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Additions to the Ecogeography of *Veronica vindobonensis* with Special Reference to Poland

Cytotaxonomy of *Veronica chamaedrys* agg., IV

By

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With 4 Figures

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Key words: *Scrophulariaceae, Veronica chamaedrys* agg., *Veronica chamaedrys* subsp. *ch.* var. *eglandulosa* M. A. FISCHER, var. nova, *Veronica vindobonensis.* – Chromosome numbers. – Xerothermic vegetation, chorology, pontic-pannonian distribution. – Flora of Europe.

Summary

MIREK Z. & FISCHER M. A. 1986. Additions to the ecogeography of *Veronica vindobonensis* with special reference to Poland. Cytotaxonomy of *Veronica chamaedrys* agg., IV. – Phyton (Austria) 26 (1): 107–129, 4 figures. – English with German summary.

Veronica vindobonensis, a new species to the flora of Poland, grows in xerothermic grassland communities (of the Cirsio-Brachypodion alliance), in the hills to the North of Cracow and in the lower Vistula valley. The diploid chromosome number (2n = 2x = 16) agrees with previous data from Austria, Slovakia, and Bulgaria. – The total distribution range of the species is presented as a dot map: it is centred in the Pontic-Pannonian Subregion (SE. Europe) and stretches from S. Germany to Transcaucasia, but is absent from NW. Anatolia. A discussion of the ecological (phytocoenological) behaviour reveals the xerothermic-subcontinental character of the species: it grows in oak-forests and corresponding border- and grassland communities in the lowlands of Central Europe but occurs right up to the subalpine belt on the mountains of Southern Europe. – A critical revision of the differential characters between *V. vindobonensis* and the closely related species *V. chamaedrys* s. str. is presented in a table, and a key includes two more related species, *V. micrantha* and *V. magna,* and two more subspecies of *V. chamaedrys:* subsp. *krumovii* and subsp. *micans.*

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Zusammenfassung

MIREK Z. & FISCHER M. A. 1986. Ergänzungen zur Ökogeographie der *Veronica vindobonensis* mit besonderer Berücksichtigung Polens. Zur Cytotaxonomie von *Veronica chamaedrys* agg., IV. – Phyton (Austria) 26 (1): 107–129, 4 Abbildungen. – Englisch mit deutscher Zusammenfassung.

Veronica vindobonensis ist eine neue Art der Flora Polens: sie wächst in xerothermen Rasengesellschaften in der nördlichen Umgebung von Krakau sowie im unteren Tal der Weichsel. Die diploide Chromosomenzahl (2n = 2x = 16), ermittelt an einer dieser Populationen, stimmt mit den bisher vorliegenden Angaben für Österreich, die Slowakei und Bulgarien überein. – Das Gesamtareal der Art wird als Punktkarte dargestellt; es hat seinen Schwerpunkt in der Pontisch-Pannonischen Unterregion (SE-Europa) und reicht von Süddeutschland bis Transkaukasien, nimmt jedoch NW-Anatolien aus. Die ökologische und pflanzensoziologische Position wird diskutiert: *V. vindobonensis* besiedelt lockere thermophile subkontinentale Eichenwälder und entsprechende Saum- und Rasengesellschaften der planar-collinen bis submontanen Stufe Mitteleuropas und steigt weiter im Süden in höhere Gebirgslagen. – Eine Revision der Differentialmerkmale gegenüber den nahverwandten Arten *V. chamaedrys* s. str. (mit subsp. *krumovii* und subsp. *micans*), *V. micrantha* und *V. magna* wird in Form eines Schlüssels und einer Merkmalstabelle geboten.

1. Introduction

Veronica vindobonensis (M. A. FISCHER) M. A. FISCHER is a diploid (2n = 16) species belonging to the *V. chamaedrys* group (FISCHER 1970, 1973 a, 1974) and is closely related to the tetraploid (2n = 32) *V. chamaedrys* L. s. str. widespread in Europe. *V. vindobonensis* (= *V. chamaedrys* subsp. *vindobonensis* M. A. FISCH., see also WALTERS & WEBB 1972), in contrast to *V. chamaedrys* s. str., inhabits more xerothermic communities and has a much smaller distribution area centred in SE. Europe (FISCHER 1974; FISCHER in MEUSEL & al. 1978: that map is now corrected in this paper).

2. Distribution in Poland

Revisions of material in Polish herbaria (mainly KRAM and TRN) (by M.A.F.) and subsequent field studies (by Z. M.) have shown that *V. vindobonensis* also grows in Poland, where it seems to be restricted to xerothermic parts of the country (map Fig. 1): There are seven localities in Northern Poland (Vistula valley N. of Toruń; nos. 9 to 15 below) and seven more localities in southern Poland in the Małopolska Highlands, mainly in the Jura Krakowsko-Wieluńska (Cracow-Wieluń Jurassic Highland) and in the Miechów-Pińczów district, all N. of Kraków (= Cracow; nos. 1 to 7 below), with only one record from the Carpathians S. of Kraków: Pieniny Mts. (No 8).

(1) Jurassic region between Kraków and Wieluń (NW. of Kraków), Olsztyn near Częstochowa, xerothermic grassland, rendzina on Jurassic limestone, c. 300 m s. m.; 26. 6. 1982, Z. MIREK, relevé no. VI., (KRAM).

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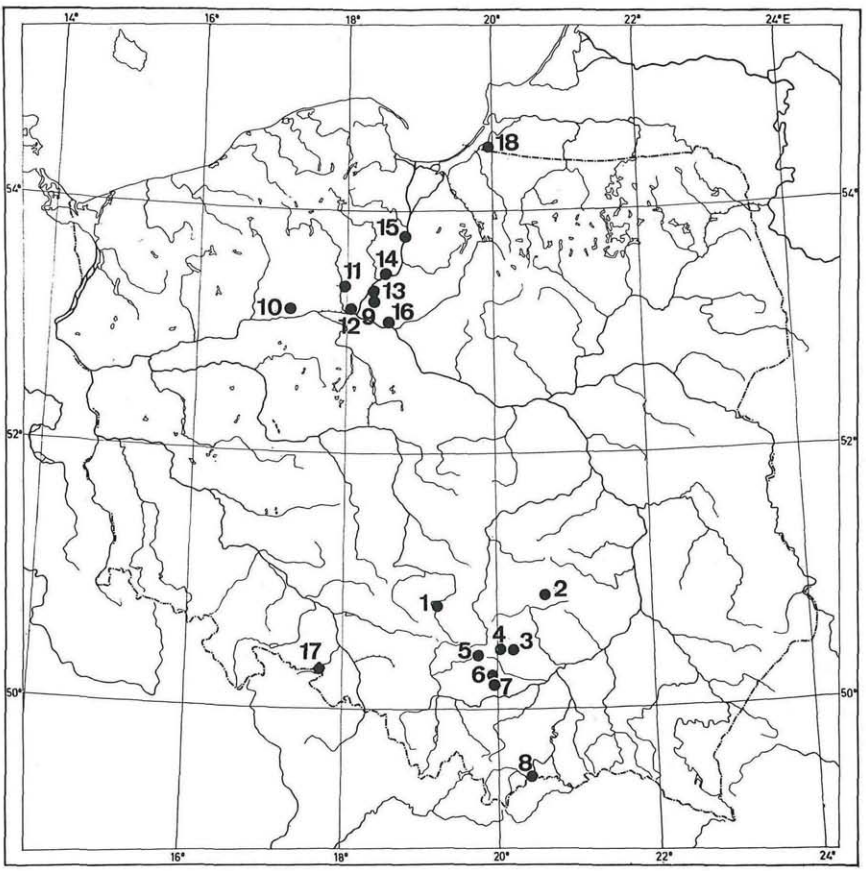

Fig. 1. Herbarium records of *Veronica vindobonensis* from Poland. For the numbers see sub 2. and 5.2.

