POLLEN MORPHOLOGY OF THE POLISH SPECIES OF THE FAMILY CAPRIFOLIACEAE. PART 2.

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ABSTRACT

This paper presents further results of studies on pollen morphology of the family *Caprifoliaceae*. Besides detailed descriptions of 6 species of genera *Linnaea* and *Lonicera*, series of LM and SEM microphotographs are included. All examined species have pollen grains of medium- or large-sized, with oblate forms, echinate (microechinate) ornamentation and short ectoaperture, often margined by costa. Length of spines and density of their distribution on the tectum allow to distinguish *Linnaea* and *Lonicera* subtypes. The key for determination of 11 *Caprifoliaceae* species, based on pollen morphology is proposed too.

KEY WORDS: *Caprifoliaceae*, *Linnaea*, *Lonicera*, pollen morphology, SEM, LM.

INTRODUCTION

The results of studies on pollen morphology of 6 *Caprifoliaceae* species occurring in Poland are presented in this paper. Beside native species, as *Linnaea borealis* L., *Lonicera nigra* L., *L. periclymenum* L., *L. xylosteum* L., locally running wild species, as *Lonicera caprifolium* L., *L. tatarica* L., have been also observed.

Pollen from mature anthers was collected from natural localities and sometimes from herbarium. For native species 7-8 samples were examined. In case of *Linnaea borealis*, *Lonicera periclymenum* and *L. tatarica* 2-3 samples were studied. All samples have been determined by herbarium specimens. Detailed information about collected material is given below pollen diagnosis of each species. The using methods have been described in first part of article.

POLLEN DIAGNOSIS

Linnaea borealis L. (Figs 1-4)

Size:

medium; P 38.9 μm (36.0-43.2 μm), E (longest axis) – 44.4 μm (40.8-48.0 μm)¹.

P/E ratio:

0.88 (0.81-0.98), shape of grains are suboblate (46.7% of observed pollen grains) or oblate spheroidal (53.3%)².

Outlines:

Polar view – circular to triangular, with convex sides, equatorial view – mainly elliptic, sometimes circular.

Exine:

2.4 μm thick (up to 3.2 μm)³; there is no difference in its thickness between apocolpia and mesocolpia. Exine consists of two layers visible in LM. Sexine somewhat thicker than nexine (mean thickness of sexine – 1.23 μm , of nexine – 1.21 μm)⁴.

Ornamentation:

Microechinate (scabrate); wide, cone-shaped short spines, variable in size (0.5-1 μm), densely spaced, about 80 per 100 μm^2 of tectum. Surface of tectum slightly wrinkled, with minute, poorly visible perforations.

Pollen class:

Trizonocolporate⁵.

Apertures:

Compound.

Ectoaperture:

Colpus short or medium, narrow, fissured or boat-shaped, with acute ends.

Endoaperture:

Lalongate colpus⁶. Endocolpus margins underlined by costa only at the polar sides of apocolpia.

¹ According to Kuprianova & Alyoshina (1972) pollen grains of this taxon have been decidedly large-sized.

² In accordance with Punt, Reitsma & Reuvers (1976) grains with prolate polar axis were also noticed.

³ According to the study of Stachurska, Szczepk & Sadowska (1963) exine may have been up to 5 μm thick. Others authors determined thickness of exine as about 3-4 μm (Bassett & Crompton 1970, Kuprianova & Alyoshina 1972, Punt, Reitsma & Reuvers 1976).

⁴ According to Weberling (1966) and Punt, Reitsma & Reuvers (1976) pollen grains of *Linnaea borealis* were crassisechinous. Similar observations were noted by Stachurska, Szczepk & Sadowska (1963) and Bassett & Crompton (1970), who considered ectexine of *L. borealis* always thicker than endexine.

⁵ Pollen grains with 4 or 5 apertures were occasionally noted (Kuprianova & Alyoshina 1972, Punt, Reitsma & Reuvers 1976, Stachurska, Szczepk & Sadowska 1963).

⁶ $\pm$ izodiametric endopori were also observed (Kuprianova & Alyoshina 1972, Punt, Reitsma & Reuvers 1976, Stachurska, Szczepk & Sadowska 1963).

