

Variability in the hairiness of lemma and palea in European populations of *Poa alpina* subsp. *alpina*

Variabilita v odění pluchy a plušky u evropských populací lipnice alpské (*Poa alpina* subsp. *alpina*)

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A description is given of the morphology of lemma and palea of non-viviparous plants of *Poa alpina* L. subsp. *alpina*. The majority of the plants investigated were collected by the author in the Carpathian Mts.; additional herbarium material came from Scandinavia, the Alps and the Jeseníky Mts.

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INTRODUCTION

Poa alpina L. shows considerable variability in almost all of its diagnostic characters. In Central and Northern European populations belonging to subsp. *alpina* (FIŠEROVÁ 1974b), much variation is seen in the hairiness of lemma and particularly in that of palea. Differences were found mainly in the length of hairs and in the general pattern of hairiness; no differences were recorded for the teeth.

Studies on populations from the Carpathian Mts. and on herbarium materials from the Jeseníky Mts. (the latter were studied for comparison) revealed that differences in the hairiness do not occur incidentally, but mainly in populations occupying certain geographical areas. In view of the fact that they are not correlated with other variable morphological characters, no attempt at the taxonomic treatment is made here. Nine types are recognized, defined mainly geographically. They cannot be distinguished easily in the field. A more extensive material is required, to identify the type concerned.

The hairiness of lemma and palea has been the object of numerous studies. Many years ago KRAUSE (1909) drew attention to the variability of this character. PILGER (1949) was the first to study in detail the morphology of palea which was often neglected by botanists.

In several instances, differences in the hairiness have been used in taxonomy. OETTINGEN (1925) classified species of *Poa* sect. *Pachyneuræ* ASCH. on the basis of hairiness of the lemmatal keels; PAWLOWSKI (1937) used this character to identify species of the section *Hemalopoa* (DUMORT.) JIRÁSEK. BUSCHMANN (1942) identified several species of the genus *Poa* L. on the basis of their hairiness; HOLUB (1958) used the hairiness of the keels and the structure of the central area of palea as diagnostic characters in the genus *Helictotrichon* BESS.

The hairiness of the keels of the palea was also used to separate intraspecific taxa of *Poa pratensis* L. (JIRÁSEK 1963) and the Bulgarian plants of *Poa alpina* L. (FIŠEROVÁ 1974b).

A range of variation comparable with that found in *Poa alpina* subsp. *alpina*, has not been recorded in any other related species.

MATERIALS AND METHODS

The hairiness of lemma and palea was studied mainly on the author's own material collected in the Carpathian Mts. in 1971—1973. Representative collections, showing the range of variation in each locality, were made. These materials were completed by herbarium material (PRC, PR) from the Carpathian and Jeseníky Mts., Scandinavia and the Alps. Only variation in non-viviparous plants of *P. alpina* L. subsp. *alpina* was considered.

Lemmas and paleae were taken from the lowermost part of the inflorescence and, whenever possible, from the posterior flower of the spikelet. Under microscope, measurements were made of the posterior (longest) hairs on the keels, and the general character of hairiness was recorded. Increased attention was given to the palea because the differences in hairiness showed certain correlation with the geographical distribution.

Plants with the same character of hairiness were arranged in groups called types from which subtypes were separated in several instances. The names of the types and subtypes were derived from their distribution areas.

The morphological terminology used follows DOMIN (1925) and DOSTÁL et FUTÁK (1966). A list of localities of all specimens examined is given in a previous paper (see FIŠEROVÁ 1974a, 1974b).

SURVEY OF THE TYPES STUDIED

Carpathian populations

In the Carpathian Mts., where *P. alpina* is rather variable, two groups of populations were examined differing in the hairiness of lemma and palea. These are referred to two basic types, one confined to the Choč Mts., one distributed throughout the Carpathians, except the Choč Mts. Both contain several closely related subtypes. The Choč type with short hairs on the keels of the palea appears to be more similar to plants from the Jeseníky Mts. in which this character is even more conspicuous. It is different from the other Carpathian populations with longer hairs which are referred to the Carpathian type.

