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SCANNING ELECTRON MICROSCOPY OF SOME SELECTED RECENT AMENTIFLORAE POLLENS II.

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Abstract

From the *Myrica*, and *Gale* genus one species, from the genus *Betula* 17 species were investigated by the scanning electron microscope, from the latter mentioned genus two hybrid species, too. Based on recent data, compared with the earlier SEM data of the brevaxonate *Amentiflorae* pollen grains *(Corylus, Carpinus, Ostrya, Casuarina)* we may conclude the following: 1. The submicroscopic characteristic feature of the brevaxonate *Amentiflorae* pollen grains may be characterized by the coni. In each case the basis diameter and the number per square micron have taxonomic value. 2. Inside the submicroscopic coni, two types may be distinguished; a) simple, when these ornamental elements are prominent from the smooth tectum, b) composite, in this case the coni are on short striae. 3. The two kinds of coni have intergeneric and intrageneric taxonomic value. 4. The prominent germinal area is in general connected by submicroscopic striae.
Key words: Palynology, recent, Amentiflorae, SEM.

Introduction

In the evolutionary point of view of the *Angiospermatophyte*, the *Amentiflorae* have a peculiar importance. Concerning this question PRAGLOWSKI (1962, p. 46) wrote the following: „I have added a few lines on some exotic amentaceous pollen types. They may perhaps be of interest to taxonomists and to paleobotanists dealing, for example, with the pollen flora of Upper Cretaceous." In a previous paper (KEDVES, 1979) the SEM results of the following genuses were summarized: *Corylus, Ostrya, Carpinus, Casuarina.* This will be completed by the present paper, with the results of the *Myrica, Gale* and *Betula* genus. In this way, if not in all details, but we will have a general knowledge about this question.

Materials and Methods

Essentially the same published previously with the difference that the pictures were taken in the Electron Microscope Laboratory of the Institute of Biophysics of the Biological Center of the Hungarian Academy of Science on a JEOL-100B JEM-ASID scanning supplement.

Results

Similarly to the previous publication, the most important morphologic, primarily SEM characteristic features are summarized in a table.

Species	Coni basis	No. coni per μm^2	Stries	Diameter, μm	Prominent germ.
		Myrica			
M. cerifera	0.3—0.35	3—4	—	25—32	±
		Gale			
G. palustris	0.3—0.4	2—3	—	22—28	±
		Betula			
B. verrucosa	0.2—0.4	2—3	+	22—26	±
B. albo-sinensis	0.2—0.3	4—5	±	28—37	+
B. nana	0.2—0.3	2—3	±	20—27	+
B. nigra	0.2—0.3	2—3	±	27—34	+
B. pendula	0.2—0.3	3—4	+	25—30	+
B. chinensis	0.2—0.3	3—4	±	34—37	±
B. papyrifera	0.15—0.2	2—3	+	30—36	±
B. pubescens carpathica	0.2—0.3	4—5	+	27—35	±
B. grossa	0.2—0.3	3—5	+	25—32	±
B. mandschurica	0.2—0.3	2—3	±	24—28	+
B. ermani	0.2—0.3	3—4	+	32—44	±
B. davurica	0.15—0.2	2—3	+	27—37	±
B. lenta	0.2—0.3	2—3	±	25—32	±
B. pubescens urticifolia	0.2—0.3	2—3	+	32—43	±
B. humilis	0.3—0.35	3—4	+	19—24	±
B. x aurata	0.15—0.2	3—4	+	27—32	±
B. x intermedia	0.2—0.3	3—4	+	25—32	—

The most important results are as follows:

The surface ornamentation of the species investigated from the *Myrica* and *Gale* genuses alike are simple coni, without short striae. There is no significant difference in the diameter of the coni basis, but the number of coni per square micron is different. But it must be emphasized that these characteristic features have their variation, so this evaluation must be taken into consideration with criticism.

The *Betula* genus is heterogeneous in palynological point of view, but as common characteristic feature the submicroscopic coni on short striae may be emphasized.