(2) Near Kielce, margin of a pine-forest, c. 350 m s. m., 9. 5. 1926, K. KAZNOWSKI (KRAM 188802).

(3 A, B) Giebułtów near Książ Wielki, xerothermic grassland, rendzina on cretaceous marl, 270 m s. m., 24. 5. 1983, Z. MIREK, relevé nos. III. and IV., (KRAM).

(4) Between Tunel and Podleśna Wola (c. 7 km N. of Miechów), xerothermic grassland, rendzina on cretaceous marl, 340 m s. m., 24. 5. 1983, Z. MIREK, relevé no. V., (KRAM).

(5) Wolbrom (40 km NNW. of Kraków), c. 370 m s. m., sine dat., A. KOZŁOWSKA (KRAM 242023).

(6) Between Iwanowice and Danice (c. 18 km N. of Kraków), Dłubnia river valley, rendzina on cretaceous marl, xerothermic grassland, 270 m s. m., 14. 8. 1974, Z. MIREK, relevé no. I., (KRAM).

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(7) Near Maszków (c. 15 km N. of Kraków), Dłubnia river valley, rendzina on jurassic limestone, xerothermic grassland, 12. 8. 1974 and 25. 5. 1983, Z. MIREK, relevé no. II., (KRAM); two specimens investigated karyologically: 2n = 16 (Fig. 2 A, B).

(8) Pieniny Mts. (SE. of Kraków), lower part of the Sobczański Ravine, xerothermic grassland, rendzina on jurassic limestone, 560 m s. m., 6. 7. 1982, Z. MIREK (KRAM).

(9) Plutowo (30 km NE. of Bydgoszcz), grassy slope, c. 90 m s. m., 7. 6. 1953, MAŁEK (SZCZ).

(10) Wyrzysk (c. 55 km W. of Bydgoszcz), deciduous forest, 100 m s.m., 23. 5. 1964, T. SZCZEŚNIAKÓWNA (TRN).

(11) Wymyslowo (7 km N. of Koronowo), slopes on the Brda river, c. 100 m s. m., no date, M. CEYNOWA (TRN).

(12) Rynkowo (at the N. frontier of the town Bydgoszcz), mixed forest, 85 m s. m., 10. 5. 1952, T. GROCHOWSKI (TRN).

(13) Starogród (c. 40 km NNW. of Toruń), on S. slopes of ravine, c. 80 m s. m., 17. 5. 1958, D. MALCZYŃSKA (TRN).

(14) Slopes of Vistula river between Świecie and Sartowice, c. 70 m s. m., 29. 5. 1952, leg. ?, (TRN).

(15) Village Opalenie (= Münsterwald) near Kwidzyń (= Marienwerder), 65 m s. m., [xerothermic vegetation on the slope of the Vistula river; at present nature preserve], 5. 1866, C. J. KLINGGRÄFF (TRN).

(16) Borussia occidentalis: Thorn [= Toruń], Wald bei Fort IV, 13. 5. 1887, Georg FROELICH, sub. "*V. chamaedrys* v. *glabrescens* m. fr. *incisa*", (Z).

(17) Upper Silesia: Kapellenberg bei Rausen [= nr Osoblaha in N. Moravia, ČSSR, close to Polish border], 31. 8. 1879, P. SINTENIS, sub "*V. ch.* f. *petiolata* UECHTR." [the forma name refers to the petiolate leaves of the vegetative shoots], (W).

Further records are to be expected from other parts of Poland where suitable xerothermic habitats occur, i. e. expecially in the Lublin Highlands (SE. Poland), in Lower Silesia (SW. Poland), in the Lower Vistula (Wisła region (N. Poland), and in the Lower Odra Region (NW. Poland).

3. Chromosome Counts

Two specimens of *V. vindobonensis* from locality 7 (see sub 2.) have been studied karyologically (colchicine pretreatment, glacial acetic alcohol fixation, squash method, aceto-carmine staining; mitoses in root-tips of adult plants): The diploid chromosome number 2n = 2x = 16 already established for eastern Austria (2 localities in Vienna and in Niederösterreich (Lower Austria): FISCHER 1970: 206; 13 more localities in Vienna, Niederösterreich, and Steiermark (Styria): FISCHER 1974: 290–291), for Slovakia (2 localities in W. Slovakia: M. VÁCHOVÁ and J. ZÁBORSKÝ in MÁJOVSKÝ 1978: 40), and for Bulgaria (5 localities in Vitoša Mt. and Pirin Mt.: FISCHER 1974: 291; 1 population in Vitoša Mt.: PEEV 1972: 812 and 1978: 83), is confirmed now for Polish plants: Fig. 2A, B.

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For comparison, one specimen of *V. chamaedrys* s. str. from the same locality 7, growing close to *V. vindobonensis* in a slightly more humid place in an Arrhenatherion community in the same meadow was likewise investigated (same method): 2n = 32 (Fig. 2C). This is the first chromosome count of this species in Poland.

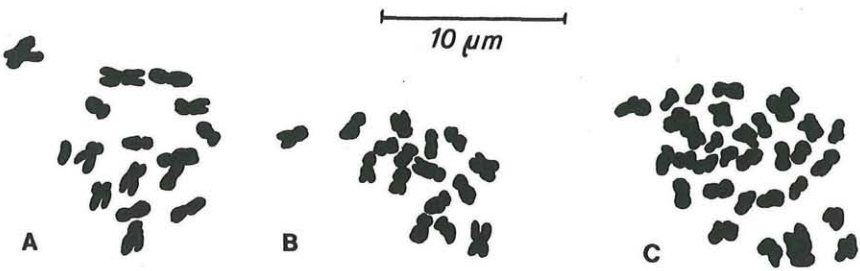

Fig. 2. Somatic mitosis (root tips) of *Veronica chamaedrys* group from Maszków (locality no. 7) in Poland (see sub 2.). – A, B Two different specimens of *V. vindobonensis;* C *V. chamaedrys* subsp. *chamaedrys*.

4. Habitats of *Veronica vindobonensis* in Poland

Phytocoenology. Judging from the available records, *V. vindobonensis* is restricted to xerothermic grasslands of the Festuco-Brometea syntaxonomical class. The floristic composition of habitats of six Polish records is presented in Table 1. They are all representatives of the Cirsio-Brachypodion alliance, but because of the too few available relevés, we do not identify and classify them as definite associations.

Orography and Soils. Vegetation samples with *V. vindobonensis* occur on rendzina-soils developed on jurassic limestones (loc. 1, 7, 8 and probably also 2 and 5) or on cretaceous marls (loc. 3, 4, 6); exposition (in the ecologically investigated localities, see Table 1) ranged from NW to S; inclination from 5° to 55°; the soils (samples taken from the rhizosphere layer) were alkaline: pH (H 20) 7–7,5, their moisture content ranged from 17–40%. [Soil humidity (S_{hm}) is expressed by the following formula: $S_{hm} = \frac{A - B}{A} \cdot 100\%$. – A = weight of (moist) sample after collecting; B = weight of sample after drying in the air at room temperature until constant weight (air-dry soil)]. The altitudes range mainly from 100–400 m, only the Carpathian relevé is from 560 m s. m.