Choč type

Hair on keel and marginal nerves of lemma very short (0.38—0.40 mm). Hairs on keels of palea short (0.24—0.26 mm).

Choč subtype *sensu stricto* (Fig. 1)

Lemma hairless between nerves, hairs on keel and marginal nerves of lemma very short (0.38—0.40 mm), sparsely distributed between keel and central nerves. Hairs on paleal keels short (0.24—0.26 mm), present in posterior third of keels only, mid-paleal area hairless.

Geographical distribution: Choč Mts., SW. part of the Západné Tatry Mts. (Mt. Babky) and northern part of the Polish Tatry Zachodnie; occasionally in the Belianske Tatry Mts., Nízke Tatry Mts. and Veľká Fatra Mts. The populations are very homogeneous.

Osobitá subtype (Fig. 2)

Lemma hairy between nerves, hairs on keel and marginal nerves very short (0.38—0.40 mm) and dense. Hairs on paleal keels short (0.24—0.26 mm), present on posterior third of keels only, seldom above it; mid-paleal area always more hairy.

Geographical distribution: Western part of the Vysoké Tatry Mts. (from Mt. Osobitá to Mt. Sivý vrch and Ostré). Plants transitional to the Choč subtype were found between Ostré and Babky.

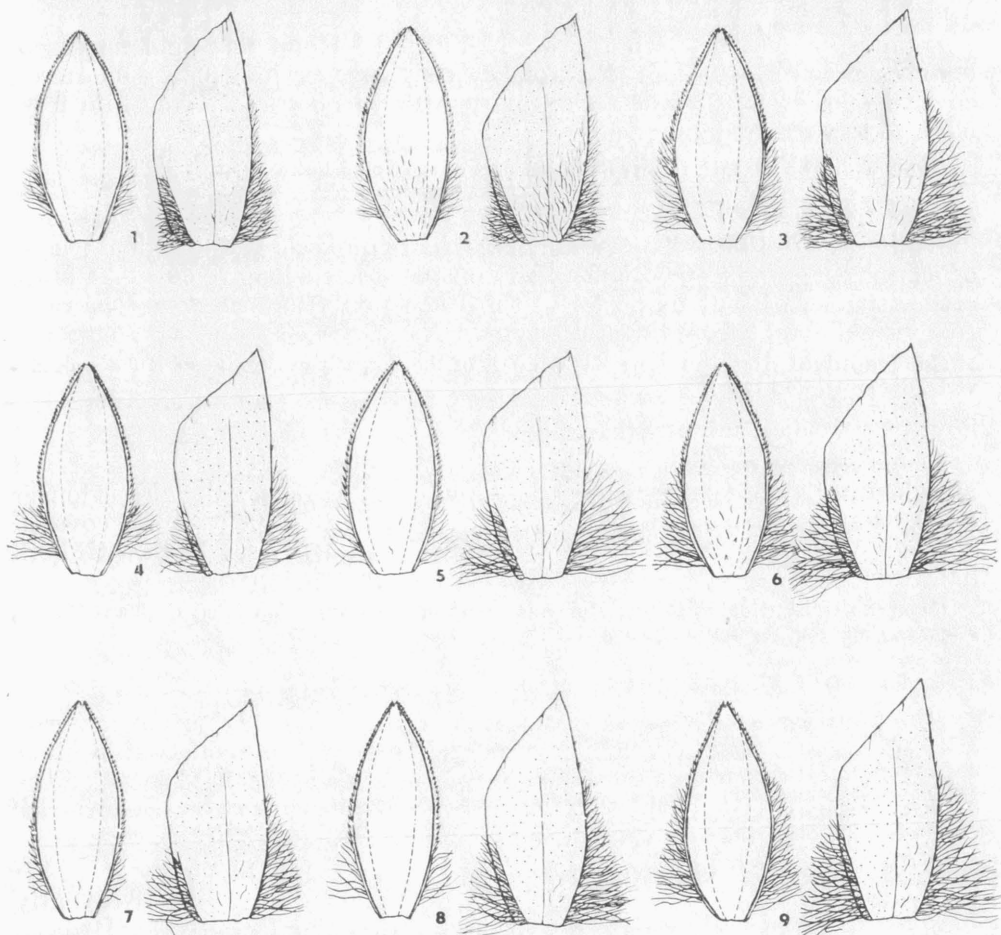


Fig. 1—9. — Paleae and lemmas of *Poa alpina* L. subsp. *alpina*. 1 — Choč subtype s. str.; 2 — Oso-bitá subtype; 3 — Malá Fatra subtype; 4 — Velká Fatra subtype; 5 — East-Carpathian subtype; 6 — South-Carpathian subtype; 7 — Sudeten type; 8 — Arctic type; 9 — Alpine type.

Carpathian type

Hairs on paleal keels longer (0.30 mm).

Malá Fatra subtype (Fig. 3)

Lemma sparsely hairy between nerves, hairs on keel and marginal nerves of lemma longer (0.46—0.50 mm), hairs on paleal keels longer (0.26 to 0.30 mm), covering posterior half of keels; mid-paleal area $\pm$ hairless.

Geographical distribution: The Kriváň part of the Malá Fatra Mts., extending to the Belianske Tatry and Nízke Tatry Mts.

Populations of this subtype are rather homogeneous in the Kriváň part of the Malá Fatra Mts., less homogeneous elsewhere.

Velká Fatra subtype (Fig. 4)

Lemma hairless between nerves, hairs on keel and marginal nerves of lemma short (0.38—0.4 mm); hairs on keels of palea very long (0.30—0.36 mm), covering posterior third of keels; mid-paleal area hairless. Transition from hairs to teeth very distinct.

