Genus	Supplement 14: 35-39	Wrocław, 15 XII 2007

Morphological analysis of carpel styles of polish members of the *Potentilla collina* group (Rosaceae)*

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Abstract. Carpel style morphology in taxa from *P. collina* group, i.e. *P. collina* Wibel s.str., *P. thyrsiflora* Hülsen ex Zimmeter., *P. silesiaca* Uechtr., *P. leucopolitana* P.J. Müller, *P. wimanniana* Günther & Schummel and *P. argentea* L. x *P. leucopolitana* P.J. Müller is presented. The examination of these taxa has been performed by SEM for the first time. Morphological analysis of carpel style confirmed that the carpel style in taxa from the *P. collina* group has a conical (*coniformis*) shape. However, plants of this type plants show divergence of style shape details into two forms. Looking from the base upwards, i.e. towards the broad carpel stigma, the style may be: suddenly conically narrowing (typically conical) – *P. collina* and *P. argentea* x *P. leucopolitana* or longitudinally filiform-elongated, i.e. equally thick from the middle up to the stigma (atypically conical) – *P. leucopolitana*, *P. thyrsiflora*, *P. silesiaca* and *P. wimanniana.* All of the 6 studied taxa have a carpel style which is always thicker (swollen) at the base, but in *P. leucopolitana* and *P. argentea* x *P. leucopolitana* the broader base is very conspicuous, while in *P. silesiaca* and *P. collina* it is less visible. The author's research has also shown that the carpel style base in all studied taxa is provided with a few papillae, which in *P. collina* and *P. thyrsiflora* are large and conspicuous, while in *P. silesiaca*, *P. thyrsiflora* and *P. wimanniana* – small and insignificant. The investigated morphological features type of the carpel styles of the *P. collina* group proved significant in taxonomic terms and may be useful in the systematic diagnosis of the *Potentilla* genus.

Key words: Rosaceae, *Potentilla collina* group, carpel style, SEM.

INTRODUCTION

Within the genus *Potentilla*, the form of carpel style is a very important taxonomic character. With regard to its shape, Wolf (1908) has divided the genus *Potentilla* into 6 subsections:

*Proceedings of the 8th Conference of the Polish Taxonomical Society, Wiechlice 18-20 V 2007

1) *Rhopalostylae* – with clavate style (*clavaeformis*).
2) *Closterostylae* – with fusiform style (*fusiformis*).
3) *Conostylae* – with conical style (*coniformis*).
4) *Gomphostylae* – with nail-shaped style (*claviculiformis*).
5) *Nematostylae* – with filiform style (*filiformis*).
6) *Leptostylae* – with rod-shaped style (*virguliformis*).

Based on their carpel style shape, Wolf (1908) included taxa from the *P. collina* group in the *Conostylae* subsection.

Identification of most of the taxa from *Potentilla collina* group is based on the calyx to petals length ratio, the shape of carpel style, the number of leaflets on basal leaves, the pattern of pubescence of upper and lower surfaces of leaf blades (Wolf 1901, 1903, 1908; Ascherson & Graebner 1904-1905; Juzepczuk 1941; Ball et al.1968; Borhidi & Isépy 1965; Soják 1995; Gerstberger 2002). Moreover, in recent, years the morphology of achenes (Kołodziejek & Gabara 2007), in addition to anatomy of leaves (Kołodziejek & Gabara 2003), has been a useful tool in their identification.

However, apart from descriptions of anatomy of achenes and leaves, no morphological studies of *Potentilla* group have been carried out in Poland. Therefore, the aim of the present paper is to analyse in detail the morphological analysis of carpel style of *P. collina* group to distinguish and characterise individual taxa.

MATERIAL AND METHODS

The present study describes the carpel styles of 6 taxa: *P. collina* Wibel s.str., *P. thyrsiflora* Hülsen ex Zimmeter, *P. silesiaca* Uechtr., *P. leucopolitana* P. J. Müller, *P. wimanniana* Günther & Schummel and *P. argentea* L. x *P. leucopolitana* P. J. Müller. Nomenclature of taxa was used according to Wolf (1908) and Kurtto et al. (2004).

Plants of *Potentilla collina* group originated from the Czech Republic (PR, PRC), Hungary (BP) and Russia, (LE – for abbreviations see Holmgren et al. 1990) except for *P. argentea* x *P. leucopolitana*, which came from their natural habitat in Poland. Carpel styles from herbarium material were rehydrated by boiling in water and detergent, then mounted and coated with gold, examined and photographed using a Tesla BS 340 scanning electron microscope. The carpel styles were analyzed on 3 photographs for each taxon.