Table 1. The species accompanying *Veronica vindobonensis* in Poland

Number of relevé	I	II	III	IV	V	VI
Locality number (see chapt.2)	6	7	3A	3B	4	1
Exposure	W	S	SW	NW	W	W
Inclination (degree)	30	7	5	40	55	30
Cover of herb layer (%)	95	80	95	80	80	100
Area of relevé (m^2)	10	10	10	10	10	10
pH in H_2O	7.0	7.0	7.0	7.5	7.5	7.0
Veronica vindobonensis	1	2	1	1	+	+
Agrimonia eupatoria	3	1	1	+	1	+
Galium mollugo	3	1	1	1	1	1
Poa angustifolia	1	1	3	1	1	2
Thymus pulegioides	+	+	+	1	1	+
Euphorbia cyparissias	.	2	+	+	+	1
Medicago lupulina	1	1	+	.	+	+
Centaurea scabiosa	.	+	+	1	1	.
Knautia arvensis	.	.	1	1	2	2
Lotus corniculatus	+	2	+	.	.	+
Pimpinella saxifraga	.	.	2	2	2	+
Ranunculus bulbosus	.	2	+	.	1	+
Sanguisorba minor	+	.	+	.	2	1
Achillea pannonica	.	1	1	.	1	.
Brachypodium pinnatum	1	.	3	3	.	.
Campanula rapunculoides	.	.	3	1	2	.
Convolvulus arvensis	1	+	.	.	+	.
Cytisus ruthenicus	.	.	2	3	1	.
Festuca rubra	2	+	.	.	.	1
Fragaria vesca	1	.	.	+	1	.

	I	II	III	IV	V	VI
Galium verum	+	.	+	+	.	.
Hypericum perforatum	.	+	+	.	.	+
Leontodon hispidus	.	.	+	.	1	+
Linum catharticum	.	.	+	.	+	3
Plantago media	.	1	1	.	.	1
Prunus spinosa	.	1	r	.	+	.
Salvia pratensis	.	2	+	2	.	.
Vicia sepium	.	.	1	1	+	.
Anthoxanthum odoratum	.	.	.	.	+	1
Briza media	.	.	1	.	+	.
Carex flacca	.	.	+	1	.	.
Carex pairaei	.	1	+	.	.	.
Centaurea pannonica	.	.	+	.	+	.
Festuca pratensis	1	.	.	.	1	.
Festuca sulcata	.	.	2	1	.	.
Cruciata verna	.	.	1	.	1	.
Helianthemum ovatum	.	.	+	1	.	.
Luzula campestris	.	.	+	.	r	.
Orchis militaris	.	.	+	+	.	.
Pastinaca sativa	1	.	+	.	.	.
Plantago lanceolata	.	1	.	.	.	1
Polygala comosa	.	.	.	.	1	+
Potentilla reptans	.	1	.	.	r	.
Prunella grandiflora	.	.	1	1	.	.
Ranunculus acris	r	.	+	.	.	.
Salvia verticillata	.	.	1	.	.	+
Taraxacum officinale	.	.	.	+	1	.
Trifolium repens	.	1	.	.	.	+
Veronica chamaedrys s.str.	+	1	.	.	.	.

Species occuring in one relevé only (locality numbers): Achillea collina 1, A. millefolium 6:1, Ajuga reptans 4:1, Anthericum ramosum:4, Anthyllis vulneraria 1:3, Arabis hirsuta 4:r, Artemisia campestris 1, Asperula cynanchica 1, Avenochloa pubescens 1, Bromus hordeaceus 7, Calamagrostis epigeios 3A, Campanula glomerata 4:1, C. sibirica 4, Carex caryophyllea 3A, Carlina acaulis 4, C. vulgaris 1, Cerastium arvense 7, C. holosteoides 7, Chaerophyllum aromaticum 6, Cirsium acaule 1:1, Coronilla varia 7, Crepis biennis 7:r, Dactylis glomerata 7, Daucus carota 4, Erysimum odoratum 1, Euphorbia stricta 1, Fragaria viridis 7:2, Genista tinctoria 4:2, Glechoma hederacea 4, Hieracium sylvaticum 3A, Juniperus communis 1, Lavatera thuringiaca 7:r, Leucanthemum vulgare 4, Malus sylvestris 3B:r, Medicago falcata 1:2, Melilotus officinalis 3A:1, Phleum nodosum 1:1, Potentilla erecta 4:r, P. heptaphylla 4:1, Prunella vulgaris 1, Quercus petraea juv. 3B:r, Ranunculus polyanthemos 6:1, Rosa sp. juv. 3B:r, Seseli annuum 1:1, Senecio jacobaea 4, Thalictrum minus 1, Trifolium minus 7, T. pratense 1:3, Verbascum thapsus 7, Viburnum opulus 4:r, Viola collina 4:2, Viola rupestris 1.

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5. Notes on Ecology and Distribution of *V. vindobonensis* in its Whole Distribution Range (see also map Fig. 3)

5.1. Habitats and Distribution in Eastern Austria

Dry and warm oak-forests (often with *Quercus pubescens* or *Qu. cerris*) and forest-clearings and forest and shrub borders, dry meadows and pastures, in sunny and warm regions and exposures; on limestone, loess and also siliceous and serpentinic substrates; rather indifferent to soil acidity. Table 2 shows the ecological position of *V. vindobonensis* in terms of syntaxonomy as compared to that of the closely related species *V. chamaedrys* s. str. These data essentially agree with OBERDORFER's 1983 a ecological characteristic for Germany (which is, however, probably based on the Austrian situation described by FISCHER 1970 and 1974). For a numerical characterization of the ecology, using ELLENBERG's 1974 system[1]), the following values can be attributed to *V. vindobonensis* according to our data and field experience:

L	T	K	F	R	N
6	7	6	3	X	6

In contrast, *V. chamaedrys* s. str. is characterized by:

6	5	3	5	X	7

That means, *V. vindobonensis* inhabits considerably warmer, drier and more continental, and slightly less nutrient-rich habitats. ELLENBERG 1974, 1982, for *V. chamaedrys* s. l., gives:

6	X	3	4	X	X

The many „indifferent" values (X) in this formula express the very large ecological amplitudes of the species aggregate (group).

In NE. Austria, within the Pannonic Province, *V. vindobonensis* is common in the oak-forests and dry meadows and shrub margins characterized by Table 2; here, it ranges from 150–500 (–750) m s. m. (with the comparatively high altitudes on the warm eastern slope of the Alps). – *V. chamaedrys* s. str. in this region is likewise common although clearly confined to its relevant habitats (see Table 2); both species come into close contact only in places where both types of habitat meet. *V. chamaedrys* s. str. occurs up to much higher altitudes (up to the montane and the subalpine belt, where it meets subsp. *micans*, see FISCHER 1973a).

Towards the south, on the south-eastern margin of the Alps – within the Praenoric-Slavonian Subprovince of the Central-European Province

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[1]) L = Light: full shadow (1) to full light (9); T = Temperature: cold (1) to very warm (9); K = Continentality: euoceanic (1) to eucontinental (9); F = Moisture: extremely dry (1) to frequently inundated (10); R = Reaction (pH): very acid (1) to only basic (9); N = Nitrogen (soil nutrients): very poor (1) to very rich (9).