On the basis of the coni number per square micron the following groups may be established:

1.1, 2—3 — *B. verrucosa*
B. nana
B. nigra
B. papyrifera
B. mandschurica
B. davurica
B. lenta
B. pubescens urticifolia

1.2, 3—4—*B. pendula*
B. chinensis
B. ermani
B. humilis
B. x aurata
B. x intermedia
1.3, 3—5—*B. grossa*
1.4, 4—5—*B. albo-sinensis*
B. pubescens carpathica

It is worth mentioning that the two examined subspecies of *B. pubescens* are different in this point of view.

When we take for basis the diameter of the coni, the sequences are as follows:

2.1, 0.15—0.2 — *B. papyrifera*
B. davurica
B. x armata
2.2, 0.20—0.3 — *B. albo-sinensis*
B. nana
B. nigra
B. pendula
B. chinensis
B. pubescens carpathica
B. grossa
B. mandschurica
B. ermani
B. lenta
B. pubescens urticifolia
B. x intermedia
2.3, 0.2—0.4 — *B. verrucosa*
2.4, 0.3—0.35 — *B. humilis*

Noteworthy, the two subspecies of *B. pubescens* are identic, but the two hybrids which where identic in the previous sequence, in this case are different.

Taking into consideration the two characters, the following species are in the same group:

1.1×2.1 *B. papyrifera*
B. davurica
1.1×2.2 *B. nana*
B. nigra
B. mandschurica
B. lenta
B. pubescens urticifolia
1.1×2.3 *B. verrucosa*
1.2×2.1 *B. aurata*
1.2×2.2 *B. pendula*
B. chinensis
B. ermani
B. x intermedia
1.2×2.4 *B. humilis*
1.3×2.2 *B. grossa*
1.4×2.2 *B. albo-sinensis*
B. pubescens carpathica

But when we compare the light microscopic morphological characteristic features with the SEM characters, the conclusions are not unianimous. Of these the following may be emphasized:

1. The pollen grains of *B. humilis* in comparison to the other studied species are relatively small in size, and the total SEM characteristic features are also different. *B. grossa* separates well by its SEM characteristics, but its size is average. The two species with the greater size *(B. ermani, B. pubescens urticifolia)* have different SEM sculpture except the diameter of the coni basis.

2. Regarding the germinal area, the hybrid *B. x intermedia* may be accentuated because between the examined species only in this case the germinal area was not prominent, but the total SEM characteristics are not different from the others. Based on our present knowledge, the prominent germinal area is generally connected with more or less characteristic striae, except the *B. pendula, B. chinensis* and *B. lenta.*