Caprifoliaceae pollen, LM and SEM photographs. On photo the bar refers to magnification.

Figs 1-4. *Linnaea borealis* L.:

- 1 (LM) – Outline in polar view.
- 2 (LM) – Outline in equatorial view; marked exine layers.
- 3 (SEM) – Microechinate ornamentation of apocolpium.
- 4 (SEM) – Microechinate ornamentation; marked exine layers.

Remarks:

Owing short spines, densely set on the tectum, pollen grains of *Linnaea borealis* are very characteristic and easy to recognize. Superficially they are similar to grains of *Lonicera* species.

Analysed samples of *Linnaea borealis*:

1. Near Olejnica (prov. Leszno), W coast of Olejnickie lake, 29.06.1977, K. Boratyńska, A. Boratyński, KOR.
2. Panasówka near Zwierzyniec (prov. Zamość), 23.06.1993, K. Oklejewicz, POZF.
3. Between Obroc and Guciowo (prov. Zamość), 28.07.1952, POZ.

Lonicera caprifolium L. (Figs 5-8)

Size:

Large, P – 58.4 µm (52.8 to 64.8 µm), E (the longest one) – 64.2 µm (56.8-70.4 µm)⁷.

P/E ratio:

0.91 (0.84-1.0); grains usually oblate spheroidal (77.8% of observed pollen grains), sometimes suboblate (16.7%) and only occasionally subprolate (5.6%).

Outlines:

Polar view – triangular with convex sides, equatorial view – elliptic⁸.

⁷ According to Stachurska and co-authors (1970) for Polish population of this species length of polar axis was up to 54 µm, length of equatorial axis – 61 µm. Somewhat larger pollen grains were observed in the Northwest-European populations (P = 60-72 µm; E = 68-77 µm; Punt, Reitsma & Reuvers 1976).

⁸ They can be sometimes obtusely acuminate in equatorial view (Punt, Reitsma & Reuvers 1976).

Figs 5-8 *Lonicera caprifolium* L.:

5 (LM) – Outline in polar view.

6 (LM) – Outline in equatorial view; composite aperture visible, endoaperture marked by costa.

7 (SEM) – Echinate ornamentation of apocolpium.

8 (SEM) – Ornamentation of tectum in details; marked exine layers.

Exine:

about 3.1 µm thick⁹; becoming thicker near apertures; formed by two layers. Sexine ± as thick as nexine or up to 1.5 times thicker¹⁰.

Ornamentation:

Echinate. Echinae – cylindrical, with slightly widened base and obtuse apex, relatively short, up to about 1 µm long (maximally 2 µm), about 10 per 100 µm² of tectum. Surface of tectum variable; undulate or wrinkled, covered with scarce granula and sometimes with fine, shallow perforations.

Pollen class:

Trizonocolporate¹¹

Apertures:

Compound.

Ectoaperture:

Colpus short, narrow, slit-like; with acute ends.

Endoaperture:

Lalongate porus or lalongate colpus, underlined by costae only at the polar sides. Polar axis of endo- and ectoaperture of similar length.

Remarks:

Pollen grains of *Lonicera caprifolium* resemble very much the grains of *L. periclymenum*. The main feature differing pollen of these species is the nature of costa. In the grains of *L. capri-*

⁹ In previous studies on the *Lonicera caprifolium* pollen exine thickness was about 4-5 µm (Punt, Reitsma & Reuvers 1976, Stachurska et al. 1970).

¹⁰ According to Punt, Reitsma & Reuvers (1976) sexine was rather much thicker. Similar observation was noted by Stachurska and co-authors (1970), in accordance to this ectexine was much thicker than endexine.

¹¹ Pollen grains with two apertures as well as with four apertures were observed only occasionally (Punt, Reitsma & Reuvers 1976, Stachurska et al. 1970).

