https://doi.org/10.15407/ukrbotj82.05.460
RESEARCH ARTICLE

Morphological features of flowers and fruits of *Valeriana stolonifera* (*Caprifoliaceae*) and their taxonomic significance

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Abstract. Results of macro- and micromorphological studies of flowers and fruits of two subspecies of *Valeriana stolonifera*, subsp. *stolonifera* and subsp. *angustifolia*, are presented. Samples from Ukraine and Poland were studied. The structure of flowers and fruits is described, and their detailed characteristics are identified. Morphological structures were examined using scanning electron microscopy (SEM). New micromorphological features of the fruit surface of the studied taxa have been revealed, including the characters of outer periclinal and anticlinal walls of exocarp cells, trichomes, and stomata. In flowers of both subspecies of *V. stolonifera*, an ovoid protrusion of the connective over the anthers of stamens is present. No significant differences between the studied taxa in their macro- and micromorphological features of fruits and flowers have been found. The obtained results, combined with the known characters of vegetative organs, can be used for more accurate identification of the subspecies of *V. stolonifera* and for resolving taxonomic issues within the group of *V. officinalis* aggr.

Keywords: exocarp, flower, fruit, micromorphology, microstructure, SEM microscope, taxonomy

ARTICLE HISTORY. Submitted 20 January 2025. Revised 16 July 2025. Published 30 October 2025

CITATION. Tsarenko O.M., Bulakh O.V., Shykhaleyeva G.M., Szczepaniak M., Felbaba-Klushyna L.M., Kucher O.O., Kaczmarek K., Rewicz A. 2025. Morphological features of flowers and fruits of *Valeriana stolonifera* (*Caprifoliaceae*) and their taxonomic significance. *Ukrainian Botanical Journal*, 82(5): 460–472. https://doi.org/10.15407/ukrbotj82.05.460

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Introduction

The genus *Valeriana* L., according to molecular phylogenetic studies and the APG IV system (2016), is placed within the family *Caprifoliaceae* Juss. *sensu lato*, including *Dipsacaceae* Juss., *Morinaceae* Raf., and *Diervillaceae* (Raf.) N. Pyck (Bell et al., 2001; Bell, 2004; Hidalgo et al., 2004; Bell, Donoghue, 2005). According to various authors, the genus includes from 150 to 350 species in the world flora (Dweck, 1997; Takhtajan, 1997, 2009; Bell, Donoghue, 2005) and occurs mainly in Europe, central and northern Asia, North and South America, and North Africa (Grubov, 1958; Katina, 1961; Weberling, 1970; Voroshilov, 1978; Katina, 1987; Gorbunov, 2002; Takhtajan, 2009).

The distribution of *V. stolonifera* covers Western and Central Europe, including many European countries (e.g., Albania, Austria, Baltic countries, Belgium, Bulgaria, Czech Republic, Slovakia, Denmark, France, Germany, Great Britain, Greece, Hungary, Iceland, Ireland, Italy, Norway, Poland, and Ukraine) (Kirschner, Raab-Straube, 2017; POWO, 2025–onward).

The taxonomic status of *V. stolonifera* as a separate species within the genus *Valeriana* remains problematic and is debated among researchers. It is listed as an accepted species in the databases *World Flora Online* (WFO, 2025–onward), *Plants of the World Online* (POWO, 2025–onward), *Catalogue of Life Checklist* (2024), and in a number of floristic publications from the territory of Ukraine and other regions of Europe (Katina, 1961; Mosyakin, Fedoronchuk, 1999; Kirschner, Raab-Straube, 2017, etc.). In the *Flora of the USSR* (Grubov, 1958) most species readily recognized in Ukraine (Katina, 1961), in particular, *V. angustifolia* Tausch ex Host, *V. nitida* Kreyer, *V. rossica* P.A. Smirn., *V. sambucifolia* J.C. Mikan ex Pohl, *V. stolonifera* Czern., *V. wallrothii* Kreyer, and *V. wolgensis* Kazak., have been listed only as synonyms of the species *V. officinalis* L. *sensu latissimo*. Recently, *V. stolonifera* has also been classified within the *V. officinalis* complex (Kirschner, Zeisek, 2017).

To date, the taxonomy of entities within the *V. officinalis* complex has not been definitively clarified (Buttler et al., 2008; Kirschner, Zeisek, 2017). Due to differences in taxonomic treatments, some taxa are recognized as species, subspecies, or varieties, depending on views and species concepts applied by the authors (Bressler et al., 2017; Kirschner, Raab-Straube, 2017), therefore, clarifying the much confusing and complicated nomenclature in the group remains relevant (Kirschner, Zeisek, 2017). The reasons for this taxonomic situation is the fact the *V. officinalis* complex includes many morphologically variable "narrow" species or, alternatively, infraspecific entities, which are variable in many of their characters throughout the vast territory range of the group, covering almost the entire temperate zone of Eurasia. This complex is represented by a polyploid series, ranging from diploids to octoploids, but each karyotype was considered morphologically indistinct (Grubov, 1958). According to a recent taxonomic summary, the *V. officinalis* complex in Central Europe includes *V. officinalis* (2n = 14, diploid), *V. stolonifera* (2n = 28, tetraploid), *V. pratensis* Dierb. (2n = 28, tetraploid), and *V. excelsa* Poir. (2n = 56, octoploid) (Kirschner, Zeisek, 2017; Kirschner, Raab-Straube, 2017).

On the basis of detailed taxonomic and nomenclatural studies of the *V. officinalis* complex, it has been found that the correct and accepted name for tetraploids is *V. stolonifera*, with two currently recognized subspecies, subsp. *stolonifera* and subsp. *angustifolia* Soó (Kirschner, Zeisek, 2017; Kirschner, Raab-Straube, 2017; IPNI, 2025–onward; POWO, 2025–onward). *Valeriana stolonifera* subsp. *stolonifera* has a limited range and is found only in Ukraine, whereas the native range of *V. stolonifera* subsp. *angustifolia* is both in Ukraine and in the rest of Europe where the species occurs.