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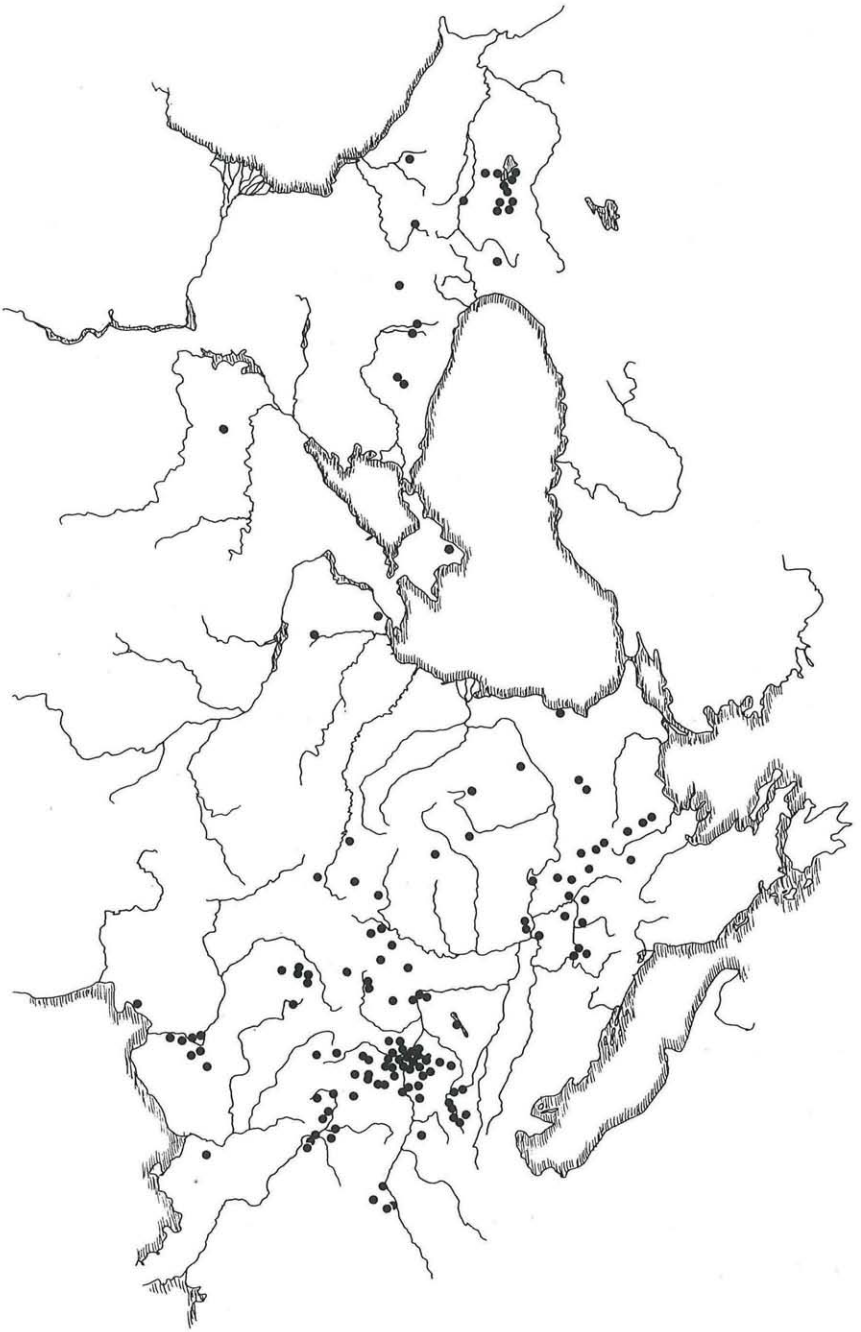

Fig. 3. Dot map of the total range of *Veronica vindobonensis:* From Bavaria to the Caspic Sea.

Table 2

Comparison of the ecological (phytocoenological) behaviour of *V. vindobonensis* and *V. chamaedrys* subsp. *chamaedrys* in eastern Austria. Syntaxonomy follows OBERDORFER 1983 a, 1983 b and ELLENBERG 1982.

	V. vindobonensis		*V. chamaedrys* subsp. *chamaedrys*	
Communities mainly inhabited	of the Quercetalia pubescenti-petraeae order (of Querco-Fagetea);	i. e. thermophile oak-forests;	of the Fagetalia order (of Querco-Facetae): Alno-Ulmion and Tilio-Acerion alliances?	i. e. mesophytic sub-humid eutrophic deciduous forests;
	of the Geranion sanguinei alliance (of Origanetalia of Trifolio-Geranietea);	i. e. xerothermic heliophile herbage borders;	of the Trifolion medii alliance (of Origanetalia of Trifolio-Geranietea);	i. e. mesophytic herbage borders;
	of the Mesobromion erecti alliance (of Brometalia erecti of Festuco-Brometea);	i. e. suboceanic subarid oligotrophic meadows and pastures;	of the Arrhenatheretalia order (of Molinio-Arrhenatheretea);	i. e. eutrophic lowland meadows;
Communities marginally (partly) inhabited	of the Cirsio-Brachypodion alliance (of Festucetalia valesiacae of Festuco-Brometea);	i. e. subcontinental subarid oligotrophic meadows and pastures;	of the Calystegio-Alliarietalia or Glechometalia order (of Artemisietea): mainly of the Aegopodion podagrariae alliance.	i. e. nitrophytic mesophytic to sub-humid herbage borders.
	± xerothermic communities of the Arrhenatherion elatioris alliance (of Arrhenatheretalia of Molinio-Arrhenatheretea).	i. e. dry and warm communities of ± eutrophic lowland meadows.		

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(MEUSEL & al. 1965) – *V. vindobonensis* occurs more scattered in warm and dry places in the central and southern Burgenland (TRAXLER 1974, 1975, 1976) – in c. 200–400 m s. m., on serpentinic soils up to ca. 700 m s. m. – and in xerothermic places (including *Quercus-pubescens*-forest fragments) around Graz (Steiermark/Styria) at altitudes between 400 and 600 m.

Within the Alps (Alpic Subregion), *V. vindobonensis* occurs only in xerothermic grassland at altitudes of 700–800 (–1100) m in the central part of the Mur valley between Unzmarkt and Leoben (with a few more localities scattered down the river forming a connection with the stations near Graz mentioned above) and in a few adjacent places in NE. Kärnten (Carinthia). These subcontinental communities of the central Mur Valley exhibit the easternmost (floristically depauperated) part of the inner-alpic subcontinental xerothermic steppe vegetation (BRAUN-BLANQUET 1961).

5.2. Survey of the Distribution of *V. vindobonensis* in the Rest of its Range

The material of several herbaria (see 9. Acknowledgements) has been revised (by M. A. F.). For Poland see sub 2.

In Germany, *V. vindobonensis* is recorded only from the southern parts of the F. R. G. (BRD) and from only one locality (Prenzlau) in the G.D.R. (DDR). A few specimens from Bavaria (near Regensburg and Eichstätt and in the Fränkischer Jura) have been seen, but it might well be further distributed in the other climatically suitable dry parts of N. Bavaria and Hessen and Rheinland-Pfalz, and likewise in the subcontinentally influenced regions (Hercynian arid districts) of SW. G. D. R. (DDR).

The record from the Wetterau (in Hessen, F. R. G.) given by FISCHER 1974: 288 and probably considered by OBERDORFER 1983a: 845 as „nöRh" is to be cancelled because based on the wrong interpretation of an old herbarium sheet in herb. W with *V. vindobonensis* together with *V. chamaedrys* and two different labels: one for Prague and one for the Wetterau; evidently the "Prague" label referes to the *V. vindobonensis* specimen.

In Hungary the species is probably rather common. We saw specimens from mountainous regions in Western (Bakony Forest) and Northern parts of the country (Budapest and hills NW. of the town, Mátra Mts. and hills N. and NW. of Miskolc), most of them collected by F. KRENDL (herb. W) in oak-forests between c. 250 and 600 m s. m.

In Roumania too, *V. vindobonensis* is probably rather common; so far only specimens from near Cluj, from the pădura Săbăreni near Bucureşti (Bucharest), from Sibiu (= Hermannstadt), and from Braşov have been seen.

In Czechoslovakia, *V. vindobonensis* is distributed in the warm parts of central Bohemia (surroundings of Prague) and in Moravia (in connection with the NE. Austrian area; see also record no 17 sub 2. and on Fig. 1 at c. 200–400 m s. m., and more widely and probably more continuously spread

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in Slovakia at c. 200–750 m s. m. The ecology, judging from herbarium lables, seems to be similar to that in Austria.

In Yugoslavia, the species is known only from several places in Serbia (but from none of the other Yugoslavian republics) where it ranges from c. 100–1400 m s. m. in steppes (puszta of Deliblat = Deliblatska peščara in Vojvodina), oak-forests, mountain-meadows, stony places; on limestone, siliceous and serpentinic substrates. (Those few records already published by FISCHER 1974 are mentioned by DIKLIĆ 1977: 162).

Further southwards, in Bulgaria, *V. vindobonensis* occurs to still higher altitudes, up to 2000 m, and grows in subalpine meadows and pine-forests, e.g. in the Vitoša, Rila, and Pirin mountains.