Figs 9-13. *Lonicera periclymenum* L.:

- 9 (LM) – Outline in polar view.
 10 (LM) – Outline in equatorial view.
 11 (LM) – Composite aperture; endoaperture marked by costa.
 12 (SEM) – pollen grains in polar and equatorial views.
 13 (SEM) – Ornamentation of tectum in details; marked exine layers.

folium it is visible only at the sides of the polar area, while in the grains of *L. periclymenum* it is also marked at the sides of mesocolpia. Besides, pollen grains of *L. caprifolium* are usually smaller and their spines are somewhat shorter and widened at the base.

Analysed samples of *Lonicera caprifolium*:

1. Between Lubiechów Dolny and Markocin (prov. Szczecin), Bielinek reserve by Odra river, 18.06.1958, F. Celiński, M. Filipek, POZ.
2. Janowiec (prov. Lublin), over Wisła, 25.06.1973, A. Bora-tyński, J. Zieliński, POZ.
3. Bulgaria, Rhodopi Mts., above Sokolovo, distr. Momcil-grad, 08.06.1971, J. Koeva, KOR.

Lonicera periclymenum L. (Figs 9-13)

Size:

Large; P – 67.09 μ m (59.2 to 76.8 μ m), E (longest axis) – 74.37 μ m (65.6 to 83.2 μ m)¹².

P/E ratio:

0.9 (0.8 to 1.04), grains with prolate equatorial axis prevail (suboblate – 24.6% of observed pollen grains, oblate spheroidal – 74.2%), prolate spheroidal ones are observed much rarer (1.3%).

Outlines:

Polar view – triangular with straight or convex sides¹³, equatorial outline – mainly elliptic.

¹² According to data in literature length of polar axis has been up to 76 μ m, equatorial – 83 μ m (Punt, Reitsma & Reuvers 1976).

¹³ Pollen grains with polar view of quadrangular forms, with convex sides have been noticed too (Stachurska et al. 1970).

Exine:

3.17 μm thick (2.4-4 μm)¹⁴; becomes thicker in the zone of apertures; formed by two layers. Sexine as thick as nexine, rarely thicker¹⁵.

Ornamentation:

Echinate. Echinae – straight, 1.5 μm (up to 2 μm) long, not widened at base; 5-9 per 100 μm^2 of tectum. Surface of tectum gently undulate, with fine, sparse granulations and perforations.

Pollen class:

Trizonocolporate¹⁶.

Apertures:

Compound.

Ectoaperture:

Colpus short, slit-like, with acute ends.

Endoaperture:

Lalongate colpus or lalongate porus. Polar axis of ectoaperture distinctly longer than polar axis of endoaperture. Costa around the endoaperture well marked, both in polar and equatorial area.

Remarks:

See diagnosis of *Lonicera caprifolium*.

Analysed samples of *Lonicera periclymenum*:

1. Międzyzdroje (prov. Szczecin), Przytor peninsula, 16.09.1992, W. Danielewicz, I. Maciejewska, D. Wrońska-Pilarek, POZF.
2. Rokita (prov. Szczecin), 16.09.1992, W. Danielewicz, POZF.
3. Świnoujście (prov. Szczecin), 27.06.1993, P. Rogalski, POZF.
4. 1 km S of Stary Kraków (prov. Słupsk), 08.09.1977, A. Boratyński, KOR.
5. Podczele near Kołobrzeg (prov. Koszalin), 17.09.1993, W. Danielewicz, I. Maciejewska, D. Wrońska-Pilarek, POZF.
6. Rosnówko (prov. Poznań), Wielkopolski National Park, 20.09.1993, I. Maciejewska, POZF.
7. Chelmek Wołowski (prov. Legnica), 8 km SW of Ścinawa by Odra river, 20.05.1993, G. Bobrowicz, POZF.
8. Near Wasilew Skrzyszewski (prov. Siedlce), 19.07.1990, J. Zieliński, KOR.

Lonicera xylosteum L. (Figs 14-18)

Size:

Medium, rarely large; P – 45.1 μm (40-53.6 μm), E (longest axis) – 50.6 μm (43.2-59.2 μm).

P/E ratio:

0.89 (0.78-1.0), shape of grains includes suboblate (36.2% of observed pollen grains), oblate spheroidal (63.3%) and exceptionally prolate spheroidal forms (0.5%).

