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THE WESTERNMOST LOCALITY OF *MACROSCIADIUM ALATUM* (APIACEAE) IN EUROPE AND A NEW DIAGNOSTIC FEATURE OF THE SPECIES

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Abstract - A new locality of *Macrosciadium alatum* in the Western Bieszczady Mts. (Duszatyn, Komańcza district, Sanok county) is described in this paper. The locality is currently the westernmost point of distribution of the species. As *Macrosciadium alatum* is an invasive species, it is advisable to monitor it cyclically in this area. A newly discovered diagnostic feature of this species, not included in descriptions of this plant so far, is conically elongated cells, i.e. papillae on the upper side of the petals. It is suggested that this feature be used in the identification of representatives of the Apiaceae family in Poland and Europe. The distribution map of the species has been updated in this work.

Key words: Macrosciadium alatum; Apiaceae; invasive species; distribution; kenophyte; Poland; diagnostic feature

INTRODUCTION

Macrosciadium alatum belongs to the Apiaceae family. The species was described in 1808 by M. Bieberstein from the Caucasus area as *Athamanta alata* Bieb. Later, different authors added it to different genera: *Ligusticum* L., *Selinum* L., *Silaus* Bernh., and *Meum* L. (Nobis et al.,, 2009). Finally, taxonomic examinations conducted by Tichomirov and Lavrova (1988) introduced a new genus – *Macrosciadium* V. Tichomirov & Lavrova, to which the species was assigned.

Macrosciadium alatum (Bieb.) V. Tichomirov & Lavrova is a species native to the flora of the Caucasus Mountains, which are its center of distribution. It generally occupies most of the area between the Black and Caspian Seas – it occurs in SE Russia, NE and E Turkey, Georgia, Armenia, Azerbaijan and NW Iran (Nobis et al.,, 2009; Fig. 1).

It is a foreign species (kenophyte) to Polish and European flora, yet it has been found so far in the following localities: Strzebowiska, Krzywe and Przysłup in Poland (ca. 4 km from the border with Slovakia), and the Western Bieszczady Mts. (N Carpathians), where the first specimens were collected in 2007 (Nobis et al., 2009). It is not clear yet whether its spread will continue towards native natural, semi-natural communities or ruderal habitats (in this case the species should be classified as a holoagriophyte, hemiagriophyte or epecophyte, respectively). Its currently