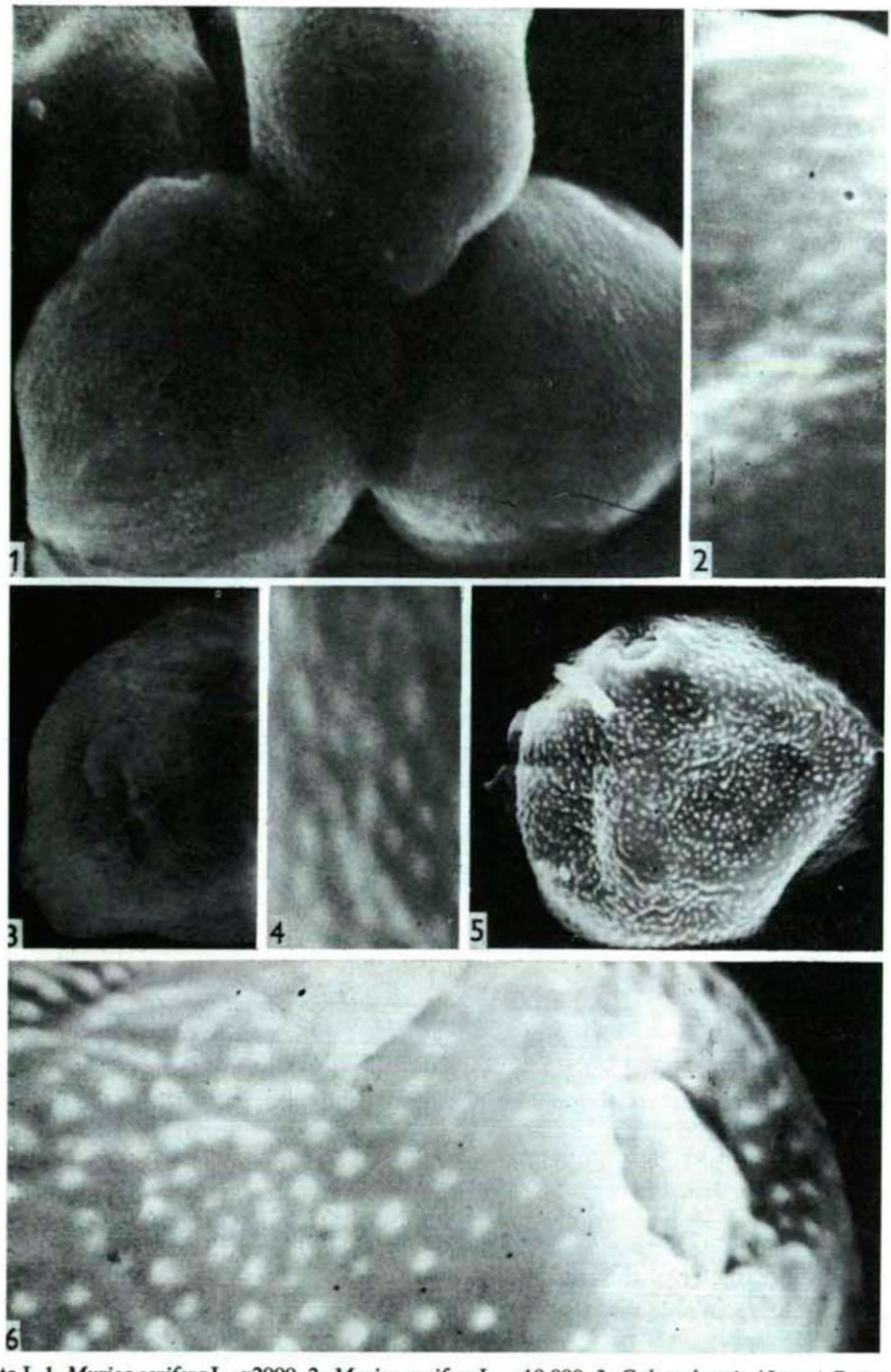

Plate I. 1. *Myrica cerifera* L., x2000. 2. *Myrica cerifera* L., x10 000. 3. *Gale palustris (Lam.)* CHEVAL., x2000. 4. *Gale palustris (Lam.)* CHEVAL., x10 000. 5. *Betula verrucosa* EHRH., x2000. 6. *Betula verrucosa* EHRH., x10 000.