Outlines:

Polar view – circular or triangular, with convex sides, equatorial view – circular to elliptic.

Exine:

1.7 μm thick (1.6-2.4 μm)¹⁷; becomes thicker in the zone of apertures, formed by 2 layers. Sexine is as thick as nexine¹⁸.

Ornamentation:

Echinate. Echinae – about 3 μm high¹⁹, gently becoming narrower, with obtuse apex; 5-7 per 100 μm^2 of tectum. Surface of tectum variable, almost smooth, with minute, sparsely placed granulations or wrinkled, with rather hardly visible perforations.

Pollen class:

Trizonocolporate²⁰.

Apertures:

Compound.

Ectoaperture:

Colpus short, slit-like, with acute ends.

Endoaperture:

Lalongate porus, sometimes also lalongate colpus. Polar axis of ectoaperture longer than polar axis of endoaperture. Costa only at polar area of endoapertures.

Remarks:

Pollen of *Lonicera xylosteum* may be hardly distinguished because of variable surface of tectum and significant similarity to pollen of *L. tatarica* and *L. nigra*. In comparison to *L. tatarica*, however, its pollen grains are smaller, beside their polar axis of ectoaperture is longer than polar axis of endoaperture (both axes are of similar lengths in *L. xylosteum*). On the other hand grains of *L. xylosteum* have distinct costae at the polar sides, while such costae are absent in grains of *L. nigra*.

Analysed samples of *Lonicera xylosteum*:

1. Woliński National Park, between Międzyzdroje and Warnowo (prov. Szczecin), 08.05.1993, D. Wrońska-Pilarek, POZF.
2. Gorzeń (prov. Bydgoszcz), 05.05.1993 I. Maciejewska, D. Wrońska-Pilarek, POZF.
3. Zielonka forest, near Bolechowo (prov. Poznań), 03.05.1993, I. Maciejewska, POZF.
4. Żelazne Mts., near Stary Waliszów (prov. Wałbrzych), c. 300 m, 17. 05.1993, I. Maciejewska, D. Wrońska-Pilarek, POZF.
5. Between Żmigród and Mały Lasek (prov. Rzeszów) 10.05.1959, M. Gostyńska, KOR.
6. Tatra Mts., Kościeliska valley (prov. Nowy Sącz), c. 300 m, 12.06.1993, I. Maciejewska, D. Wrońska-Pilarek, POZF.
7. Between Rytr and Życzanów by Poprad river (prov. Nowy Sącz), 13.05.1970, M. Gostyńska-Jakuszczyńska, KOR.

Lonicera tatarica L. (Figs 19-23)

Size:

Medium to exceptionally large; P – 47.5 μm (40 do 48 μm), E (longest axis) – 52 μm (44-56 μm).

P/E ratio:

0.91 (0.81-1.0) $\pm$ spheroidal forms predominate (suboblate – 18.3% of observed pollen grains, oblate spheroidal – 78.3%, prolate spheroidal – 3.4%).

Outlines:

Polar view circular or triangular, with convex sides, equatorial view – elliptic or circular.

Exine:

about 1.6 μm thick, usually the thickest near apertures, formed by 2 layers. Sexine as thick as nexine²¹.

¹⁴ According to Punt, Reitsma & Reuvers (1976) and Stachurska and co-authors (1970) exine has been up to 5 μm thick.

¹⁵ Punt, Reitsma & Reuvers (1976) considered sexine thicker than nexine, as in pollen grains of *Lonicera caprifolium*.

¹⁶ Pollen grains with 2 apertures have been observed sporadically (Punt, Reitsma & Reuvers 1976).

¹⁷ According to Punt, Reitsma & Reuvers (1976) up to 5 μm .

¹⁸ In previous studies thicker ectexine than endexine was observed (Kuprianova & Alyoshina 1972, Punt, Reitsma & Reuvers 1976, Stachurska et al. 1970).

¹⁹ According to Stachurska and co-authors (1970) up to 4 μm .

²⁰ Pollen grains with 2 or 4 apertures were noticed much rarer (Punt, Reitsma & Reuvers 1976).

²¹ According to Stachurska and co-authors (1970) ectexine has been thicker than endexine.

