negoiu, alt. cca. 2100–2500 m s.m.; 17. 8. 1924; A. BORZA (CL). – Siebenbürgen, Fogorascher Gebirge, Bulea-Tal, zwischen Schutzhaus u. Wasserfall, ca. 1300 m; 12.–14. 8. 1910; A. GINZBERGER (WU). – Transsilvania, Mtibus Fagarasensis, in Pinetis mughi, prope cataractam Balea, alt. cca. 1350 m s.m.; 12. 8. 1936; E. I. NYÁRÁDY (CL). – M-til Fagaras, Valea Pojortei, cca.

1500 m s.m.; 10. 8. 1961; E. VICOL (CL). – In dit. Zernest, in lapidosis fissurae montis Királykö, quae Krepatura dicitur; 23. 8. 1906; Z. ZSÀK (M).

4.3. *Aconitum* × *dragulescuanum* MUCHER hybr. (nspec.) nov.

Diagnosis: Radix globosa, caulis elatus, cernuus, flexuosus, folia caulina macrophylla laciniis latis, inflorescentia laxa diffusa multiflora, ramosa, pedunculi ± dense glanduloso-pilosi, bracteolae spathulatae versus anguste ovatae, saepe divisae, semper ramificate venosae, lamina glanduloso-pilosa, margo aeque, tepala caerulea, externe glanduloso-pilosa, cassis lata ut alta, nectarii stipes curvatus, nectarium apicem cassidis semper attingens, glabrum, filamenta superne pilosa, carpella 3, glabra vel rare pauce diffuse glanduloso-pilosa.

Holotypus: [Transsilvania], in praeruptis et graminosis rupium calc. Mt. Hagimasul Mare, supra rivum Nagyàg, alt. 1500–1740 m s. m., distr. Ciuc; 19. 8. 1948; J. E. NYÁRÁDY (SIB-Nyárády).

Eponymy: This new nothospecies is dedicated to Prof. Dr. Constantin DRAGULESCU in Muzeul Brukenthal at Sibiu (Romania).

Icones: Fig. 1e, 2e, 3e, 4e.

Description: Root globose, stem high, cernous, flexuous, caulinar leaves large with broad lacinias, inflorescence loose, diffuse, multiflorous, ramose, pedicel ± densely glandular pilose, bracteoles spatulate to narrow-ovate, often even divided, always with branching veins, lamina and margin glandular pilose, tepals blue, externally glandular pilose, hood about as high as long, claw of the nectary curved, nectary always reaching the top of the hood, glabrous, filaments in the upper part pilose, carpels 3, glabrous or rarely a little diffuse glandular pubescent.

Nomenclature: *Aconitum* × *dragulescuanum* MUCHER is the hybrid between *A. degenii* GÁYER and *A. toxicum* RCHB. Within the area where this hybrid may occur there is only hybridisation with *A. degenii* subsp. *degenii* possible (an introgressive area in Bosnia isn't certain till now.). On the other hand the description corresponds to hybridisation with *A. toxicum* subsp. *toxicum* only. A hybrid with *A. toxicum* subsp. *bucegiense* or subsp. *crispulum* isn't known until now.

Morphology: The main character of this hybrid is the intermediate form of the bracteoles (Fig. 2e). The hood (Fig. 3e) has the typical form of *A. degenii,* it is never as high as in *A. toxicum.* Therefore the nectaries are always bent and reach the top of the hood. The plants I've seen had always pilose filaments, some of them were very densely pilose.

Geographic distribution (Fig. 5): The hybrid occurs in the introgressive areas of *A. degenii* and *A. toxicum* (GÖTZ 1967). Till now I've just found specimens from Romania.

Specimina selecta: Romania: Transsilvania, distr. Alba, Piatra Strutu, Nr. 632583; 7. 1969; S. CSÜRÖS (CL). – Flora transsilvanica, in saxosis graminosisve mtis Öcsém teteje supra pagum Balam, alt. 1500–1708 m. s.m., distr. Ciuc; 5. 8. 1948;

J. E. NYÁRÁDY (SIB-Nyárády). – Flora transsilvanica, in praeruptis et graminosis rupium calc. Mt. Hagimasul Mare, supra rivum Nagyàg, alt. 1500–1740 m s.m., distr. Ciuc; 19. 8. 1948; J. E. NYÁRÁDY (SIB-Nyárády). – Prope Segesvar ..., Nr. 44213; – ; – (SIB-Soc.). – Frumoasa, Nr. 38181; 7. 9. 1852; FUSS (SIB-Ungar). – Illva, an der Maras, Nr. 44214; 26. 8. 1881; J. BARTH (SIB-Soc.). – Auf dem Kristescht, Nr. 44224; 17. 7. 1848; – (SIB-Soc.). – In alpibus Transsilvaniae, Duscher Paß, Nr. 44206; 5. 8.; M. FUSS (SIB-Soc.). – Oltenia, distr. Gorj, in silvis "Alno-Carpinion" ad vallem rivuli Gillort, alt. cca. 950 m. s. m.; 9. 7. 1973; D. et M. CIRTU (BP).