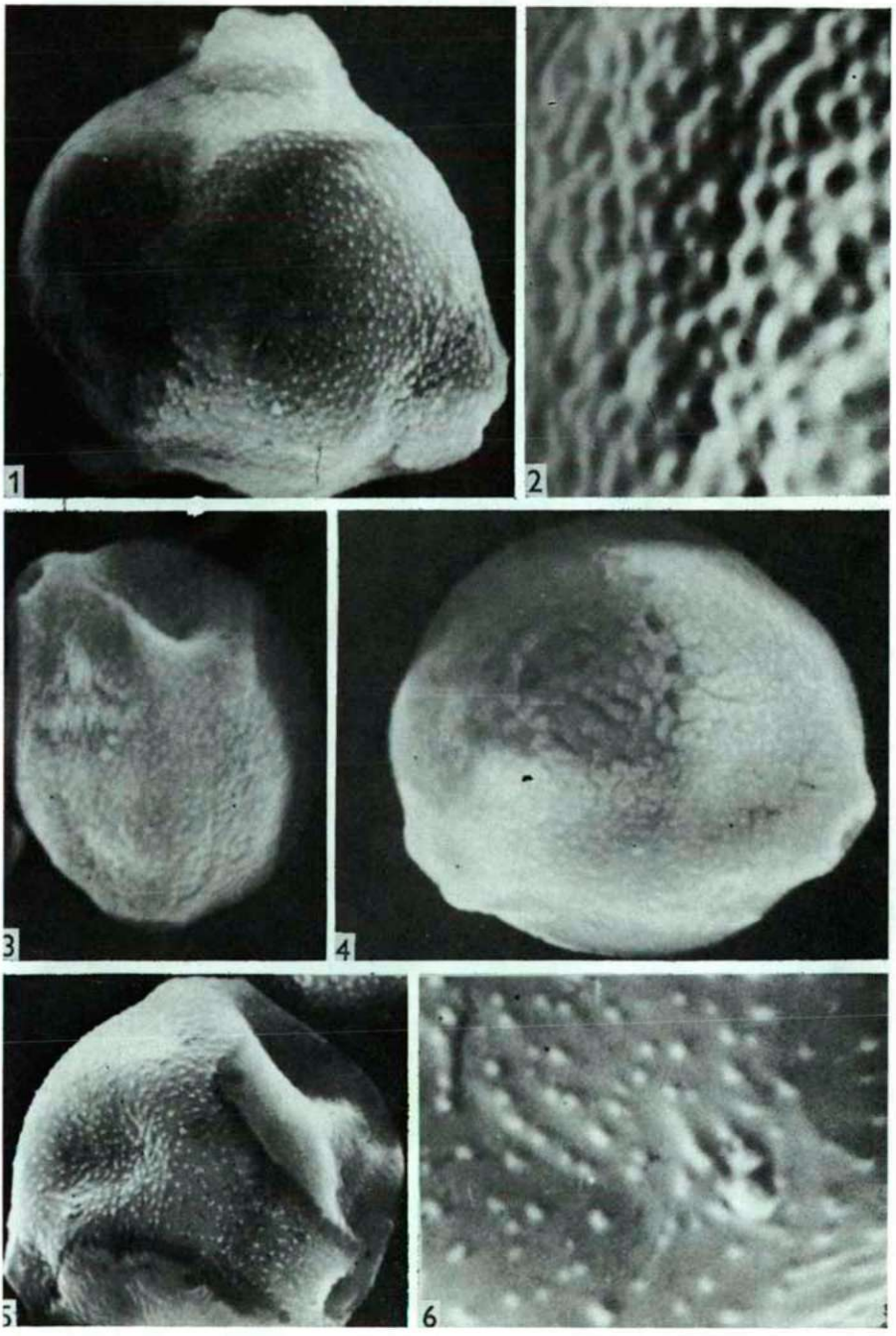

Plate II. 1. *Betula albo-sinensis* BURK., x2000. 2. *Betula albo-sinensis* BURK., x10 000. 3. *Betula nana* L., x2000. 4. *Betula nigra* L., x2000. 5. *Betula pendula* RORTH., x2000. 6. *Betula pendula* RORTH., x10 000.