Figs 14-18. *Lonicera xylosteum* L.:

14 (LM) – Outline in polar view, marked echinate ornamentation.

15 (LM) – Outline in equatorial view; composite aperture; endoaperture marked by costa.

16 (SEM) – Echinate ornamentation of apocolpium.

17, 18 (SEM) – Ornamentation of tectum in details.

Ornamentation:

Echinate. Echinae 3-4 µm high, with swelling base, about 8 per 100 µm² of tectum. Surface of tectum wrinkled, without perforations.

Pollen class:

Trizonocolporate.

Apertures:

Compound.

Ectoaperture:

Colpus short, slit-like, with acute ends.

Endoaperture:

Lalongate porus. Polar axis of ecto- and endoaperture ± equal. Costae distinct only at the polar sides.

Remarks:

Pollen grains of *Lonicera tatarica* show some affinities to pollen grains of *Lonicera nigra* and *L. xylosteum*. Main differences between *L. nigra* and *L. tatarica* are to be observed in size, lack (*L. nigra*) or presence (*L. tatarica*) of perforations in tectum and nature of costae (generally endoapertures of *L. nigra* have no marked edges). In comparison with *L. xylosteum*

pollen grains of *L. tatarica* are somewhat larger and its polar axis of ectoaperture and polar axis of endoaperture are of similar length.

Analysed samples of *Lonicera tatarica*:

1. Owińska by Warta river (prov. Poznań), 15.05.1993, I. Maciejewska, POZF.
2. Russian Republic, Novosibirsk region, Iskitimsk district, 19.06.1971, A.A. Chramov, KOR.

Lonicera nigra L. (Figs 24-28)

Size:

Medium, occasionally large. P – 43.8 µm (39-53 µm), E (longest axis) – 50.7 µm (44-59 µm)²².

²² According to Punt, Reitsma & Reuvers (1976) pollen grains of *Lonicera nigra* were of similar size as those of *L. xylosteum* (P = 42-60 µm, E = 46-66 µm); according to Stachurska and co-authors (1970) they were smaller (P = 34-43 µm, E = 40-48 µm).

Figs 19-23. *Lonicera tatarica* L.:

19 (LM) – Outline in polar view; marked exine layers.

20 (LM) – Echinate ornamentation of apocolpium.

21 (LM) – Outline in equatorial view; composite aperture; endoaperture marked by costa.

22 (SEM) – Echinate ornamentation of mesocolpium.

23 (SEM) – Ornamentation of tectum in details.

P/E ratio:

0.87 (0.75-1.03), mostly observed suboblate grains (55.0%), relatively frequent – oblate spheroidal (44.6%) and very rare prolate spheroidal (0.4%).

Outlines:

Polar view – circular or triangular with convex sides, equatorial view – mainly circular, sometimes elliptic.

Exine:

1.64 µm thick (1.6-2.4 µm), formed by 2 layers. Sexine as thick as nexine.

Ornamentation:

Echinate. Echinae – about 2-3 µm high, gradually becoming narrower, but without acuminate apex, 5-7 per 100 µm² of tectum. Surface of tectum with minute, irregularly placed striae, divided by distinct perforations.

Pollen class:

Trizonocolporate.

Apertures:

Compound.

Ectoaperture:

Colpus short, slit-like, with acute ends.

Endoaperture:

Porus lalongate, wide. Polar axis of ectoaperture as long as polar axis of endoaperture. Costae around endoapertures indistinct.

Remarks:

See diagnosis about *Lonicera xylosteum* and *L. tatarica* pollen.