RESULTS AND DISCUSSION

Morphological analysis of carpel style, performed by the author using a scanning electron microscope, confirmed that the carpel style in taxa from the *P. collina* group has a conical (*coniformis*) shape. However, plants within this type (*coniformis*) show divergence of style shape details into two forms – see Tab. 1 and Plate 1. Looking from the base upwards, i.e. towards the broad carpel stigma, the style may be: suddenly conically narrowing (typically conical) - *P. collina* and *P. argentea* x *P. leucopolitana* or longitudinally filiform-elongated, i.e. equally thick from the middle up to the stigma (atypically conical) - *P. leucopolitana*, *P. thyrsiflora*, *P. silesiaca* and *P. wimanniana.*

All of the 6 studied taxa have a carpel style which is always thicker (swollen) at the base, but in *P. leucopolitana* and *P. argentea* x *P. leucopolitana* the broader base is very conspicuous, while in *P. silesiaca* and *P. collina* it is less visible. The author's research has also shown that the carpel style base in all studied taxa is provided with a few papillae, which in *P. collina* and *P. thyrsiflora* are large and conspicuous, while in *P. silesiaca*, *P. thyrsiflora* and *P. wimanniana* – small and insignificant.

Tab. 1 Shape of the carpel style in 6 taxa of *P. collina* group

Taxa	narrowing towards the stigma	not narrowing towards the stigma	thicker at base	papillae at base
P. collina	present	absent	distinctly	large
P. thyrsiflora	absent	present	weekly	slightly
P. silesiaca	absent	present	weekly	slightly
P. leucopolitana	absent	present	weekly	large
P. wimanniana	absent	present	weekly	slightly
P. argentea x *P. leucopolitana*	absent	present	weekly	large

However, if we intend to determine the shape of carpel style in a specific taxon, it is important to investigate a significant number of carpels within the receptacle and determine the prevalent shape type, since the two forms of the conical (*coniformis*) style shape type frequently co-exist within a single flower. The often-seen biformity of carpel style shape within one flower does not preclude the usefulness (diagnostic value) of carpel style shape as a distinguishing characteristic for discrimination of taxa within the *P. collina* group, since its shape is constant, and, within the *Conostylae* subsection, can serve as a very good distinguishing characteristic between the morphologically similar taxa of *P. collina* s.l. and *P. argentea* s.l. The shape of carpel style in *P. collina* s.str. is very similar to the style of taxa from the *P. argentea* s.l. group, which also show a typically conical style with conspicuous papillae at the strongly thickened base - see Plate 1: F. This is an additional proof that the *P. collina* group formed as a result of hybridisation and taxa from the *P. argentea* s.l. (among others) participated in its emergence.

Acknowledgements

I would like to thank the Curators of herbaria for providing access to the material of *Potentilla*, and, most of all, Dr. Alexander Sennikov (V.L. Komarov Botanical Institute, Saint-Petersburg), Dr. Lajos Somlyay (Hungarian Natural History Museum in Budapest) and Dr. J. Soják (National Museum in Prague, Czech Republic) for lending the *Potentilla collina*, *P. thyrsiflora*, *P. leucopolitana*, *P. wimanniana* and *P. silesiaca*. Finally, I would like to thank Dr. Krzysztof Polański (Institute of Physics, University of Lodz) for taking the photographs.

Part of this work was supported by grant No. 2 P04F 040 26 from the Ministry of Education and Science (KBN).