On the Balkan Peninsula, the polymorphism of the *V. chamaedrys* species group is considerable; including several good taxa, some probably of specific rank, which are still under study (by M. A. F.). – The distribution pattern of *V. vindobonensis* in the Balkans is similar to that of *V. prostrata* and even more closely paralleled by that of *V. dillenii* (see FISCHER & FISCHER 1981: 191–192, figs. 8, 9).

USSR: Our knowledge is rather incomplete so far, a deplorable situation which can also bei attributed to the sceptic attitude of the expert of Soviet *Veronica,* A. G. ELENEVSKIJ. This author (1978 and 1981) does not consider *V. vindobonensis* to be a distinct taxon and, in his opinion, it is even doubtful whether it merits subspecific rank. ELENEVSKIJ 1978, in his argument against specific and subspecific taxonomic rank of *V. vindobonensis,* claims that, in a quantitative analysis, there was insufficient correlation of characters. Evidently, ELENEVSKIJ had not seen adequate material of the species. The author (1981) has become a victim of a misunderstanding: "*V. pilosa* L." is hairy between the two opposite rows of hairs on the stem and, therefore, differs in this character from *V. vindobonensis* and, consequently, is not identical with it. In a special Remark, ELENEVSKIJ 1981: 250 states that "*V. vindobonensis* is doubtlessly occuring" (". . . nesomnenno vstrečaetsja") in the European parts of the USSR, "its taxonomical rank, however, and its distribution in the European parts of the USSR are insufficiently clear" (". . . nedostatočno jasny"). We have studied, however, quite typical specimens from different parts of the southern European parts of the USSR: For Ucrainia there are several herbarium specimens from the Ucrainian Carpathians ("Carpatho-Rossia"): Tyśmienica N of Ivano-Frankovsk (= "Stanislavov"), "Bohorodecka Góra", 21. 5. 1926, T. WILCZYŃSKI (KRAM). – Near Volovec, beech forest [!], 22. 7. 1933, F. HROBARD (PR). – In collibus et silvis prope opp. Berehovo [Beregovo], 5. 1936, I. KLÁŠTERSKÝ (PR). – In monte Černá Hora prope opp. Sevluš, 5. 1936, I. KLÁŠTERSKÝ (PR). – Further specimens seen are from Kirovograd (former "Elisabethgrad", 6. 4. 1870, E. LINDEMANN, WU), from the district of Lugansk (= "Vorošilovgrad"), from L'vov (= Lemberg, herb.

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S. ENDLICHER, W), from Cherson (6. 5. 1864, E. LINDEMANN, W), and from the Crimea Peninsula ("Rikeneis", N. ZELENETZKY; "between Yalta and Nikitsky yaila", *Pinus pallas.* – *Quercus petr.* – forest, 600 m s. m., P. H. DAVIS 33420, E). – RSFSR: One specimen from Mamonovo (= Heiligenbeil) SW. of Kaliningrad (= Königsberg), 1859, SEYDLER, (TRN) (no 18 in Fig. 1); all other specimens seen are from southernmost Russia: Promontories and N. slope of the Great Caucasus, where *V. vindobonensis* occurs on the margins of as well as in open Oriental Beech- and Oriental Spruce *(Picea orientalis)* forests, in dry mountain meadows and pastures, c. 1300–2200 m s. m. – "Kuban region": Majkop and environment (Adygejskaja A. O.); Kabardino-Balkarskaja ASSR (?): "In monte Beschtau prope Pjatigorsk" (leg.?. a. 1843, herb. Horti Petropol. 644); Karačajevo-Čerkesskaja A. O.: Teberda Valley and Zelenčuksk; North-Ossetia (Severo-Osetinskaja ASSR): environment of Ordžonikidze (= former Vladikavkaz = Dsaudschikau); Daghestan (Dagestanskaja ASSR): environment of Gunib. – Transcaucasia (Georgian S. S. R., Armenian S. S. R. and Azerbaydzhanian S. S. R. and adjacent parts of Turkey): Herbarium labels indicate oak-hornbeam-forests, beech-hornbeam-forests, oak-forests, subalpine birch-rhododendron-forests, pine-hazelnut-forests *(Pinus sylvestris, Corylus avellana),* mountain and subalpine meadows and pastures, 1100–2600 m s. m. Specimens seen from central Georgia (environment of Tbilisi), from several districts in Soviet Armenia, none from Azerbaydzhan, but from the district of Posof at the easternmost margin of the Turkish province of Kars (see also FISCHER & SORGER in prep.).

V. vindobonensis does not occur, however, in NW. Turkey. Earlier determinations of some specimens of *V. chamaedrys* from there as *"V. vindobonensis"* (because of their slightly xeromorphic habit and somewhat denser calyx indumentum), in the course of the preparation of the account for "Flora of Turkey" (FISCHER 1978) proved to be erroneous. The distribution area of *"V. chamaedrys* subsp. *vindobonensis"* proposed by FISCHER in 1974 in the map by MEUSEL & al. 1978 is, therefore, to be corrected.

6. Chorology of *Veronica vindobonensis*

6.1. Descriptive Chorology

The amended chorological characterization of *V. vindobonensis* according to the principles by MEUSEL & al. 1965, 1978 (see also JÄGER 1972) should be:

(a) Zonal Distribution Range Diagnosis ("Zonaldiagnose"): sm/(mo) (– temp) · $k_{2(-3)}$ Eur.

(b) Floristic description of the distribution range ("Regionaldiagnose"; i. e. Floristic Units inhabited): (s. centreur – c. noric –)

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pann – transsylv (?) – danub – pont (– ne. illyr –) balcan – w. cauc – transcauc.

That means, (a) the distribution area lies mainly within the submeridional (in Europe: submediterranean) zone – in the N. in the colline, in the S. in the montane altitudinal belt –, and slightly penetrates into the temperate zone; its degree of continentality/oceanity is clearly subcontinental (k_2), with a slight tendency towards suboceanity ($k_3 = oz_2$); most of the range is within Europe. (b) Roughly summarized, the distribution is of pannonic-pontic-caucasic type, with marginal penetrations into Central Europe in the West and into the eastern Balkans in the South. More exactly, the distribution area of *Veronica vindobonensis* covers the western provinces of the Pontic-Southsiberic Region and marginally adjacent parts of the Middle European Region (namely, southern parts of the Middle-European Subregion, eastern parts of the Alpic Subregion, and marginal (?) parts of the Carpathic Subregion), and of the Mediterranean (s. l.) Region (namely, eastern parts of the Submediterranean Subregion and most parts of the Caucasic Subregion).

The main features of the distribution area of *Veronica vindobonensis* are:

(1) Presence in the xerothermic districts of SE. Central Europe (in the planar-colline altitudinal belt): From the Vienna Basin in E. Austria to the Basin of Prague in Bohemia, but not reaching the central G. D. R. (DDR) (environments of Halle/S.), scattered and disjunct in dry regions of Bavaria, disjunct in xerothermic districts of Poland (Cracow/Kraków region and lower Vistula/Wisła valley); northeastern dry margins of the Alps (W. and SW. of Vienna).

(2) Weak tendency to penetrate into the dry, subcontinental valleys of the inner Alps (montane belt): present only in its easternmost parts (Mur valley in Styria).

(3) In the Balkan Peninsula it is present only in its continental NE. parts with a strong tendency to mountain grassland (montane to subalpine belt, up to ca. 2300 m s. m. e. g. in Vitoša and Pirin mts. in SW. Bulgaria), but missing in the mediterranean (Greece) and suboceanic (Illyria) regions.

(4) Presence in the northern slope (foothills) of the Great Caucasus (montane belt?).

(5) Presence in mountain steppes (montane to subalpine belt) in Transcaucasia (Kura valley in Georgia and mountains of central Soviet Armenia), reaching Turkish territory in the Posof district (Kars province, at the Georgian border) which has a vegetation and flora of pronounced Transcaucasian type (thus strikingly differing from East Anatolia).