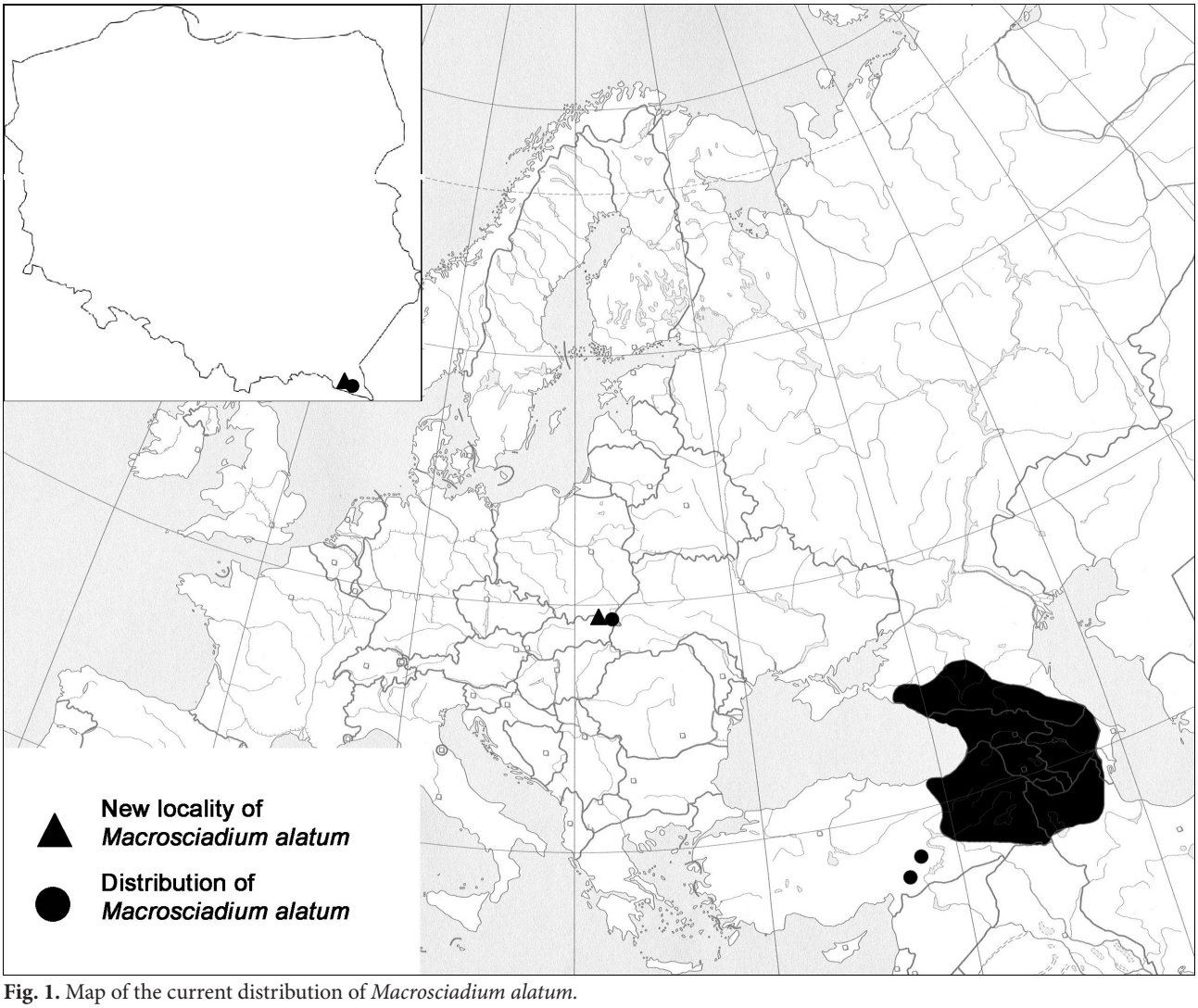

Fig. 1. Map of the current distribution of *Macrosciadium alatum.*

occupied habitats are characterized by diverse water conditions. They are covered by ruderal communities of the *Artemisietea vulgaris* class, fresh meadows of the *Arrhenatheretalia* order, and the *Molinietalia* order, as well as scrubland edges and stream banks, always near to settlements, roads and railway tracks. The population consisted of 100 to 500 individuals (Nobis et al., 2009).

The aim of this study was to extend the body of knowledge of: (i) the current distribution of *Macrosciadium alatum,* and (ii) the use of the new diagnostic feature in identification of the species.

MATERIALS AND METHODS

Field studies were carried out in Western Bieszczady in 2013. The collected and evaluated herbarium material comes from a new, previously unpublished locality: Duszatyn (Komańcza district, Sanok county), on the side of a tarmac road – the Kazimierz Sosnowski Trail (the main public hiking trail in the Bieszczady Mountains), 49°18'41.0"N, 22°7'7.5"E, alt. 486 masl, 11.07.2013, leg. J. Proćków, det. Z. Dajdok, E. Szczęśniak & J. Proćków. One ripe specimen (formed by several shoots) grew there and was not wholly collected. Another specimen of this species (also made