In Poland *V. stolonifera* subsp. *angustifolia* [reported as *V. angustifolia* Tausch subsp. *angustifolia* in Rostański (1967, 1970), and as *V. angustifolia* Tausch in Mirek et al. (2020)] occurs mainly in the southeastern part of the country. It is predominantly a steppe plant and it belongs to the Pontic elements of the Polish flora (Rostański, 1970). The isolated relict sites are located in Central Poland, Silesia, and Pomerania; in the latter areas, it should be considered within the group of steppe relics (Rostański, 1970).

Previously, based on the comprehensive analysis of herbarium specimens of *Valeriana*, it has been found that species occurring in Poland belong to the section *Valeriana*, and three subsections: *Pinnatisectae*, *Heterophyllae*, and *Officinales* (Janchen, 1958; Rostański, 1970). Within the subsection *Officinales*, *V. officinalis* s. str., *V. sambucifolia* J.C. Mikan ex Pohl, and *V. angustifolia* were placed. The species earlier accepted as *V. angustifolia* has been distinguished on the basis of its morphological and cytological features (2n = 28; Skalińska, 1950). The

recent, detailed taxonomic studies of complicated and inconsistent nomenclature within the group of taxa related to *V. officinalis* s. l. in Central Europe demonstrated that the name *V. angustifolia* Tausch ex Host 1827 is illegitimate, being a later homonym of *V. angustifolia* Mill. 1768, the name which properly applies to the species earlier known as *Centranthus angustifolius* (Mill.) DC. (Kirschner, Zeisek, 2017; Kirschner, Raab-Straube, 2017). Hence, the correct name of the steppe *Valeriana* species occurring in Poland is:

***Valeriana stolonifera* Czern. subsp. *angustifolia* Soó**, Feddes Repert. 83: 208. 1972 ≡ *Valeriana pratensis* Dierb. subsp. *angustifolia* (Soó) Kirschner, Buttler & Hand, Kochia 3: 83. 2008 ≡ *Valeriana angustifolia* Tausch ex Host, Fl. Austriac. 1: 36. 1827, nom. illeg. [non *Valeriana angustifolia* Mill. 1768].

= *Valeriana collina* var. *stolonifera* Wallr., Linnaea 14: 537. 1841.

= *Valeriana wallrothii* Kreyer, Trudy Prikl. Bot. 23: 185. 1930.

Valeriana stolonifera subsp. *stolonifera* is a perennial, widespread subxerophilous species that lives in rather arid conditions in the ground cover of forests, on forest edges, and in meadows. In Ukraine, the subspecies is distributed almost throughout the territory of the country, but it is considered regionally rare in the Dnipropetrovsk, Zaporizhzhia, Mykolaiv, Odesa, and Kharkiv administrative regions (*oblasts*) (Andrienko, Peregrym, 2012). Populations of this species are usually small, and plants are weakly competitive, as compared to other species. They are used as valuable medicinal raw materials (Minarchenko, 2005; Kolomiychuk, 2011; Andrienko, Peregrym, 2012).

Although the species is not currently considered endangered or vulnerable at the national level and is not listed in the *Red Data Book of Ukraine* (2009), it is actually endangered in many regions of Ukraine. *Valeriana stolonifera* subsp. *angustifolia* is rare in the Transcarpathian (Zakarpattia) and Ivano-Frankivsk regions of Ukraine. In Poland, *V. stolonifera* subsp. *angustifolia* (reported as *V. angustifolia*) is listed in the *Polish Red List of Pteridophytes and Flowering Plants* with the status of DD (Data Deficient) (Kaźmierczakowa et al., 2016).

In classifying the patterns of infraspecific variability of *V. stolonifera*, considerable attention is paid to morphological features of vegetative organs, in particular the life form, the rhizome shape (short, cylindrical) and stems (ribbed or not) and their size, details of basal, lower, and stem leaves. *Valeriana stolonifera* subsp. *stolonifera* is characterized by well-developed runners, and leaflets often pointed, whereas subsp. *angustifolia* has no underground runners, or sometimes has short (up to 2 cm maximum) runners, which are easily damaged or overlooked (Katina, 1961; Rostański, 1967).

Considering that the generative organs of *V. stolonifera* (both subspecies) from the territory of Ukraine and *V. stolonifera* subsp. *angustifolia* from Poland are not sufficiently studied morphologically, the detailed study of their flowers and fruits was carried out, and their morphological features were compared. An important addition to previous our research on *V. stolonifera* (Tsarenko et al., 2021) is the inclusion of samples collected from the territory of Poland in order to identify the variability of characters and to reveal differences between both subspecies, which are analyzed in the present study.

The aims of the present study were (1) to analyze and present the macro- and micromorphological characters of fruits and flowers of both subspecies of *V. stolonifera* using SEM microscopy; (2) to identify and assess the taxonomically significant characters of generative organs used for distinguishing *V. stolonifera* subsp. *stolonifera* and subsp. *angustifolia*. The presented results may be useful for further comparative and morphological studies within the *V. officinalis* complex in Europe and, hopefully, will bring researchers closer to solving its taxonomy.

Materials and Methods

We analyzed the characters of flowers and fruits of two subspecies of *V. stolonifera*. The studied samples have been obtained from Ukraine [*V. stolonifera* subsp. *stolonifera* and subsp. *angustifolia* from the National Herbarium of the M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine (KW)] and from Poland [specimens of *V. stolonifera* subsp. *angustifolia* collected in Central Poland (Nizina Południowowielkopolska lowland)].