5. Key to the toxicoid Aconites of Europe

1* Bracteoles broad-ovate, always with branching veins (*A. toxicum*) 8
1* Bracteoles filamentous to narrow-ovate, rarely even divided 2
2 Bracteoles filamentous to linear, situated about in the middle of the pedicel, mostly the whole pedicel ± densely glandular pilose 3
2* Bracteoles linear-lanceolate to narrow-ovate, always situated in the upper half of the pedicel or near the base of the flower 5
3 Carpels 3-5, ± densely pilose . . . . . .
4.1.4. *A. degenii* nsubsp. *gandoger i* (*A. d.* subsp. *paniculatum* × subsp. *valesiacum*)
3* Carpels 3, glabrous (*A. degenii* subsp. *paniculatum*) 4
4 Filaments glabrous, nectaries glabrous . . . . . .
4.1.2.1. *A. degenii* subsp. *paniculatum* var. *laxiflorum*
4* Filaments pilose, nectaries glabrous or pilose . . . . . .
4.1.2.2. *A. degeni i* subsp. *paniculatum* var. *turrachense*
5 Carpels (3–) 5, all-round ± densely pilose with rigid upright appressed hairs, bracteoles lanceolate, situated near the flower, mostly glabrous, pedicel glandular pilose, mainly above the bracteoles . . . . . .
4.1.3. *A. degenii* subsp. *valesiacum*
5* Carpels 3–5, in most cases entirely glabrous 6
6 Carpels 3–5, pedicel below the bracteoles almost glabrous . . . . . .
4.1.4. *A. degenii* nsubsp. *gandogeri* (*A. d.* subsp. *paniculatum* × subsp. *valesiacum*)
6* Carpels 3, whole pedicel ± densely glandular pilose 7
7 Bracteoles lanceolate, situated near the flower, never with branching veins, glandular pilose, the whole pedicel ± densely glandular pilose . . . . . .
4.1.1. *A.degenii* subsp. *degenii*
7* Bracteoles spatulate to narrow-ovate, often even divided, always with branching veins, mostly situated a little distant from the flower . . . . . .
4.3. *A.* × *dragulescuanum* (*A. degenii* × *A. toxicum*)
8 Pedicel glabrous . . . . . .
4.2.2. *A. toxicum* subsp. *bucegiense*
8* Pedicel glandular pubescent 9
9 Pedicel with strict glandular hairs . . . . . .
4.2.1. *A. toxicum* subsp. *toxicum*
9* Pedicel with curved or curved and strict glandular hairs 10
10 Pedicel only with curved glandular hairs . . . . . .
4.2.3. *A. toxicum* subsp. *crispulum*

10*) Pedicel above the bracteoles with curved and strict glandular hairs . . . . . 4.2.4. *A. toxicum* nsubsp. *nyaradyanum* (A. t. subsp. crispulum x subsp. toxicum)

6. Discussion

Soó 1972 mentioned that he prefers to treat *A. degenii* Gáyer as an endemic taxon of the subalpine Eastern Carpathians as subsp. *degenii* (Graebner 1929, Grintescu 1953) or var. *subalpinum* (Rapaics 1907) because of its constant combination of characteristics. Grintescu 1953 placed 3 forms under *A. paniculatum:* f. *matthioli* (Rchb.) Grint., f. *czeremossicum* (Zap.) Grint., f. *prutense* (Zap.) Grint., but they are all unimportant variations without constancy or centers of distribution. However Grintescu 1953 recognized *A. degenii* as a subspecies of its own and he mainly separated it from *A. paniculatum* s. str. by the description of the hood. The shape of the hood alone is not characteristic enough. Because of the enormous variation you can also find hood shapes like those in the Alps. The same is true for the form of the bracteoles and their position on the pedicel. But it is the combination of these three characteristics, which makes this subspecies different to the alpine taxon.

A. lasiocarpum Rchb. from the Northern Carpathians with its pilose carpels is surely no taxon, which can be placed under *A. degenii* (Szücs 1943, Soó 1972) and never under *A. toxicum* (Grintescu 1953, Michalko 1955). To treat *A. lasiocarpum* in the rank of a species (Gáyer 1911, Sojak 1972, Skalický 1982, 1990) is surely the right way. But I agree with Götz 1967 and confirm the hybridogenous origin of that taxon too. Further investigations are needed to clarify the taxonomic rank and position of *A. lasiocarpum.*

7. Acknowledgements

I am grateful to Prof. Dr. Herwig Teppner (Graz) for commenting on the manuscript. I also thank Dr. Katalin Bártok (Kolozsvár) and Prof. Dr. Constantin Dragulescu (Sibiu) for their support and helpful participation in herbarium work.

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