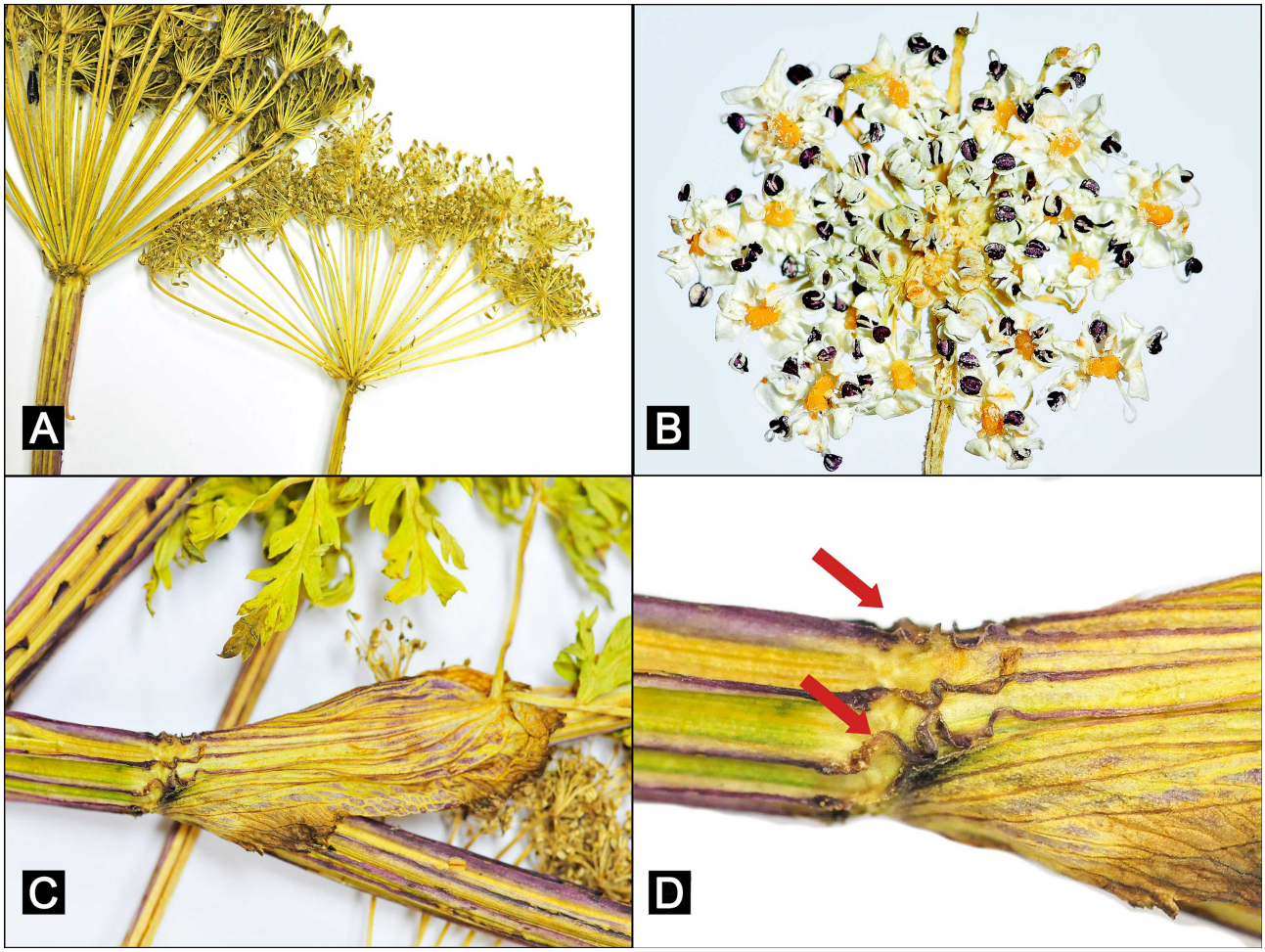

Fig. 2. A-B – General view of *Macrosciadium alatum* inflorescences, C-D – stem fragment with a characteristic purple wings.

up of several shoots) grew ca. 100 m east of that locality, also on the roadside of the same trail. A detailed description together with photography presented in Nobis et al., (2009) were used in order to identify the taxon. The collected material was analyzed for feature compatibility with the currently available data in order to possibly state new, previously unpublished characters. The material (herbarium specimens) was analyzed under a light microscopy (LM) with the use of a Nikon Eclipse 600 optical stereo-microscope (Nikon Instruments, Europe B.V.), an Olympus BX-50 microscope and a DP71 camera system supported by Cell^B software (Olympus, Olympus Optical Co.), and a Scanning Electron Microscopy (SEM) on a TESLA-BS-300 instrument in the Laboratory of Microscopic Techniques of the Faculty of Biological Sciences, University of Wrocław, Poland. Plant material used in the LM and SEM photography (Figs. 2-4) was collected from the natural population in Duszatyn, SE Poland.