(6) Complete absence from Anatolia.

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6.2. Comparative Chorology

The distribution area of *V. vindobonensis* is very similar to that of the following five species (a) to (e) to which all the above mentioned six items apply.

(a) *Melica picta* K. KOCH, a grass species of SE. European subcontinental forest-steppes (see MEUSEL & al. 1964 (I): 39 d) which differs mainly in its absence from Poland and from the Eastern Alps. *Melica picta* probably is slightly more strongly confined to woodland (oak forests) in contrast to *V. vindobonensis* which also inhabits heliophile biotopes (open grassland) on a large scale.

The other species showing distribution areas similar to that of *V. vindobonensis* are mainly steppe plants [(b) to (l)]:

(b) *Androsace elongata* L. subsp. *elongata*. This taxon (MEUSEL & al. 1978 (I): 342 c)[1]) extends, in comparison to *V. vindobonensis*, further to the NE. (SE. Sarmatian Subprovince of the Central-European Province) and slightly further to the West. Apart from these differencies there are, however, very strong agreements, even the distribution in Poland seems to be rather similar. (The 'Arealdiagnose' for *A. elongata* subsp. *elongata* var. *elongata* in MEUSEL & al. 1978 (II): 203 conflicts with the map and therefore is to be corrected: it is not "m/(mo)" and not "+ WAm"!)

(c) *Chamaecytisus ratisbonensis* (SCHAEFF.) ROTHM. (= *Cytisus ratisbonensis* SCHAEFF.). Similarily to *Androsace elongata*, it also extends further to the NE., up to N. Poland, but it is almost absent from the Balkan Peninsula, except one dot in the Pirin Mts. in SW. Bulgaria (var. *pirinicus* (STOJ.) KUZM.) (MEUSEL & al. 1964 (I): 228 c, (II): 366; KUZMANOV 1976: 88).

(d) *Oxytropis pilosa* (L.) DC. This species reaches further to the W. (dry inner Alpic valleys, central Apennines) and is spread much further to the E. (almost up to Lake Baikal) and slightly further to the N. (MEUSEL & al. 1964: 245 a).

(e) *Iris pumila* L. extends less further to the N. (absent from Prague, from Poland, and from Germany). According to MATHEWS 1984 this species does not occur in Turkey at all, so the map in MEUSEL & al. 1964(I): 101 d is to be corrected.

Considering that all these species of a chorologically very similar behaviour extend ± further to the NE. one should suspect that *V. vindobonensis* likewise is present in these regions but still not adequately documented from there.

Further representatives of a distribution type similar to that of *V. vindobonensis* include the following species. They all [(a) to (m)] are either completely absent from Turkey or restricted solely to the extreme NW. (in continuation of the Balkan segment of the range) and to the extreme (N)E. (in continuation of the Transcaucasian segment) of this country. Most of them [all except for (f)] are reaching ± further to the NE.

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(f) *Dracocephalum austriacum* L., a very rare and scattered relic species with pronouncedly disjunct range; reaches further to the SW. into the arid (continental) inneralpic valleys and extends (from Caucasia) to the mountain steppes of the Eastern Pontus (NE. Anatolia), and is absent from Poland and from the Balkans (MEUSEL & al. 1978: 380c).

(g) *Lavatera thuringiaca* L. extends further towards the SW. (Apennines Peninsula) and much further to the E. (MEUSEL & al. 1978: 282a).

(h) *Echium russicum* J. F. GMELIN: not so far to the NW. (MEUSEL & al. 1978: 361c).

(i) *Salvia nemorosa* L.: far to Central Asia in the E. and to Hyrcania in the SE. (MEUSEL & al. 1978: 381c).

(j) *Stipa stenophylla* (CZERN. ex LINDEM.) TRAUTV. [= *S. tirsa* STEV. emend. ČELAK.]: also disjunct in the SW. Alps; not in Poland, not in the Balkans (MEUSEL & al. 1964: 56b).

Pontic-Pannonic species not covering Transcaucasia and therefore markedly differing from *V. vindobonensis* include (k)–(m):

(k) *Adonis vernalis* L.: scattered localities further to the W. (MEUSEL & al. 1964: 169b).

(l) *Astragalus asper* JACQ. does not extend so far to the W. and to the NW. (MEUSEL & al. 1964: 243d).

(m) *Omphalodes scorpioides* is a forest species with northern, temperate tendency and which is absent from the Balkans (MEUSEL & al. 1978: 366a).

Several species, although similar in their pontic-pannonic tendency, show, additionally, a stronger southern, meridional behaviour in that they are distributed in Anatolia; examples are the tree (n) *Acer tataricum* L. (MEUSEL & al. 1978: 276c) and the shrub (o) *Euonymus verrucosus* SCOP. (MEUSEL & al. 1978: 275b).

V. vindobonensis together with the species (a) to (j) belong to JÄGER's 1972: 356–357 "*Astragalus asper*-type" which he characterizes by "(east-submediterranean-)pontic-sarmatian-centraleuropean" or, for short, "Pontic-Pannonian". Our examples *Melica picta* (a) and *Iris pumila* (e) are mentioned by JÄGER 1972 as representatives of this distribution type. *Astragalus asper* (l), in contrast to *V. vindobonensis,* is absent from the Balkan Peninsula, from Transcaucasia, and from Anatolia. Several other species of JÄGER's *Astragalus asper*-type, however, differ conspicuously in reaching much further to the SW. and to the S., e. g. *Inula germanica* (JÄGER 1972: 359; GRIERSON 1975; not in Poland; present in N. Greece, widespread in Anatolia and Transcaucasia), *Inula ensifolia* (JÄGER 1965 in WAGENITZ 1966: 177; GRIERSON 1975; in S. Poland; further to the SW., in Illyria; in Anatolia; in Transcaucasia), *Vinca herbacea* (MEUSEL & al. 1978: 358b; not in Poland; much further to the S.: Greece, S. Anatolia, Palaestine: pontic-eastmedit!), and *Linum flavum* (MEUSEL & al. 1978: 264b, DAVIS 1967: 433, 439; in S. Poland; in Illyria, in Anatolia; not in Caucasia). Very similar to

Table 3

Differential characters of *V. vindobonensis* und *V. chamaedrys* subsp. *chamaedrys* (* = important differential character)