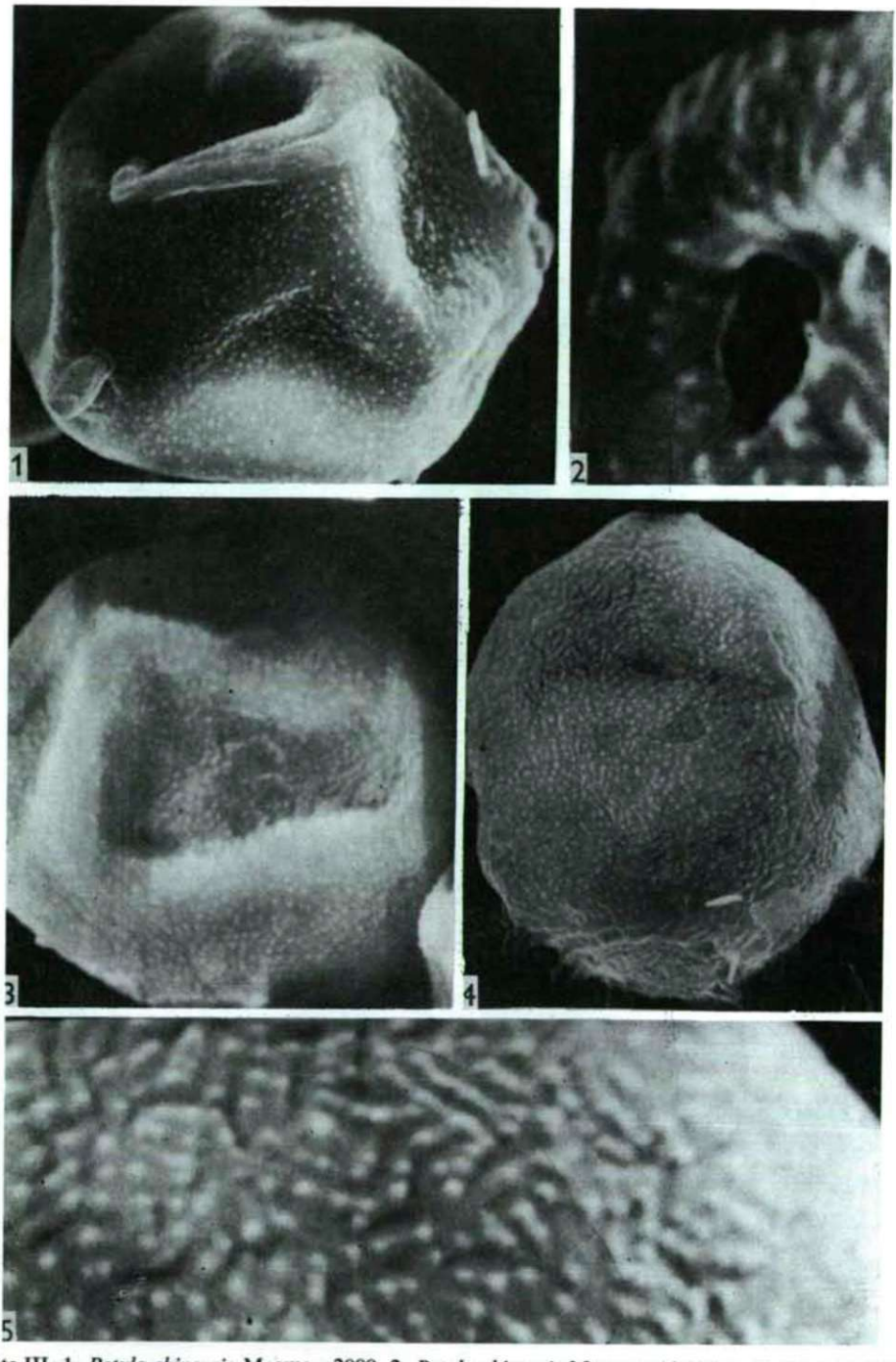

Plate III. 1. *Betula chinensis* MAXIM, x2000. 2. *Betula chinensis* MAXIM, x10 000. 3. *Betula papyrifera* MARSH, x2000. 4. *Betula pubescens* EHRH. *subsp. carpathica* (WILLD.) ASCHERSON et GRAEBNER, x2000. 5. *Betula pubescens* EHRH. *subsp. carpathica* (WILLD.) ASCHERSON et GRAEBNER, x10 000.