Examined specimens of flowers

***Valeriana stolonifera* subsp. *stolonifera*: 1.** Khmelnytsky Region, Kamenets-Podilskyi District, near Humentsy village, Mt. Karmalyuka, clearing in an

oak-hornbeam forest, 24.05.1974, leg. [B.V.] Zaveruha, No. 001250 (KW); **2.** Khmelnytsky Region, Vinkovetsky District, Kalyusik village, Kalyusetska Gora, steppe slope, 07.06.2008, leg. [Y.P.] Didukh, [T.V.] Fitsaylo, [I.A.] Korotchenko, [Y.] Vashenyak, No. 085520 (KW); **3.** Kyiv Region, Myronivskyi District, between V. [Velykyi] and M. [Malyi] Bukrin, in a ditch, pasture, 17.06.2000, Nsh [N.M. Shiyan]: 000353, leg., det. N. Drapailo [N.M. Shiyan], I. Timchenko (KW s.n.); **4.** Kyiv Region, Pereyaslav-Khmelnitsky District, Studenikivsky forest, 30.05.2001, O. Pryadko, № 009929 (KW); **5.** Ternopil Region, Husyatinsky District, near Vykno village, Mt. Ostra, northwestern slopes of mountains, bushes, 18.06.1974, B. Zaverukha, № 001239 (KW); **6.** Ternopil Region, Kremenets District, near Zholoba village, Mt. Maslyatin, meadow-steppe marginal-grassy glades on boulders, 25.06.1974, leg. [B.V.] Zaverukha, № 001251 (KW). ***Valeriana stolonifera* subsp. *angustifolia*: 7.** Ivano-Frankivsk Region, Tlumachsky District, Oleshiv-Baratyshev, meadow-steppe slopes of the gypsum mountain, 06.1974, leg. [B.V.] Zaverukha, № 001438 (KW); **8.** Transcarpathian Region, Uzhhorod District, Antonivka village, the glade Antonivska Polyana, 09.06.1948, leg. [G.I.] Bilyk, № 007634 (KW); **9.** [*Valeriana officinalis* L. s. l.] Transcarpathian Region, Perechyn District, Vorochevo village, Mt. Sinatoriya, meadow, 03.07.1956, leg. V.I. Chopyk, Notae criticae: *V. angustifolia* Tausch, 14.05.1971, M. Kotov, № 007632 (KW).

Examined specimens of fruits

***Valeriana stolonifera* subsp. *stolonifera*: 1.** Lviv Region, Zolochiv District, Bila Gora, 12.07.1980, M. Fedoronchuk (KW s.n.); **2.** Mykolaiv Region, Domanivskyi District, near Bogdanivka village, floodplain forest, 20.06.2005, O.F. Shcherbakova, L.I. Krytska, V.V. Novosad, S.M. Voronova, № 081710 (KW); **3.** Odesa Region, Rozdilnyanskyi District, near Kuchurhan, in the floodplains of the Dniester, 08.2006, O.Yu. Bondarenko, No. 119251 (KW); **4.** Ternopil Region, Kremenets District, Kremenets, Bozhy Gora, oak-hornbeam forest, 21.06.1986, leg. [A.V.] Shumilova, № 096740–096747 (KW); **5.** Ternopil Region, Kremenets District, Novoselky village, ravine, grassy-shrubby slope, 29.07.1958, M. Klokov, B. Zaverukha (KW s.n.); **6.** Vinnytsia Region, Yampil District, near Mykhailivka village, southern steppe slope, 12.06.2009, leg. [Y.] Vashenyak, № 00102996 (KW). ***Valeriana stolonifera* subsp. *angustifolia*: 7.** Poland, Łódź Voivodeship, Sieradz District, Woźniki forest District, subarea 266h, Dębowiec Forestry, subcontinental thermophilous oak forest *Potentillo albae-Quercetum petraeae*, 19.08.2021, leg., det. K. Kaczmarek; **8.** [*V. angustifolia* Tausch] Odesa Region, Izmail District, near Vylkovo, on the road to Primorske, 01.06.1966, M. Klokov, № 007639 (KW).

Micromorphological features of flowers and fruits were studied using MBS-9 binoculars and examined under a scanning electron microscope (SEM, JSM-6060 LA) at the Centre of Electron Microscopy of the M.G. Kholodny Institute of Botany and under SEM (Phenom Pro X) at the Department of Invertebrate Zoology and Hydrobiology, University of Lodz, Poland. The material was fixed on brass tables and was sputter-coated with a 4 nm layer of gold.

Micromorphological descriptions were performed using the generalized terminology (Fedorov, Artyushenko, 1975, 1979; Barthlott, 1981; Artyushenko, Fedorov, 1986; Karcz, 1996; Plisko, 2000; Zyman et al., 2004). Based on the research results, characters of the inflorescence, bracts, and flower elements of *V. stolonifera* were compiled, which were specified in relation to the data from relevant floristic treatments (Katina, 1961, 1987; Rostański, 1967). Photographs of the general appearance of flowers and fruits and microstructures of the fruit surface were performed at magnifications of ×15 to ×4000. Measurements of inflorescences, bracts and floral elements (length and width of the perianth corolla and pistil ovary, length of stamens, column, and receptacle) and fruits elements were made using the scale line of the MBS-9 binoculars and the AxioVision Rel. 4.8 software.

Results and Discussion

Morphological differentiation of the fruit of *Valeriana stolonifera* subsp. *stolonifera* and subsp. *angustifolia*

Despite many carpological studies of *Valeriana* species, especially those with a controversial taxonomic status (Karcz, 1996; Gorbunov, 2014; Vakulenko et al., 2016; Al-Dabbagh, Saeed, 2020; Tsarenko et al., 2020, 2021), is still quite a challenge to identify the diagnostic features distinguishing taxa. As we have shown in our previous study, the fruits of all species of the genus, in particular *V. stolonifera* group, are quite similar in appearance. They are