RESULTS AND DISCUSSION

The new locality of *Macrosciadium alatum* (Fig. 1) is situated ca. 22 km NW of the locality in Krzywe (Nobis et al., 2009), which had previously been the westernmost locality of this species so far. The new locality in Duszatyn may indicate that the species will occupy successive localities in western direction, particularly in that it is rather sparse (only 2

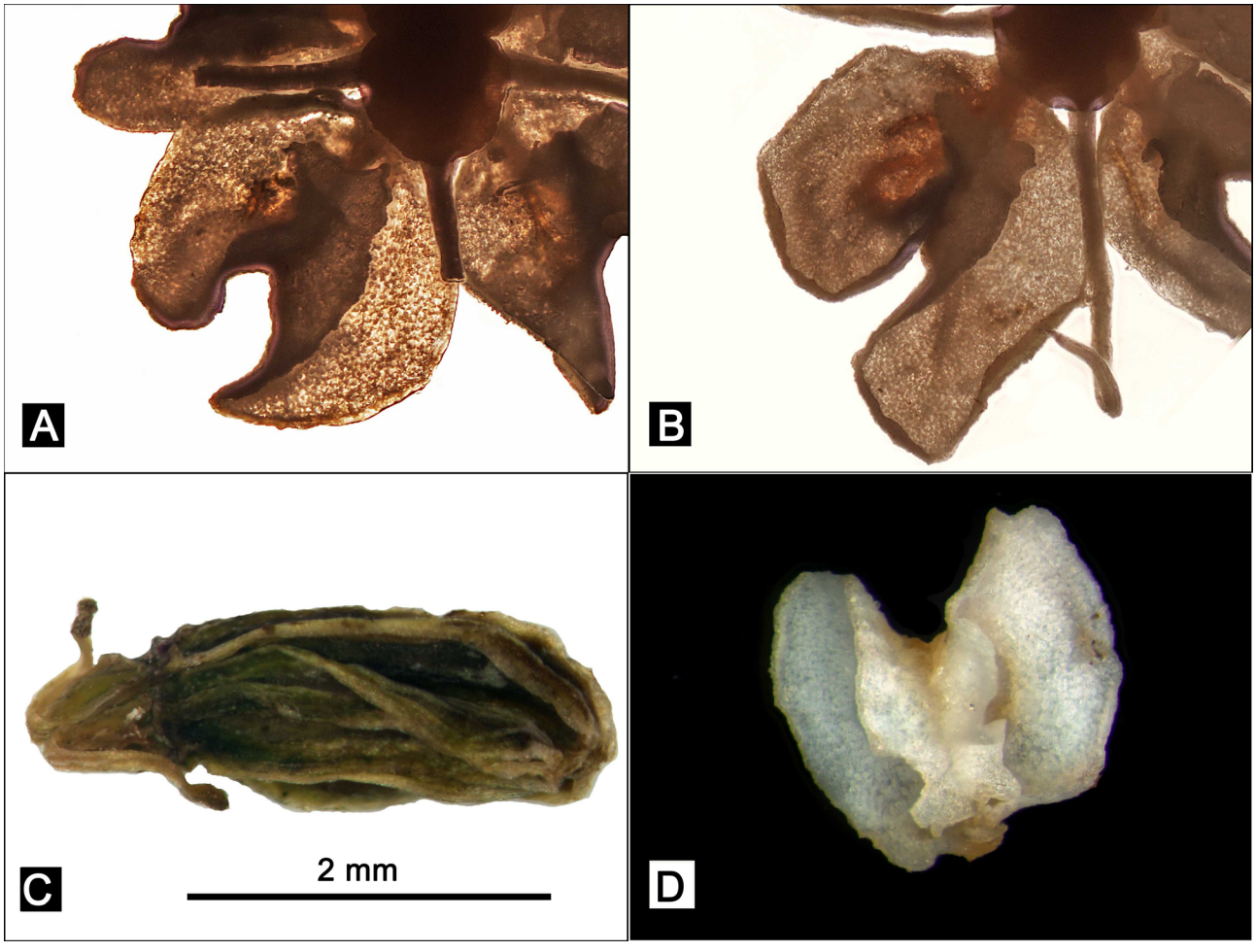

Fig. 3. View of top side (A-B, D) of *Macrosciadium alatum* petals; C – immature fruit.