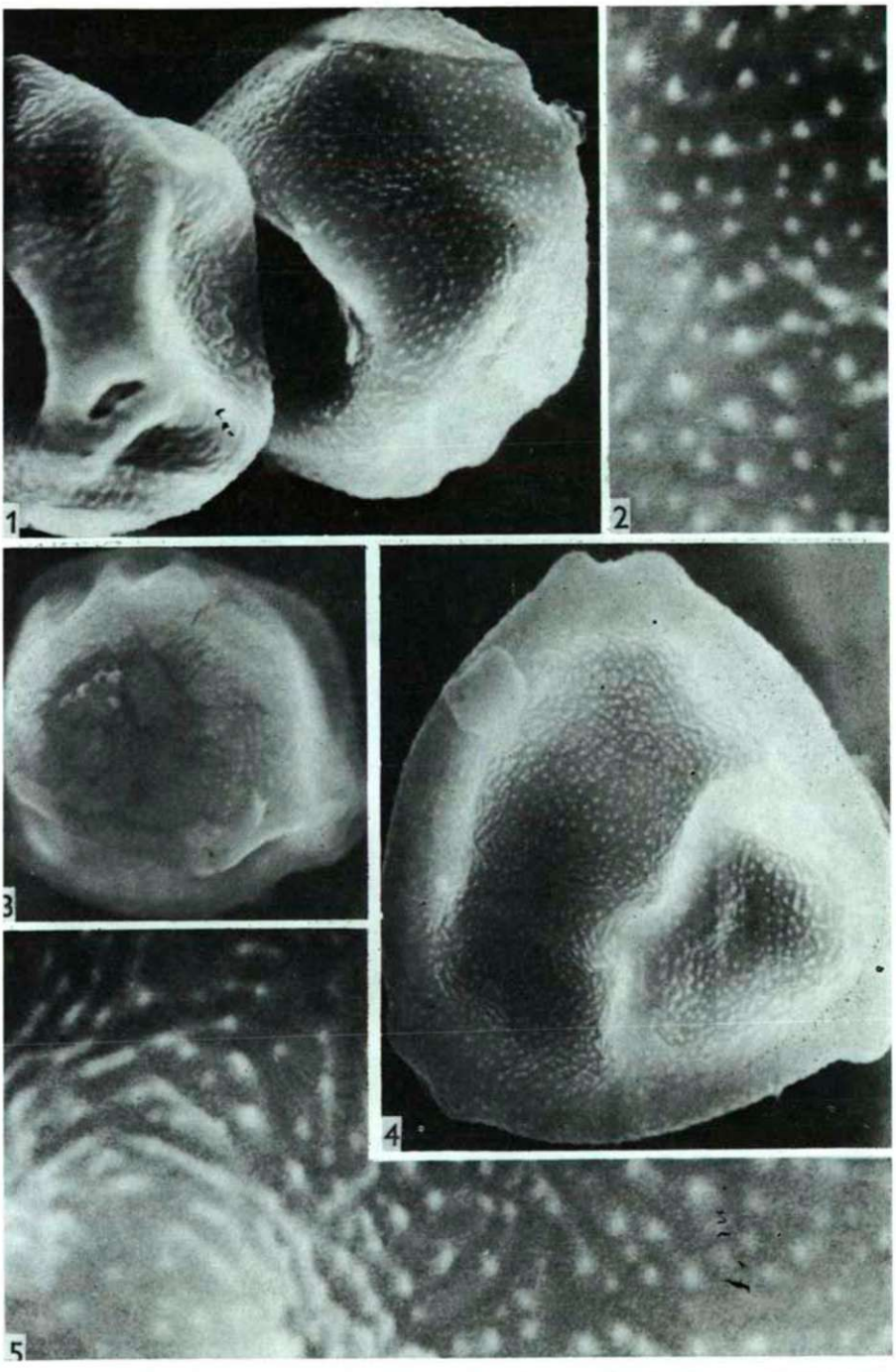

Plate IV. 1. *Betula grossa* SIEB. et ZUCC., x2000. 2. *Betula grossa* SIEB. et ZUCC.,x10 000. 3. *Betula mandschurica (Regel)* NAKAI, x2000. 4. *Betula ermani* CHAM., x2000. 5. *Betula ermani* CHAM., x10 000.