Geographical distribution: Southern part of the Velká Fatra Mts.

East Carpathian subtype (Fig. 5)

Lemma sparsely hairy between nerves, hairs on keels and marginal nerves of lemma long (0.58—0.60 mm); hairs on palea keels long (0.30—0.34 mm), rather sparse, present on posterior third keels only; internerves $\pm$ hairless. Not very different from the arctic type.

Geographical distribution: Eastern part of the Carpathian Mts. (near Mukačevo, Hosverla, Svidovec, Pop Ivan).

South Carpathian subtype (Fig. 6)

Lemma hairy or sometimes hairless between nerves, hairs on keel and marginal nerves of lemma long (0.58—0.60 mm), hairs on paleal keels longer ($\pm$ 0.30 mm), present on posterior half of keels, mid-paleal area covered sparsely or $\pm$ densely with hairs, sometimes even hairless, seldom with both hairs and teeth.

Geographical distribution: Romanian part of the Carpathian Mts.; Ceahlau, Bucegi, Făgăraș, Cibinului, Retezat and Banat Mts.

Plants from the Jeseníky Mts.

P. alpina from the Jeseníky Mts. was studied from herbarium material only. Because these plants differ considerably from those collected in other parts of the distribution area, they are referred to a separate type called the Sudeten type. It is defined by its very short and sparse hairs on the posterior parts of the paleal keels; some of the plants were almost hairless.

By the character of hairiness of the palea these plants closely resemble those from Kotouč hill near Štramberk, N. Moravia. They have frequently been regarded as intermediate between *P. alpina* and *P. badensis* (JIRÁSEK 1950) and treated as *P. badensis* var. *gogelana* PODP. (PODPĚRA 1925, JIRÁSEK 1934). In view of their doubtful taxonomic position and heterogeneity in the pattern of hairiness, they cannot be included in the Sudeten type.

Sudeten type (Fig. 7)

Hairs on keel and marginal nerves of lemma shorter (0.46 mm), internerves sparsely covered with hairs. Hairs on paleal keels very short (0.20 to 0.24 mm) and present in the lowermost parts of the keels only (up to 1/4), mid-paleal area hairless or sometimes sparsely hairy.