clumps) in its new locality for the time being when compared to populations found in 2007 in Strzebowiska, Krzywe and Przysłup (100-500 specimens) by Nobis et al., (2009). The habitat was suitable in terms of moisture, i.e. fresh, similar to that mentioned by Nobis et al., (2009), who additionally described an even broader ecological amplitude of the habitat (*Molinietalia* meadows, as well as scrub edges and stream banks).

Nobis et al., (2009) emphasized the possibility of further migration of this species towards Cisna and Komańcza settlements, although in 2007 they did not recognize such localities (Duszatyn lies ca. 4.5 km NE from Komańcza). It is possible that after the first publications on *Macrosciadium alatum* (Nobis et al., 2009 and this paper), the species will attract more attention, especially because they contain detailed descriptions with photographs.

However, the question of how *Macrosciadium alatum* reached as far as Poland remains unanswered. The distribution map in Nobis et al., (2009) shows that the nearest localities in the area of NE coast of the Black Sea are ca. 1 370 km in a straight line from the locality described in 2007. Nobis et al., (2009) do not exclude the hypothesis of the inadvertent bringing of the plant to Poland by German troops during

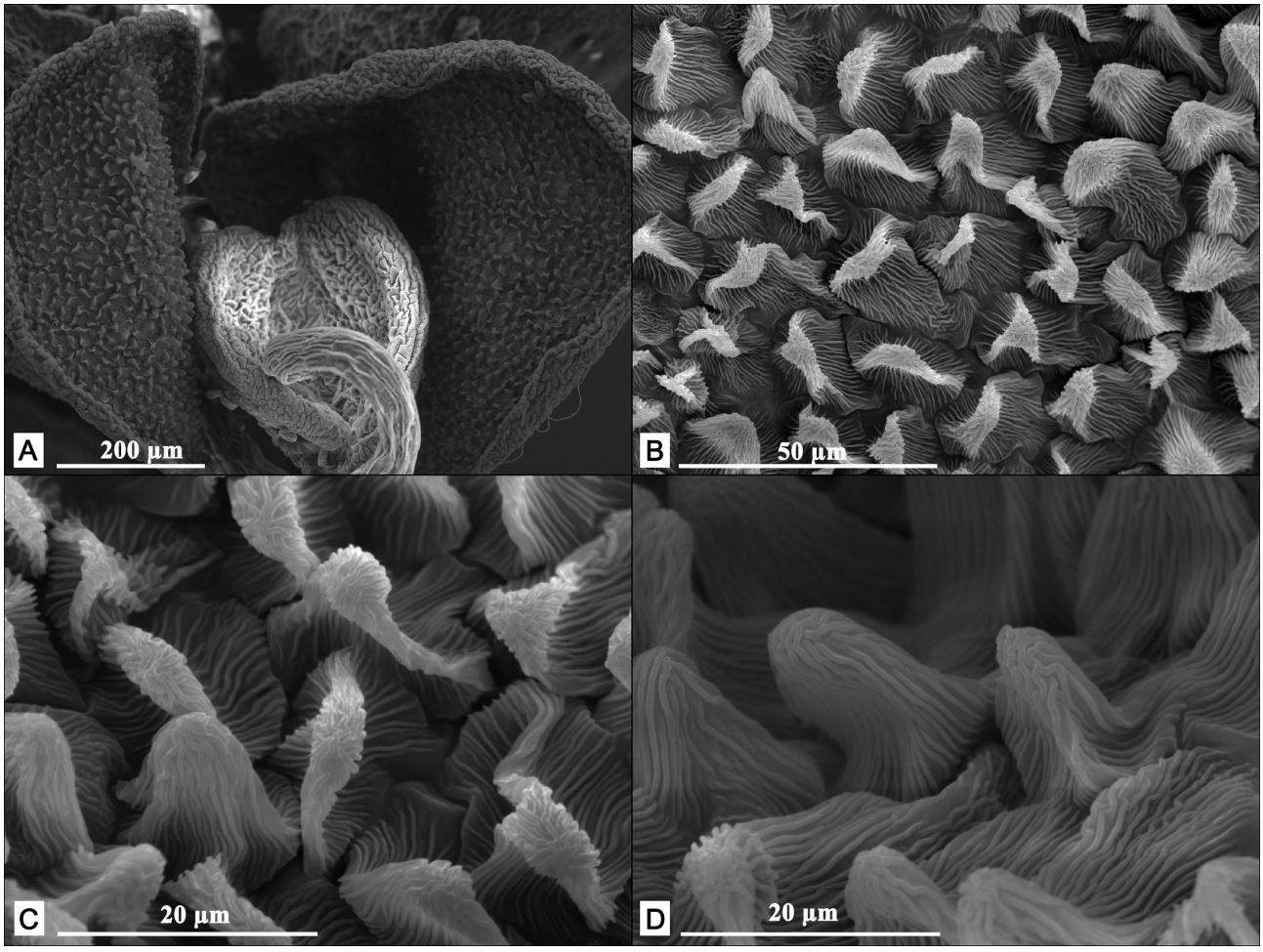

Fig. 4. The petal surface in the taxa examined viewed under the SEM; A – SEM image of *Macrosciadium alatum* petal; B-D – details of upper surface of *M. alatum* petals with high magnification of papillae.

WWII (withdrawal of the German army from the Caucasus in 1943), or by the Soviet army at the same time, or later, when they were quartered for a long time in the Bieszczady Mts.

One can wonder why no localities of this species have been found "along the way", as for example in Ukraine, when we take into account the relatively high rate of spread and expansion potential of species from the Apiaceae family, and especially of *Macrosciadium alatum,* whose seeds are dispersed by wind and a single umbel that can produce even 1 500 seeds in a given season. In addition, this plant reproduces asexually (vegetatively) (Nobis et al., 2009).

To learn more about the adaptation possibilities of the taxon to a new environment, an experiment could be conducted, e.g. one could establish an experimental plot and try to estimate the survival rate of the seedlings found in the vicinity of the parent plant.