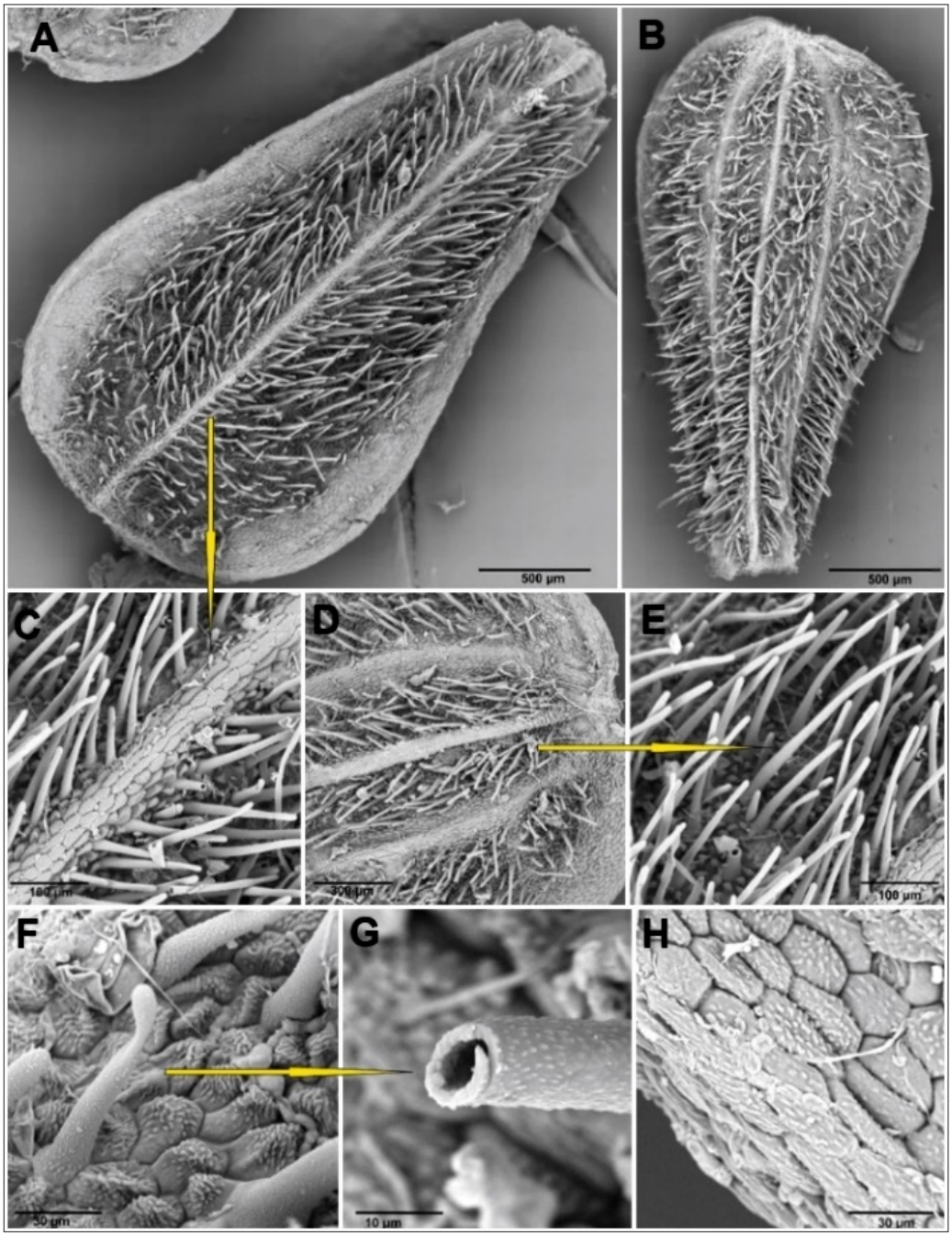

Fig. 1. Fruit of *Valeriana stolonifera* subsp. *angustifolia* (SEM) from Poland. A: adaxial side; B: abaxial side; C: rib; D–F: fragment of the abaxial surface with hairs; G: simple hair; H: verrucose surface of the fruit

somewhat flattened, especially on the adaxial side, mostly oblong-ovate or ovoid. The fruit apex is elongated, the base is rounded and slightly widened, with a slight depression in the middle, and with a basal fruit scar.

The calyx is attached the top of the fruit, which in the process of maturing turns into a white feathery formation similar to a pappus, with long thickened leathery awns covered by numerous white long soft hairs. The awns are united at the base, forming a