	V. vindobonensis	*V. chamaedrys* subsp. *ch.*
* Indumentum of the stem:	Hairs exclusively in two opposite dense rows, no hairs between the rows	Hairs in two opposite rows, additionally often scattered hairs between the rows
Density: number of hairs per 1 mm length of the row:	(15–)20–35	10–15(–20)
* Length of the majority of stem hairs:	0.5–1.0(–1.3) mm	(0.5–)1.0–1.6(–2.0) mm
Number of cells of each hair:	6–8(–11)	7–11(–13)
Leaf (leaves) bearing the lowest raceme(s)	(see also Fig. 4B)	(see also Fig. 4C)
Length of petiole:	0.5–1.0(–1.5) mm	(0.5–)1–2.0(–3.0) mm
Shape of lamina (see Fig. 4):	subtriangular-ovate to ovate-lanceolate, base truncate to subcuneate	broadly ovate, base truncate to subcordate
Colour of lamina:	dull yellowish-green; dry: slightly brownish green	± deep grass-green; dry: darker but hardly brownish
Size of lamina (length × width):	(9–)11–22(–32) × (5–)7–15(–24) mm	(17–)20–35(–45) × (12)–15–25(–30) mm
Number (per side) of the marginal teeth on the leaves bearing the lowest racemes):	(5–)6–8(–11)	(6–)7–10(–13)
on the leaves two internodes below:	5–7(–8)	5–7(–8)
* Shape and length of the marginal teeth:	long, narrow, often almost linear; lower margin often not or only weakly curved, teeth therefore ± patent (Fig. 4B)	short, broad, triangular; lower margin usually distinctly curved upwards, teeth therefore normally curved upwards (Fig. 4C)
* Quotient of width of lamina by average (left and right side) length of the longest teeth (for measurement see Fig. 4A):	(2–)3–7(–10)	(6–)7–12(–20)
* Indumentum of upper side of lamina:	marginal part or almost whole surface ± densely pubescent with short hairs, rarely ciliate and otherwise glabrous	marginal part sparsely pubescent or ciliate and otherwise glabrous
Density: number of hairs per 1 mm^2:	(15–)20–40	5–15(–20)
Length of hairs:	0.1–0.3(–0.5) mm	(0.3–)0.4–0.8(–1.0) mm
Number of cells of these hairs:	3–4(–6)	(3–)4–5(–6)
Density of cilia (marginal hairs), hairs per 1 mm:	(10–)12–25	5–12
Number of racemes per flower shoot:	(1–)2–4(–7)	1–4(–6)
Pedicels (after flowering)		
Length:	3–5(–8) mm	(4–)5–8(–10) mm
Longer than their bract:	(0.5–)0.8–1.5 ×	(0.8–)1.2–1.8(–2.5) ×
Calyx indumentum:	hairs always all glandular	hairs glandular or eglandular
* Number of hairs on each of the larger sepals (calyx segments) :	(120–)150–250(–300)	(30–)40–80(–120)
Length of these hairs:	0.2–0.3(–0.5) mm	glandular h.: 0.3–0.6(–0.8) mm; eglandular h.: (0.6–)0.8–1.2 mm
Number of cells of each hair:	4–7	6–8
Corolla size and colour:	9–12 mm diam.; white or blue with white margins or pale blue or bright blue or pale pink	10–13(–15) mm diam.; bright to dark blue or very rarely deep pink
* Style length (after flowering):	3–4.5(–5.0) mm	4.5–5.0(–5.5) mm
Capsule length × width (data based on little material only):	(2.5–)3.0–3.5 × (3.5–)4.0–4.5 (–5.0) mm	4.0–4.5 × 5.0–5.5 mm
Seeds (data based on little material only):	1.2–1.5 × 0.9–1.2 mm	(1.3–)1.4–1.7 × (1.1–)1.2–1.5 mm
Somatic chromosome number:	16	32

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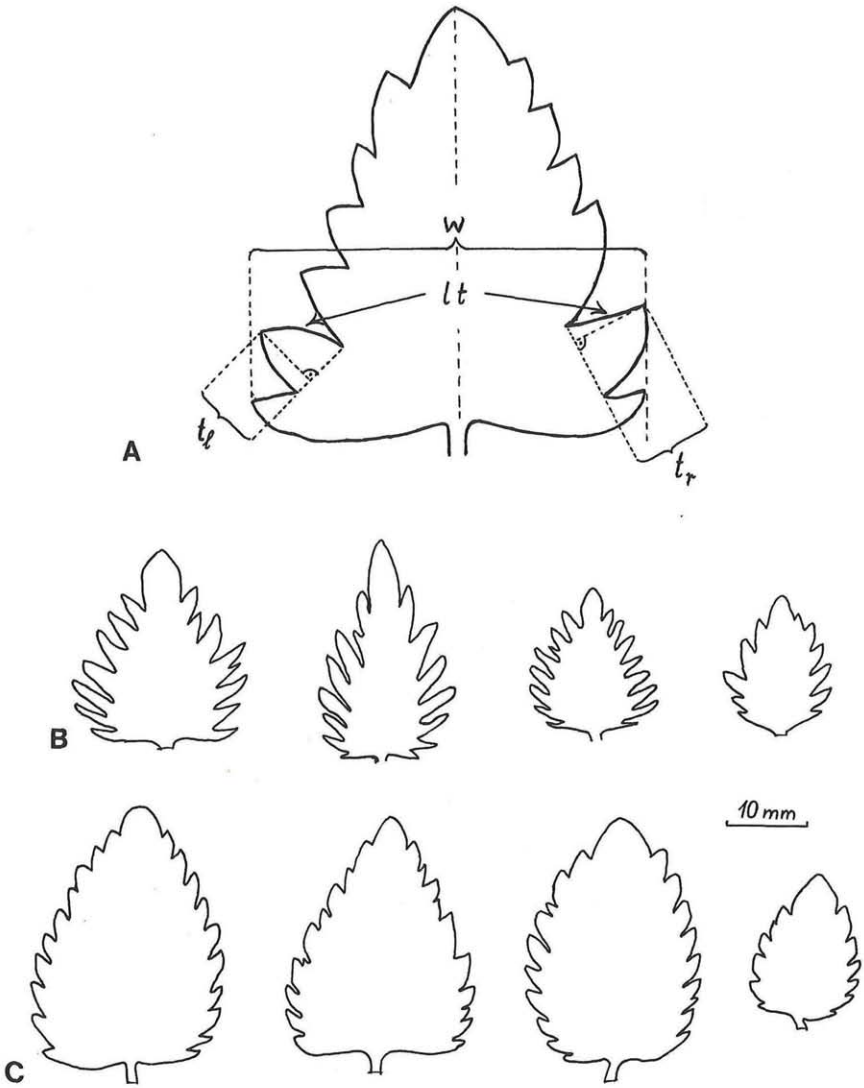

Fig. 4. Leaves of *Veronica chamaedrys* group. – A Measurement and calculation of the quotient (q) of width of lamina by average of the longest teeth (see Table 3); w = width of lamina; t_l, t_r = length of the longest tooth in left and in right side; lt = the two longest teeth of the lamina; $q = \frac{2\,w}{t_l + t_r}$; – B semischematic reference leaves (subtending leaves of the lowest racemes) of *V. vindobonensis;* – C of *V. chamaedrys* subsp. *chamaedrys*. – B, C natural size.

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that of *Linum flavum* are the distribution areas of *Chamaecytisus ratisbonensis* (c) (not in Illyria, present in NW. Caucasus and in Transcaucasia, not in Anatolia) and of *Inula hirta* (JÄGER 1972: 358; in N. Poland, N. Italy, Illyria, NW. Caucasus, not in Transcaucasia and not in Anatolia); both these species, however, by JÄGER 1972 are quoted as examples for his "*Galium triandrum*" [= *Asperula tinctoria*]-type which he characterizes as "sarmatian-centraleuropean". JÄGER 1972: 357 points out that species of his Sarmatian type (*Asperula tinctoria*-type) occur in the lower Wisła (Vistula) valley in N. Poland, whereas the Pontic-Pannonian (of the *Astragalus asper*-type) are lacking there. Eight species of our 15 chorological siblings of *Veronica vindobonensis* occur in these steppe areas in the lower Wisła valley: *Androsace elongata* (b), *Chamaecytisus ratisbonensis* (c) (?), *Oxytropis pilosa* (d), *Lavatera thuringiaca* (g), *Salvia nemorosa* (i) (synanthropic), *Adonis vernalis* (k), *Omphalodes scorpioides* (m), *Euonymus verrucosa* (o), that means, *V. vindobonensis* together with approximately 50% of its chorological siblings show a "Sarmatian" touch in their distribution range and, in JÄGER's terms, might be classified as intermediate between his Sarmatian *Asperula tinctoria*-type and his Pontic-Pannonian *Astragalus asper*-type which, as it seems to us, shows some southern (submeridional, Anatolian) tendency.

7. Taxonomical Note

Table 3 presents all the differential characters between (diploid) *Veronica vindobonensis* and (tetraploid) *V. chamaedrys* subsp. *chamaedrys* known so far. When carefully considering several characters, a determination is possible in most cases. Deviation in one single character is normally compensated by "extremely typical" states of other differential characters. Very few intermediate specimens seem to exist which possibly are hybrids (and need further study). In some regions, particularly in Yugoslavia, Roumania, and Bulgaria, the delimitation of *V. vindobonensis* against further taxa in these countries is also open to study. The diploid *V. chamaedrys* subsp. *orbelica* described by PEEV 1972: 812 from SW. Bulgaria is close to *V. vindobonensis* and differs mainly by its eglandular pubescence of the calyx; its taxonomic status is still not clear to us.