In view of the large number of individuals in the populations that have been examined so far and in view of the newly discovered locality, which moves the range border of *Macrosciadium alatum* ca. 22 km NW (in ca. 6 years), we should accept that the spreading rate of this species will continue to grow. We can already see that the species has become a

permanent component of the local flora (Nobis et al., 2009). However, taking into account that *Macrosciadium alatum* is a foreign species in the flora of Poland, its chorological studies should be continued, even on a European scale.

Interestingly, closely related species of the *Ligusticum* genus are used in folk medicine, particularly Chinese. They are used to treat the following disorders: eruptive fevers, virus infection, bronchial and digestive complaints, coughs, toothache, painful menstruation, externally for minor injuries and skin infections. Dried leaves and seeds have a flavor reminiscent of celery and parsley (Brown 2002). They contain phenylpropanoids, tetramethylpyrazine, perlolyrine and others (Wyk and Wink, 2008). These data show that *Macrosciadium alatum* could also be used in herbal medicine for its volatile terpene compounds present in the seeds, or in ritual ceremonies related to funeral (Nobis et al., 2009).

Remarks on Macrosciadium alatum petals

As a result of conducted studies, we discovered a new diagnostics feature previously not included in descriptions of this plant. While determining the species, we noticed very small conically elongated cells, i.e. papillae, on the upper surface of the petals. However, they were minuscule and thus impossible to recognize clearly under stereomicroscope. When using SEM it appeared they are small irregularly-shaped papillae (Fig. 4). Their tops are usually oblong and narrow or less often trigonous; very rarely they can be either oval, T- or Y-shaped. The papillae surface is densely covered by strips whose appearance mostly resembles 'spaghetti'. All the papillae are arranged rather regularly on the entire upper petal surface. It seems to be obvious that the feature may be used in the determination key to recognize representatives of Polish and European Apiaceae.

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