Analysed samples of *Lonicera nigra*:

1. Karkonosze Mts. (prov. Jelenia Góra), Wielki Staw, c. 1180 m, 05.06.1964, K. Browicz, KOR.
2. Izerskie Mts., between Chmielęń and Pasiecznik (prov. Jelenia Góra), 480-490 m, 13.05.1981, A. Boratyński, KOR.
3. Szklarska Poręba (prov. Jelenia Góra), about 1 km to Szklarka waterfall, c. 500 m, 15.05.1993, I. Maciejewska, T. Maliński, POZF.
4. Babia Góra Mt. (prov. Bielsko Biała), c. 1150 m, 24.06.1952, W. Bugała, KOR.
5. Slope of Szyndzielnia Mt. (prov. Bielsko Biała), 10.05.1993, M. Gancarczyk, POZF.
6. SE end of Chwaniów Mt., between Jureczkowo and Liskowate (prov. Rzeszów), c. 600 m, 10.06.1965, K. Browicz, KOR.
7. Tatra Mts., Strążyska Valley (prov. Nowy Sącz), c. 600 m, 11.06.1993, I. Maciejewska, D. Wrońska-Pilarek, POZF.
8. Bieszczady Mts., slope of Krzemień (prov. Krosno), c. 500 m, 26.05.1993, T. Maliński, D. Wrońska-Pilarek, POZF.

Figs 24-28. *Lonicera nigra* L.:

24 (LM) – Outline in polar view; marked echinate ornamentation and exine layers.

25 (LM) – Outline in equatorial view.

26 (LM) – composite aperture.

27 (SEM) – Pollen grains in polar and equatorial views.

28 (SEM) – Ornamentation of tectum in details; marked exine layers.

CONCLUSION

Pollen grains of *Lonicera* and *Linnaea* species represent similar morphological type. All grains are medium- or large-sized, with oblate forms, echinate (microechinate) ornamentation and short ectoaperture. Length of spines and density of their distribution on tectum allow however to distinguish *Linnaea* and *Lonicera*.

Pollen grains of *Lonicera* species can be only correctly determined, when combination of features is taken into account. Size of grains, arrangement of tectum, length and shape of spines, their density on tectum and character of compound apertures have essential, diagnostic value. Pollen with the most variable quality features (mainly connected with the ornamentation) has been observed in samples of *L. xylosteum*. Its range of variability overlaps with pollen variability of *L. tatarica* and *L. nigra*.

KEY TO THE POLLEN GRAINS OF CAPRIFOLIACEAE SPECIES OCCURRING IN POLAND

- 1a. Polar axis usually longer than equatorial axis. Grains semitectate, with reticulate ornamentation 2.
- 1b. Polar axis shorter than equatorial axis. Grains tectate, with echinate (or microechinate) ornamentation 6.
- 2a. Muri in reticulum with only partly fused capita of columellae. Ridges of muri beaded *Viburnum lantana* L.
- 2b. Muri in reticulum with completely fused capita of columellae. Ridges of muri psilate 3.
- 3a. Muri in reticulum at least 0.5 μm wide *Viburnum opulus* L.
- 3b. Muri in reticulum up to 0.4 μm wide 4.

- 4a. Apocolpium tectate, almost smooth
..... *Sambucus racemosa* L.
- 4b. Apocolpium semitectate, with distinct ornamentation
..... 5.
- 5a. Apocolpium mainly foveolate. Lumina of reticulum in mesocolpium with diameter about 3 μ m
..... *Sambucus ebulus* L.
- 5b. Apocolpium mainly reticulate. Lumina of reticulum in mesocolpium with diameter about 1-2 μ m
..... *Sambucus nigra* L.
- 6a. Spines dimorphic, up to 1 μ m long, densely spaced on the tectum
..... *Linnaea borealis* L.
- 6b. Spines monomorphic, longer than 1 μ m, scattered on the tectum
..... 7.
- 7a. Pollen grains large, equatorial axis usually more than 60 μ m long. Spines up to 2 μ m long
..... 8.
- 7b. Pollen grains medium-sized, equatorial axis usually not more than 52 μ m long. Spines at least 2 μ m long
..... 9.
- 8a. Spines $\pm$ 1 μ m long, with widened bases. Endoaperture costa marked only at polar sides
..... *Lonicera caprifolium* L.
- 8b. Spines $\pm$ 1.5 μ m long, without widened bases. Endoaperture costa marked both at polar and equatorial sides.
..... *Lonicera periclymenum* L.
- 9a. Surface of tectum with perforations, wrinkled or with granulations
..... 10.
- 9b. Surface of tectum without perforations, wrinkled to smooth
..... *Lonicera tatarica* L.
..... *Lonicera xylosteum* L.
- 10a. Endoaperture at the polar area surrounded by distinct costa. Polar axis of ectoaperture longer than polar axis of endoaperture
..... *Lonicera xylosteum* L.
- 10b. Endoaperture poorly marked, without costa. Polar axis of ectoaperture $\pm$ as long as polar axis of endoaperture
..... *Lonicera nigra* L.