Geographical distribution: Hrubý Jeseník Mts.: several localities on rocks.

Plants from Northern Europe and the Alps

These plants have also been studied from herbarium materials only. In view of the wide distribution and scarcity of samples collected, no attempt at a taxonomic re-arrangement is made here. Two types, viz. the Arctic and the Alpine, can be distinguished. They appear to be closely related to each other.

Herbarium material from the Šumava Mts. (Mt. Plechý) was also studied. The pattern of hairiness of the lemma and palea was similar to that in plants of the Alpine type.

Arctic type (Fig. 8)

Lemma $\pm$ hairless between nerves, hairs on keel and marginal nerves of lemma longer (0.50–0.52 mm), hairs on keels of palea sparse, long (0.30 to 0.33 mm) covering posterior third of keels only: mid-paleal area $\pm$ hairless.

Geographical distribution: Northern Europe, Scandinavia, Kola.

Alpine type (Fig. 9)

Lemma sparsely hairy to $\pm$ hairless between nerves, hairs on keel and marginal nerves of lemma long (0.50–0.60 mm), hairs on keels of palea longer (0.30–0.34 mm), present on posterior half, sometimes above it, mid-paleal area $\pm$ hairless.

Geographical distribution: The Alps.

SUMMARY

A study of the variation in the hairiness of lemma and palea of *Poa alpina* L. was undertaken. With regard to the length of the hairs and the character of hairiness, nine types can be distinguished, differing also in their geographical distribution. They are not given any taxonomic rank but they are classified as types and subtypes and named according to their distribution areas: Choč type (including Choč subtype sensu stricto and Osobitá subtype), Carpathian type (including Malá Fatra subtype, Velká Fatra subtype, East-Carpathian subtype and South-Carpathian subtype), Sudeten type, Arctic type and Alpine type.

SOUHRN

U evropských populací *Poa alpina* L. subsp. *alpina* byla zjištěna velká variabilita v odění pluchy a zvláště plušky. Na základě délky a charakteru odění bylo rozlišeno 9 skupin rozšířených v určitých geografických oblastech. Taxonomicky hodnoceny nejsou, jsou označeny pouze jako typy, v některých případech dále členěny na podtypy. Jména typů jsou volena podle místa výskytu. Jsou to: typ chočský zahrnující podtyp vlastní chočský a podtyp „Osobitá“, typ karpatský zahrnující podtyp malofatranský, velkofatranský, východokarpatský a jihokarpatský, typ sudetský, typ arktický a typ alpský.

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Profesor fyziologie rostlin a kryptogamologie na universitě v Praze. Posledních 14 let života strávil ve Vídni. Svou vědeckou činnost věnoval především algologii. V období 1880—1905 sbíral a studoval řasy nejen v Čechách, ale i v Korutanech, Štýrsku, Tyrolích, Kraňsku, Bosně a Dalmácii, dokonce i v Řecku, Egyptě a na Jávě. V letech 1886—1892 vydal v Archivu pro přírodovědné prozkoumání Čech německy a česky základní dílo „Prodromus českých řas sladkovodních“. Výsledky zkoumání, např. termálních, halofilních, horských i termofilních řas v Čechách, jakož i výsledky studia polymorfismu řas aj. publikoval ve „Physiologische und algologische Studien“ (1887) a v řadě dalších prací. Revize typů taxonů popsanych Hansgirkem, provedená např. F. Drouetem z Chicaga, však ukázala, že se v mnoha případech jednalo jen o extrémní růstové formy již známých druhů. Hansgirk věnoval mnoho pozornosti i floristice vyšších rostlin. Kromě drobnějších pojednání vyšla v r. 1881 jeho „Květena okolí Hradce Králové“, kde do té doby působil jako středoškolský profesor. Poměrně méně publikoval z fyziologie a z morfologie. Vědecko-popularizační literaturu obohatil o dílko „Z říše rostlin“ (1885).