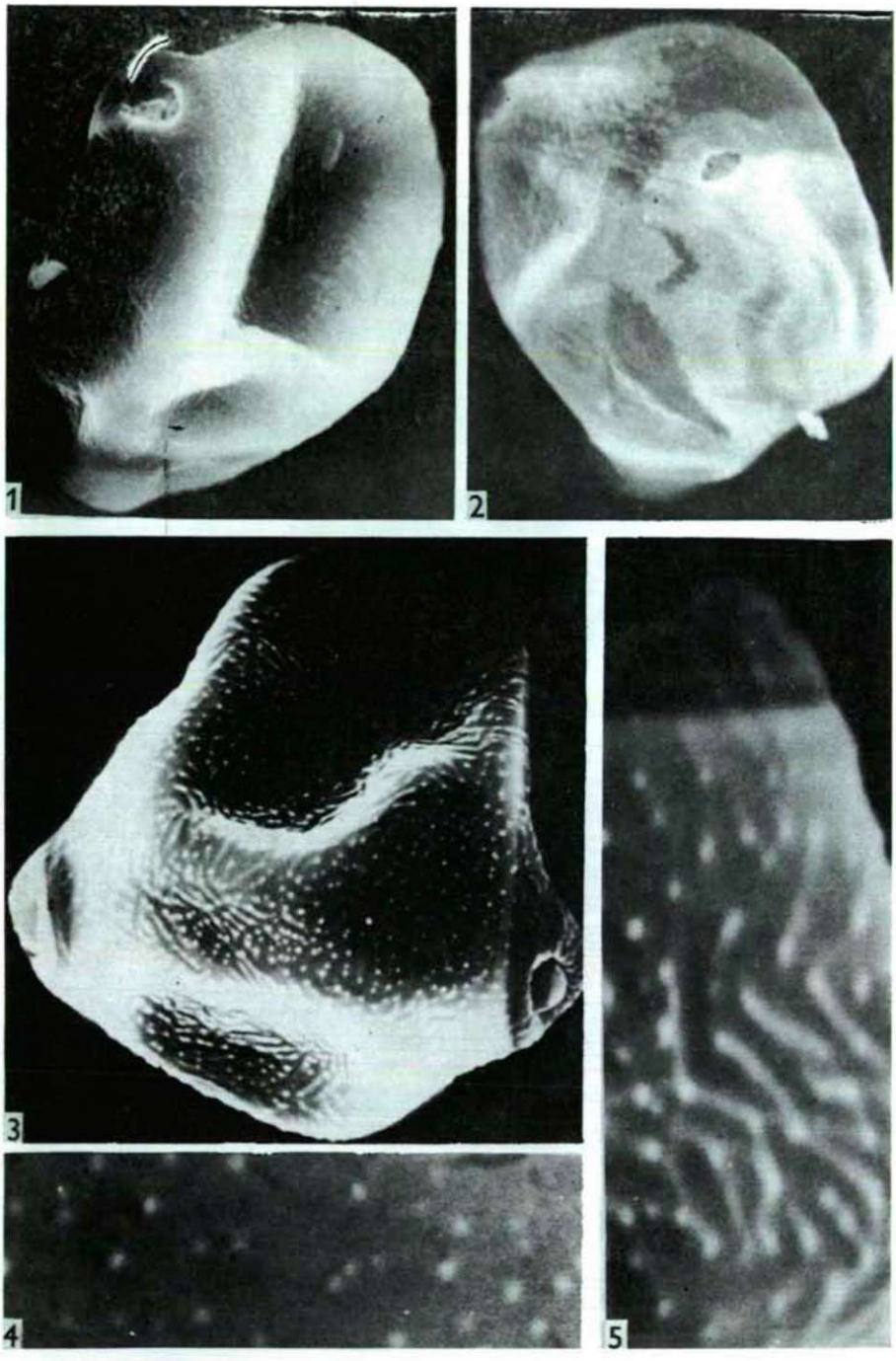

Plate V. 1. *Betula davurica* PALL., x2000. 2. *Betula lenta* L., x2000. 3. *Betula pubescens* EHRH. *var. urticifolia* REGEL, x2000. 4. *Betula pubescens* EHRH. *var. urticifolia* REGEL, x10 000. 5. *Betula pubescens* EHRH. *var. urticifolia* REGEL, x10 000.