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LITERATURE CITED

- BASSETT J.J., CROMPTON C.W. 1970. Pollen morphology of the family *Caprifoliaceae* in Canada. *Pollen Spores* 12: 366-380
- KUPRIANOVA L.A., ALYOSHINA L.A. 1972. *Linnaea* Gronov. ex L. – *Linnaea*, *Lonicera* L. – *Zimolost*. In: *Pylca i spory rastenij flory evropejskoj tchasti*. Izdat. Akad. Nauk SSSR, Komarov Bot. Inst. "Nauka" Leningrad: pp. 81-84
- PUNT W., REITSMA T.J., REUVERS A.A.M.L. 1976. The northwest European pollen flora 2. *Caprifoliaceae*. In: PUNT W. (ed.) *The northwest European pollen flora*. 1. Elsevier Science Publishers B.V. Amsterdam, Oxford New York: pp. 5-29
- STACHURSKA A., SZCZYPEK P., SADOWSKA A. 1963. *Linnaea borealis* L., *Zimozioł północny* (*Caprifoliaceae*). *Kartoteka palynologiczna roślin polskich*. *Zeszyty Przyrod.* Opol. Tow. Przyj. Nauk 3: tab. 16
- STACHURSKA A., SADOWSKA A., BUŁATY M., KUSZELL T. 1970. *Lonicera periclymenum* L., *Wiciokrzew pomorski*, *Lonicera caprifolium* L., *Wiciokrzew przewiercień*, *Lonicera xylosteum* L., *Wiciokrzew suchodrzew*, *Lonicera tatarica* L., *Wiciokrzew tatarski*, *Lonicera nigra* L., *Wiciokrzew czarny* (*Caprifoliaceae*). *Kartoteka palynologiczna roślin polskich*. *Zeszyty Przyrod.* Opol. Tow. Przyj. Nauk 10: tab. 150-154
- WEBERLING F. 1966. *Linnaea* [Gronov. ex] L., *Lonicera* L. In: HEGI G. *Illustrierte Flora von Mitteleuropa*. 6, 2: 50-87

MORFOLOGIA ZIAREN PYŁKU KRAJOWYCH GATUNKÓW
Z RODZINY CAPRIFOLIACEAE. CZĘŚĆ 2.

STRESZCZENIE

W pracy przedstawiono wyniki badań nad morfologią ziarn pyłku 6 krajowych gatunków z rodzajów *Linnaea* i *Lonicera* (rodzina *Caprifoliaceae*). Obserwacje przeprowadzono w oparciu o różne typy mikroskopów świetlnych oraz skaningowych. Opisy morfologiczne ziarn poszczególnych gatunków zostały zilustrowane seriami zdjęć spod obydwu rodzajów mikroskopów. Badane gatunki z rodzajów *Linnaea* i *Lonicera* charakteryzują się ziarnami o średnich, względnie dużych rozmiarach, spłaszczonym kształcie, kolczastym urzeźbieniu daszka oraz o krótkiej bruzdzie zewnętrznej, często podkreślonej przez ożebrowanie. Cechami odgraniczającymi te dwa taksony i zarazem pozwalającymi na wyróżnienie dla nich podtypów ziaren są gęstość rozmieszczenia kolców na powierzchni daszka oraz ich wysokość. Ponadto w pracy zamieszczono klucz do oznaczania 11 krajowych gatunków ziarn pyłku z rodziny *Caprifoliaceae* (rodzaje *Linnaea*, *Lonicera*, *Sambucus*, *Viburnum*).

SŁOWA KLUCZOWE: *Caprifoliaceae*, *Linnaea*, *Lonicera*, morfologia, ziarna pyłku, SEM, LM.