8. Key

This key is given for the species and subspecies within the *V. chamaedrys* group (agg.) so far recognized by us (there are more good taxa to be expected, particularly on the Balkan Peninsula, which are still not adequately studied). – For the leaf characters, the usual reference is that leaf bearing the lowest raceme.

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1 Style 1.6–2.5 mm long; corolla not longer than calyx, corolla diametre 5–7 mm. – Stem strongly hairy between the two rows of hairs; petiole 0–1 mm; lamina c. 20–30 × 12–20 mm, c. 10–16 teeth per side; upper side of lamina densely pubescent with short thin hairs, lower side very densely (up to subtomentose) pubescent, ± greyish; 2–4(–6) racemes per stem; pedicels 1–2 mm; calyx densely eglandular pubescent with 0.1–0.5 mm long thin hairs; corolla whitish to pale pinkish; capsule 3.5–4 × 4–4.5 mm, sparsely pubescent on face. – N. Portugal . . . . . *V. micrantha* HOFFMANNSEGG & LINK

1* Style 3–6 mm long; corolla longer than calyx, corolla diametre 8–13 mm 2

2 Stem and leaves with glandular hairs (c. 0.5–1.5 mm long). – Stem densely glandular-villous usually all around; petiole 0–1 mm; lamina c. 20–30 × 15–25 mm long, 10–14 teeth of ± equal size per side; 1–4 racemes per stem; pedicels 4–7 mm long; corolla bright blue, 12–16 mm diam.; style 4.5–5.5 mm long. Still not adequately studied. – Bulgaria, Serbia. . . . . *V. chamaedrys* L. subsp. *krumovii* D. PEEV

2* Stem and leaves with eglandular hairs only 3

3 Capsule ciliate, otherwise glabrous; stem hairy all around, without two distinct rows of hairs. – Petiole 1–4 mm long; leaves 30–80 × 15–50 mm; teeth 8–20 per side; upper side sparsely pubescent to subglabrous; racemes (5–)8–14(–18) per stem; calyx ciliate and sparsely eglandular-pubescent with 0.3–0.8 mm long hairs; corolla blue, 7–12 (?) mm diam.; capsule 4–5 × 5–6 mm. – N. Anatolia, Caucasia. . *V. magna* M. A. FISCHER

3* Capsule pubescent all over its surface; stem with two distinct rows of hairs, between them glabrous or sparsely hairy 4

4 Calyx hairs glandular 5

4* Calyx hairs eglandular 6

5 Calyx densely glandular-pubescent; stems with no hairs between the two rows; style usually 3–4.5 mm long; leaves ± incised serrate-crenate to subpinnatifid. – Chromosomes: 2n = 16. – (For further characters see Table 3). – C. Europe to Caucasia. . . . . *V. vindobonensis* M. A. FISCHER

5* Calyx sparsely pubescent; stems often with hairs between the rows; style usually at least 4.5 mm long; leaves crenate. – Chromosomes: 2n = 32. – (For further characters see Table 3.) – Europe, NW. Anatolia, parts of Siberia; introduced to E. Asia and N. America (?). . . . . *V. chamaedrys* L. subsp. *chamaedrys* var. *chamaedrys*

6 Most calyx hairs longer than 0.7 mm; hairs of the stem longer than 1.3 mm; uppermost leaves ovate, usually 1–1.5 × longer than wide; raceme bearing leaves with petiole 0.5–1.5 mm long; leaves deep green, not shining in the living state, leaves one internode below the lowest raceme with usually 4–9 teeth per side; teeth of lowest leaves curved, not prominent; hairs on upper side of leaf lamina apex usually 0.2–0.6 mm

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long. – Chromosomes: 2n = 32. – (For further characters see Table 3.) – Widespread in Europe. . . . . .
V. *chamaedrys* subsp. *chamaedrys* var. *eglandulosa* M. A. FISCHER, var. nova.

A typo differt calycis pilis omnibus eglandulosis, 0.8–1.2 mm longis. – Holotypus: Austria, Styria media (Mittel-Steiermark), in pago Kleinstübing dicto prope Peggau (in valle flum. Mur); Q. 8857/2; in graminosis ad viae marginem, 400 m s. m.; chrom. num.: 2n = 4x = ca. 32; leg. M. A. & G. FISCHER, 12. 5. 1972 (WU). – See also FISCHER 1973b: 383.

6* Most calyx hairs 0.4–0.7 mm long; hairs of the stem usually 0.6–1.3 mm long; uppermost leaves lanceolate, usually 1.8–2.5 × longer than wide; raceme bearing leaves with distinct petiole usually 2–4 mm long; leaves bright green, thin, upper surface shining (in the living state); leaves one internode below the lowest raceme with usually 9–14 teeth per side; teeth of lowest leaves long, prominent, patent; hairs on upper side of leaf lamina apex usually 0.1–0.2 mm long. – Chromosomes: 2n = 16. – Stem usually with scattered hairs between the rows; corolla bright blue, 9–12 mm diam.; style c. 4 mm; capsule c. 2.5–3.5 × 3.5–4.5 mm; seeds 1.2–1.5 × 1.0–1.2 mm. – E. Alps, above 1000 m s. m. . . . . *V. chamaedrys* L. subsp. *micans* M. A. FISCHER

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Recensiones

BRANDENBURGER Wolfgang 1985. Parasitische Pilze an Gefäßpflanzen in Europa. – Gr. 8°, 22 + 1248 Seiten, 403 Abbildungen auf 150 Bildtafeln; Kunststoffband. – Gustav Fischer Verlag Stuttgart, New York. – DM 320,–; ISBN 3-437-30433-X.

Nun liegt BRANDENBURGERS schon lange erwartetes Werk, das eine neue Grundlage zum Bestimmen der parasitischen Pilze einheimischer, eingebürgerter und kultivierter Gefäßpflanzen Europas sein soll, vor. In diesem Werk sind diejenigen Pilze berücksichtigt, „die an lebenden Pflanzen oder Pflanzenteilen Krankheitssymptome hervorrufen und/oder an diesen zur Ausbildung von Fruchtkörpern bzw. Sporen gelangen. Die epiphytischen, nichtparasitischen Vertreter der Rußtaupilze *(Meliolales)*, die phytopathogenen Großpilze (vorwiegend *Hymenomycetes)* ... sowie die besonders an eingelagerten Pflanzenteilen (Früchten, Knollen etc.) auftretenden Pilze fanden keine Berücksichtigung."

Im Hauptteil (p. 2–887) wird zunächst nach Familien der Wirtspflanzen entsprechend dem System in ENGLERS Syllabus geordnet, innerhalb der Familien (z. T. auch Unterfamilien und Tribus) sind die Gattungsnamen der Wirte nach dem ABC gereiht. Innerhalb einer Wirtsgattung werden die Pilze zunächst nach den Organen, die sie befallen, gruppiert (Wurzel, Stengel, Blätter etc.) und schließlich innerhalb dieser Gruppen nach der systematischen Zugehörigkeit der Pilze geordnet. Zu den Pilznamen wird jeweils eine knappe Beschreibung geboten. In diesem Teil wird keine Literatur zitiert. Im folgenden Teil (p. 892–1204) sind die Pilzgattungen nach ihrer systematischen Zugehörigkeit geordnet und beschrieben (Diagnosen). Hier wird zu den einzelnen Gattungen auch weiterführende Literatur zitiert und meist ist ein Vertreter abgebildet. Am Schluß folgen ein Glossar, ein Verzeichnis der Autorennamen, das Literaturverzeichnis sowie ein Verzeichnis der Gefäßpflanzen- bzw. Pilznamen.

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