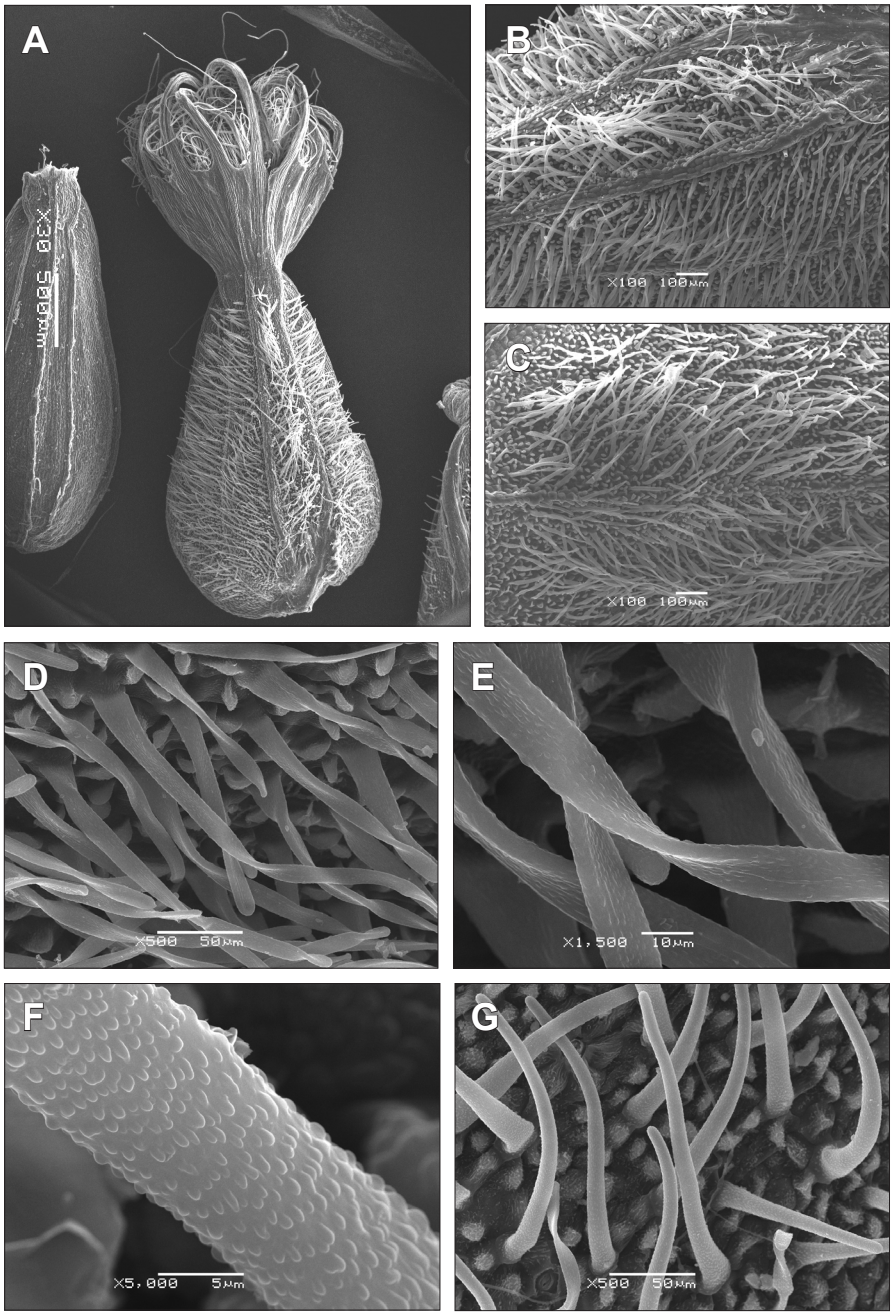

Fig. 2. Fruit of *Valeriana stolonifera* subsp. *angustifolia* (SEM) from Ukraine. A: abaxial side; B: fragment of the abaxial surface with ribs and hairs; C, D: fragment of the adaxial surface with hairs; E: simple hair; F: coarse surface of the hair; G: verrucose microstructure surface

membranous crown. In immature fruits, the awns with hair are wrapped down; they unfold only after ripening. On the adaxial side of the fruit, there is one longitudinal vein in the center; on the abaxial side there are three longitudinal veins (one central and two lateral) with vascular bundles, which look like ribs from the outside (Figs 1A, B; 2A, B; 3A, B).

The fruits of *V. stolonifera* are brown, dull, oblong-ovate, with a rounded base, slightly flattened on the sides, 2.4–3.7 mm long, 1.3–1.6 mm wide,