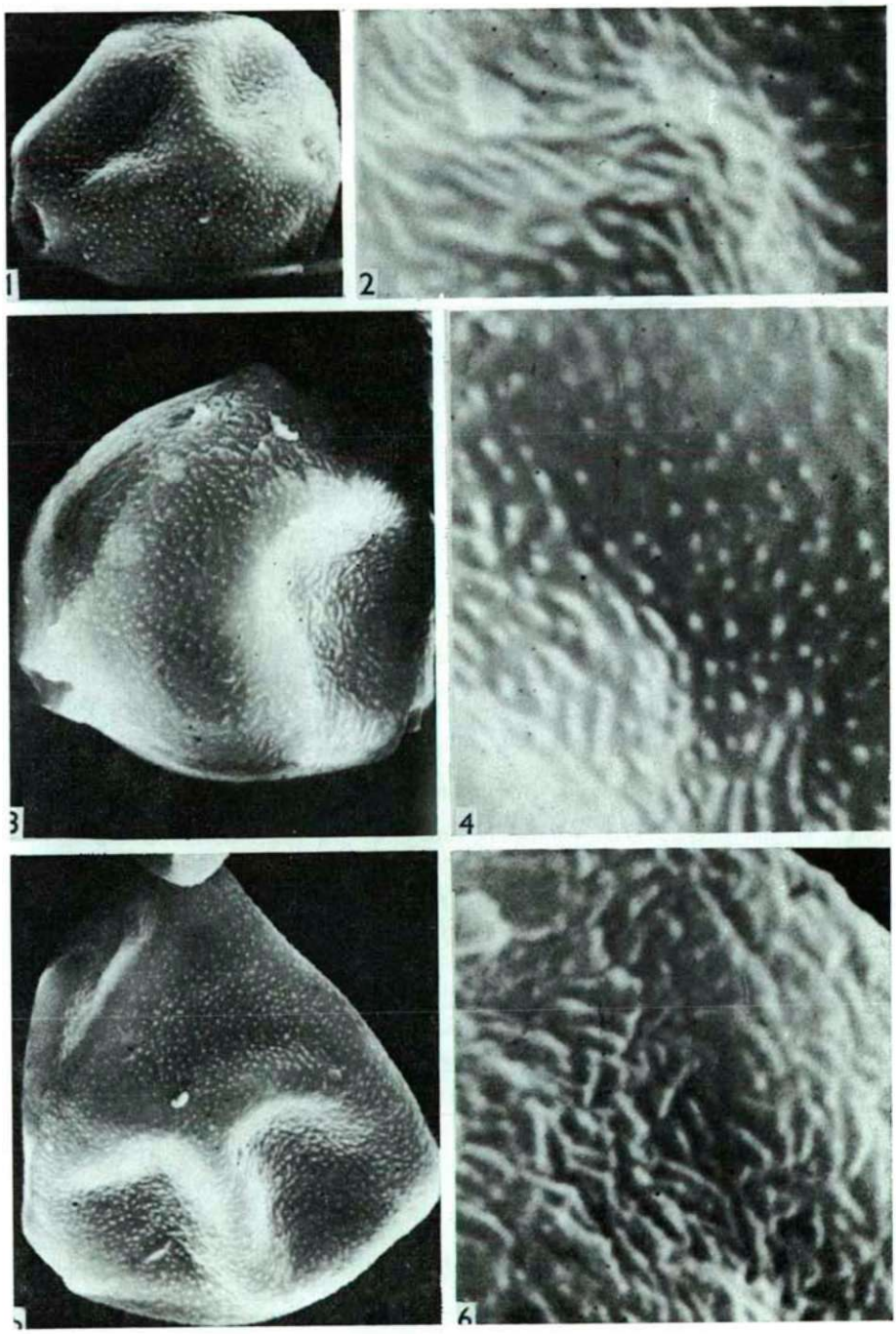

Plate VI. 1. *Betula humilis* SCHRANK, x2000. 2. *Betula humilis* SCHRANK, x10 000. 3. *Betula x aurata* BORKH., x2000. 4. *Betula x aurata* BORKH., x10 000. 5. *Betula x intermedia* THOMAS ex REICHB., x2000. 6. *Betula x intermedia* THOMAS ex REICHB., x10 000.

Discussions

Based on our present data and completed with those previously published, it may be concluded that on the taxonomic or other evaluation of the pollen morphological characteristic features it is necessary to be careful because some previously con-

cepts taken as general need to be modified. So the striae (suprategillar crest; PRAGLOWSKI, 1962, ridges, TAKEOKA and STIX, 1963) are not exclusively the characteristic features of the *Betula* genus, this may occur in other genuses too, for example, *Ostrya, Carpinus, Corylus* and *Casuarina* pro parte. The relations between the TEM and SEM data are not always unianimous either. In this point of view as primitive example the *Juglandaceae* and *Myricaceae* may be emphasized, where the simple coni is connected with granular infratectum. Similarly the rather peculiar infratectum is also suitable for taxonomic and evolutionary evaluations. The present results also support the necessity of the electron microscope investigations for more exact palynological evaluations.

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