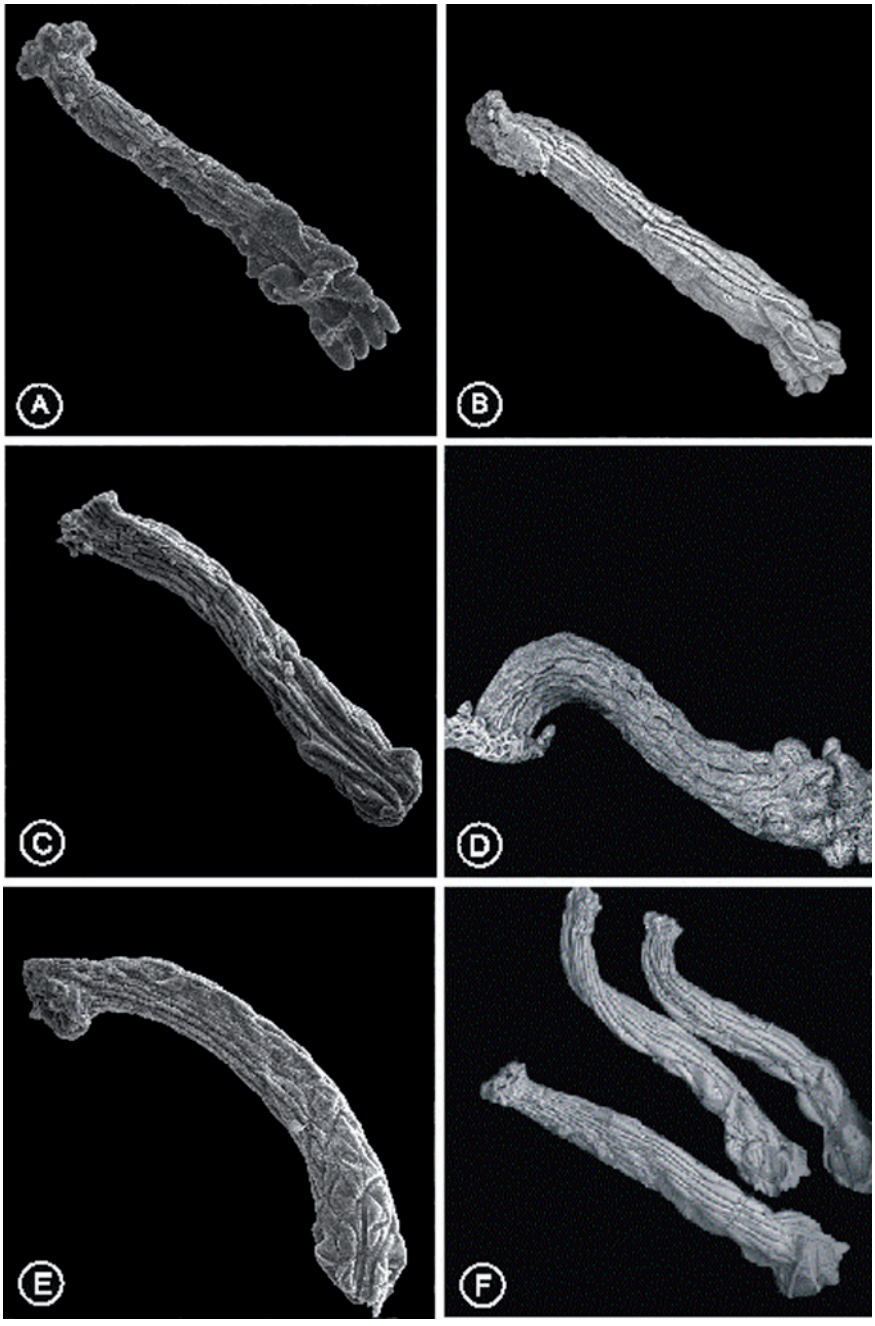

Plate 1. Carpel styles (SEM x 250): A - *P. collina*, B - *P. thyrsiflora*, C - *P. silesiaca*, D - *P. leucopolitana*, E - *P. wimanniana*, F - *P. argentea x P. leucopolitana*

Provenance of analysed samples of *Potentilla collina* group:

P. collina Wibel – syntype, A. Wibel, 1801 (LE 2174); *P. thyrsiflora* – Fl. Silesiaca Exs. no 1042, Leszno (Lissa), forest near road, 20.7.1894, A. Callier (BP 167321); *P. silesiaca* – syntype, Wrocław (Breslau: Spitzberg zwischen Nimkau und Nippern), 28.6.1863, R. Uechtritz (PR); *P. leucopolitana* - F. Schultz herbarium normale Cent. 3 no. 256, Wissenbourg (Bas-Rhin, France), 27.5.1857, F. Schultz; (BP 165401); *P. wimanniana* – isotype, Günther et Schummel 1813?, Schedae Cent. Plant. Sil. Exsicc. 5 Wratislaviae, (LE); *P. argentea* x *P. leucopolitana* - Jaroszów near Żarki 50°39‘21“N/19°21‘32“E, 333 m a.s.l., 21.6.2003, J. Kołodziejek (LOD).

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