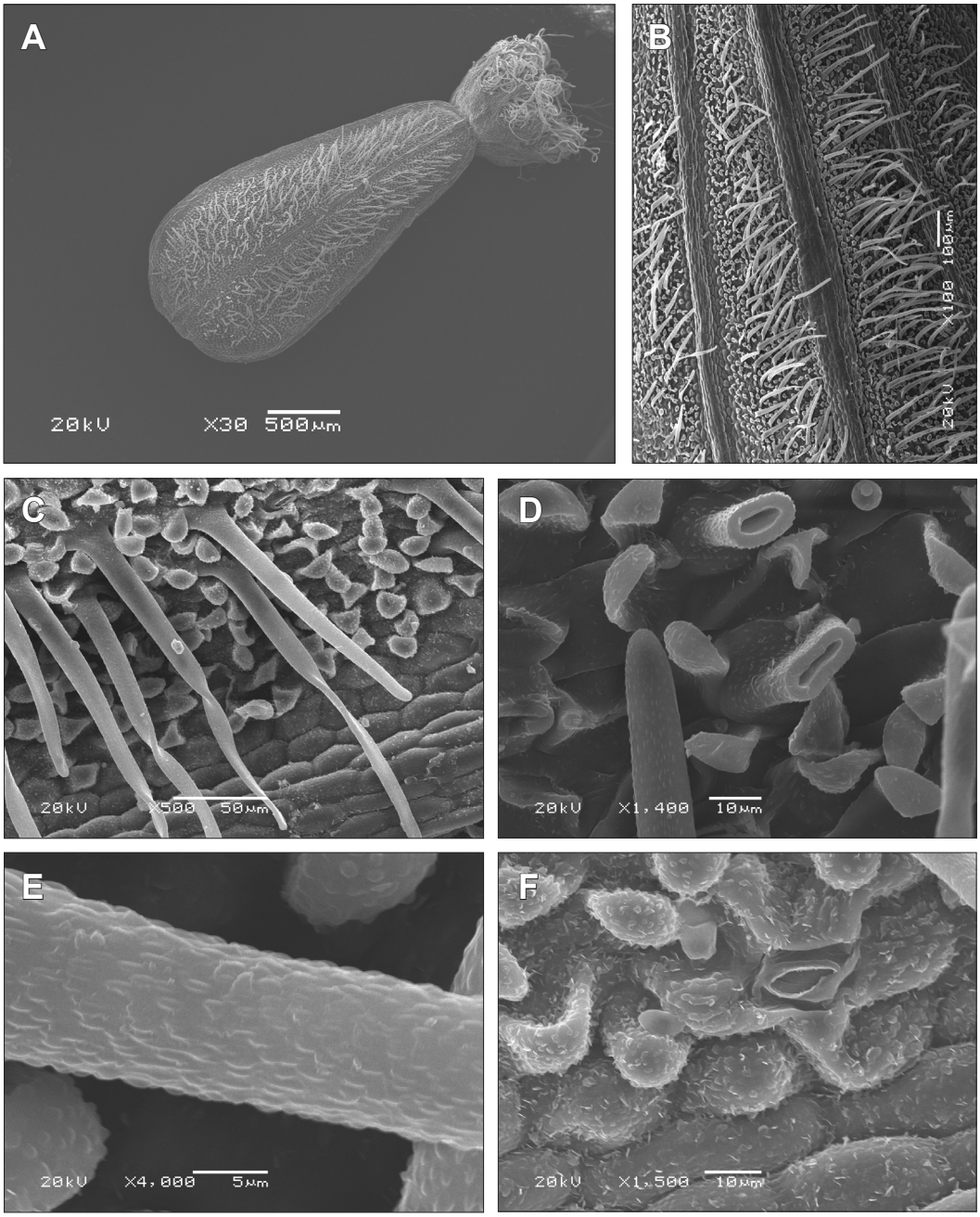

Fig. 3. Fruit of *Valeriana stolonifera* subsp. *stolonifera* (SEM). A: adaxial side; B: fragment of the abaxial fruit surface; C, D: simple hairs; E: coarse surface of the hair; F: verrucose microstructure surface of the fruit with visible stoma

with narrow borders at sides (Figs 1A, B; 2A; 3A). The fruits are pubescent on both sides between the ribs, with simple, short hairs up to 0.2 mm. Ribs are without trichomes (Tsarenko et al., 2021) (Figs 1A–F; 2A–E; 3A–D). The fruits of both subspecies of *V. stolonifera* (subsp. *stolonifera* and subsp. *angustifolia*) are pubescent with tubular and ribbon-like hairs. However, earlier we described for *V. stolonifera* only pubescence with ribbon-like hairs (Tsarenko et al., 2021). The predominance of these

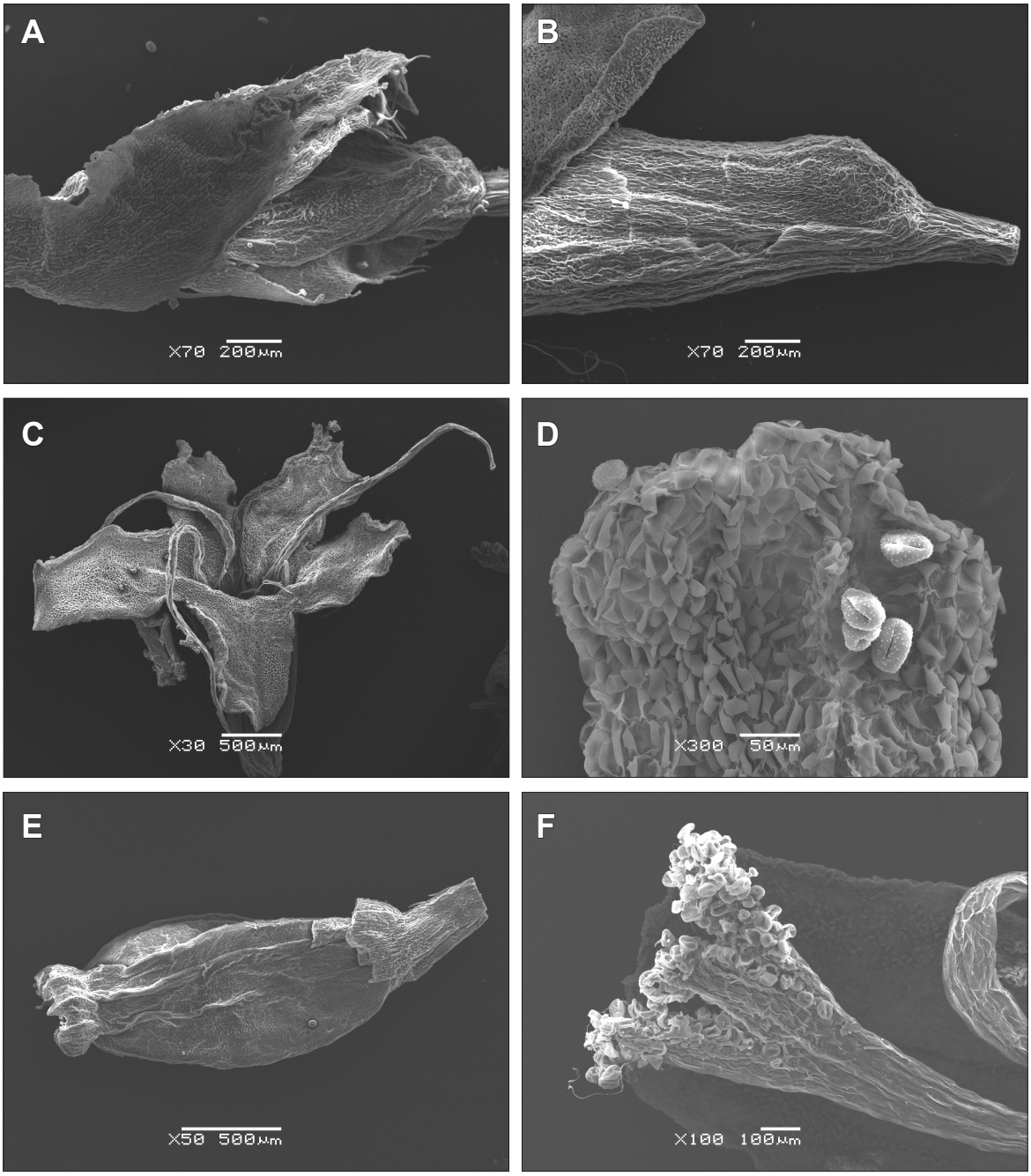

Fig. 4. Flower of *Valeriana stolonifera* subsp. *angustifolia* (SEM) from Ukraine. A: bract and top of the pistil; B: top of the calyx and base of the corolla; C: corolla; D: anther with projection of the connective; E: pistil; F: trifid stigma

or other hairs in pubescence of the fruit depended on the state of maturity and is not a diagnostic character — unripe fruits are mostly covered by ribbon-like hairs (Figs 2D–F; 3C–E). The pubescence on the awns is similar in all studied samples. The awns are covered with long, twisted, mostly ribbon-like hairs.

It should be noted that the use of SEM in our study revealed important features of the fruits surface microstructure. Both subsp. *stolonifera*

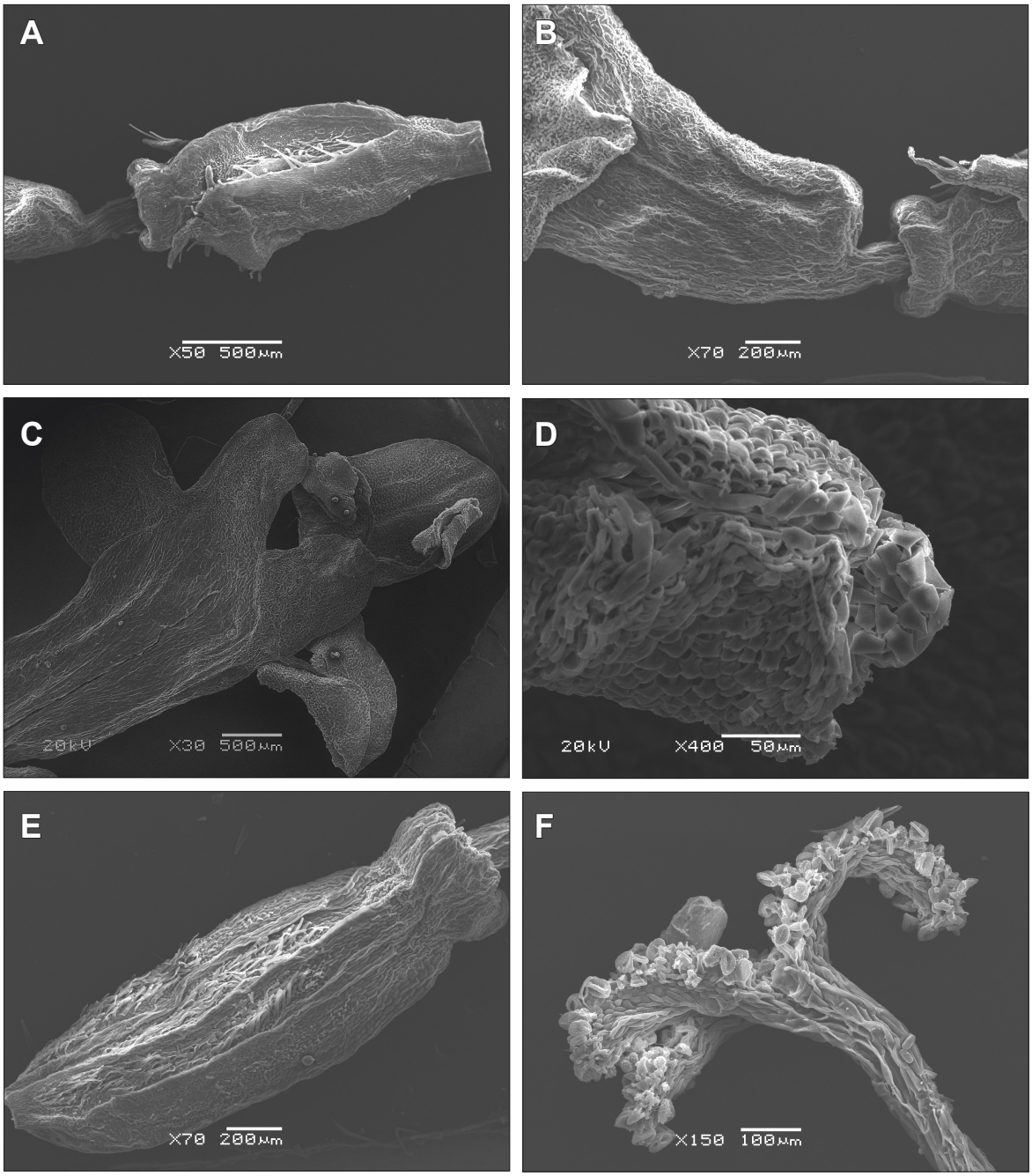

Fig. 5. Flower of *Valeriana stolonifera* subsp. *stolonifera* (SEM) from Ukraine. A: bract and pistil; B: top of the calyx and base of the corolla; C: corolla; D: anther with projection of the connective; E: pistil; F: trifid stigma

and subsp. *angustifolia* are quite similar, having the small tuberculate type of fruits surface. Exocarp cells on the ribs are arranged in rows along the longitudinal axis. They are elongated and have slightly convex outer periclinal walls. The cells of the surface on the interribs areas are without clear orientation, boundaries between the cells of the exocarp are clear. The cells are with slightly convex periclinal walls, angular, rounded, or in some areas elongated, mostly with trichomes, but closer

to the ribs, hairs are absent. The fruit surface of *V. stolonifera* subsp. *stolonifera* is covered with numerous papillae up to 40 μm long and with rounded or linear cuticular formations on the cell surface. In fruit specimens of *V. stolonifera* subsp. *angustifolia*, papillae were very rare or absent. The presence of papillae on the fruit surface may be a result of environmental factors or physiological processes in the plant. Oval stomata were found on the surface of all samples. The stomata are surrounded by two, more often five lateral cells, located radially relative to the stomata. The shape and cuticular sculpture of lateral cells are the same as those of other exocarp cells. On some areas of the surface of the fruit, plates of epicuticular wax were found. As shown by our previous carpological studies of representatives of the genus *Valeriana*, the type of wax formation on the epidermal cell surface cannot be used as an additional diagnostic character (Tsarenko et al., 2021). In conclusion, no significant differences were found in the carpological features between both subspecies. Our study also confirmed that the described micromorphological characteristics of the fruits are stable and do not differ from those described by us (Tsarenko et al., 2021) previously for *V. stolonifera* samples from other parts of Ukraine.

Morphological differentiation of the flower of *Valeriana stolonifera* subsp. *angustifolia* and subsp. *stolonifera*

Inflorescence in both subspecies is corymbose, multiflorous, 5(10)–30 × 5–20 cm, branches of inflorescence arched. Bracts 2–4 × 0.5–0.8 mm, herbaceous, greenish, paired, opposite, elongated, lanceolate (subsp. *angustifolia*) to linear (subsp. *stolonifera*), acute at the apex, slightly fused at the base, with dense pubescence of bristly hairs in the form of spots on the sides, broadly membranous at the edges and with single cilia (Figs 4A; 5A).

The flowers are solely hermaphrodite, 3.5–6.0 mm long in *V. stolonifera* subsp. *stolonifera* and up to 5 mm in *V. stolonifera* subsp. *angustifolia*. We noted that the calyx has 10–12 awns on its apex that wrap inward, and the calyx on the surface has scattered pubescence of simple hairs. The corolla is 2.5–4.5 mm long in both subspecies, white or pale pink in *V. stolonifera* subsp. *stolonifera* and pinkish-lilac in *V. stolonifera* subsp. *angustifolia*, in both subspecies glabrous, funnel-shaped, narrowed at the base. The corolla above its base has a thickening on one side, a characteristic place for the accumulation of nectar (Donoghue et al., 2003). Corolla is tubiform, with five lobes. The lobes are different in shape: two lobes are inverted-ovate, 0.50–0.75 × 0.50 mm, third — oval, 0.75–1.00 × 0.30 mm, making the corolla slightly zygomorphic (Figs 4B, C; 5B, C).

Stamens three, inside the flower, opposite to corolla petal lobes; their filaments are thin, filamentous, exceeding the corolla, up to 5 mm long; anthers ellipsoidal, mobile, about 0.5 mm. We recorded in the stamens of both subspecies of *V. stolonifera* the presence of an ovoid projection of the connective over the anthers, the average length of which is about 0.5 mm (Figs 4D; 5D).

Ovary 1–3 mm long, oblong-ovate, flat, with one rib on the adaxial side and three ribs on the abaxial side, in *V. stolonifera* subsp. *stolonifera* densely pubescent with conspicuous, short bristly hairs on both surfaces except the ribs (Fig. 5E), whereas in *V. stolonifera* subsp. *angustifolia* its pubescence was seen on both sides and on one side of the ovary surface (Fig. 4E); the column is filamentous, exceeding the corolla; the trifid stigma is having three prongs extended from the upper part of the column (Figs 4F; 5F).

Our analysis of flower samples from both subspecies did not reveal significant distinguishing features between them. The differences between these subspecies are only in the color shades of the perianth, in a slight difference in the size of the flowers; we also noted the presence of carpels without pubescence on the abaxial side in some specimens of *V. stolonifera* subsp. *angustifolia*.

Conclusions

The detailed characteristics of the fruits and flowers of *V. stolonifera* subsp. *stolonifera* and *V. stolonifera* subsp. *angustifolia* were compiled based on the results of a comparative morphological study using SEM. No significant differences were found in the macro- and micromorphological features of the plant reproductive organs examined at the subspecies level. Intraspecific differentiation of *V. stolonifera* is likely limited to the vegetative parts of plants.

However, the data obtained made it possible to expand the range of possible morphological characteristics of fruits and flowers. Thus, the revision of carpological samples showed that the pubescence of fruits of both subspecies can be either predominantly of flattened ribbon-like hairs or predominantly tubular, depending on the degree of maturity

of the fruit. It was also found that the papillose formations revealed on the fruit surface are developed to varying degrees, regardless of the subspecies and, possibly, are due to the physiological state of the plant and environmental factors. It is important to consider these fruit features when diagnosing other taxa of the genus *Valeriana*.

For the first time, this study revealed a feature of the flowers of both subspecies of *V. stolonifera* — the presence of an ovoid protrusion of the connective above the anthers of the stamens.

The identified morphological characteristics of generative organs are additional characters that, along with vegetative ones, can be used for more accurate identification of the species, as well as in solving taxonomic issues of the *V. officinalis* complex. To better understand of the taxonomic issues related to the infraspecific differentiation of *V. stolonifera*, molecular studies are needed, which are in our plans for the future.

Acknowledgements

The research was funded in part by the statutory funds of the W. Szafer Institute of Botany of the Polish Academy of Sciences to MS.

ETHICS DECLARATION

The authors declare no conflict of interest.

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Морфологічні особливості квіток і плодів
***Valeriana stolonifera* (*Caprifoliacaea*) та їхнє таксономічне значення**

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Реферат. В роботі представлені результати макро- та мікроморфологічного дослідження квіток і плодів двох підвидів *Valeriana stolonifera*: subsp. *stolonifera* та subsp. *angustifolia*. Вивчено зразки з територій України та Польщі. Описано будову квіток і плодів та визначено їхні детальні характеристики. Морфологічні структури досліджено за допомогою сканувальної електронної мікроскопії. Виявлено нові мікроморфологічні ознаки поверхні плодів представників досліджуваних таксонів, відмічено особливості поверхні — зовнішніх периклінальних і антиклінальних стінок клітин екзокарпію, трихом і продихів. У квітках представників обох підвидів *V. stolonifera* наявний яйцеподібний виступ в'язальця над пиляками тичинок. Суттєвих відмінностей у макро- та мікроморфологічних ознаках плодів і квіток між досліджуваними таксонами не виявлено. Отримані результати в комплексі з відомими ознаками вегетативних органів рослин можуть бути корисними як для точнішої ідентифікації підвидів *V. stolonifera*, так і для вирішення таксономічних питань у групі *V. officinalis* aggr.

Ключові слова: екзокарпій, квітка, мікроморфологія, мікроструктура, плід, СЕМ мікроскоп, таксономія