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Scanning electron microscopic analysis of the seed surface in wild and cultivated petunias (Petunia axillaris Juss. and Petunia hybrida hort. Vilm.)

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Abstract

The seed surfaces of wild and cultivated petunias were analyzed by SEM. The sculpturing of the seed surface was similar in all forms analyzed.

INTRODUCTION

Scanning electron microscopy (SEM) is best suited for examining structural features in various biological objects (Kessel and Smith, 1976). It was extensively used for analyzing the ultrastructure of pollen grain surfaces and was found very helpful in the elucidation of taxonomic relationships (Foggle, 1977; Martens and Fretz, 1980; Kocoń and Muszyński, 1982). There is, however, very little data in literature concerning application of SEM to study the structure of the seed surface (Kessel and Smith, 1976; Kuźniewska, 1980). The last author analyzed the structure of the seed surface in *Saxifraga*, and described such details as warts, which were not seen in light microscopy.

MATERIAL AND METHODS

Seed samples of four cultivars of diploid petunias (*Petunia hybrida hort.* Vilm.) 'Koronkowy Welon', 'Zorza Wieczorna', 'Rotes Meer', and 'Tango', of tetraploid subspecies *superbissima*, and of the wild *Petunia axillaris* Juss., were taken for analysis.

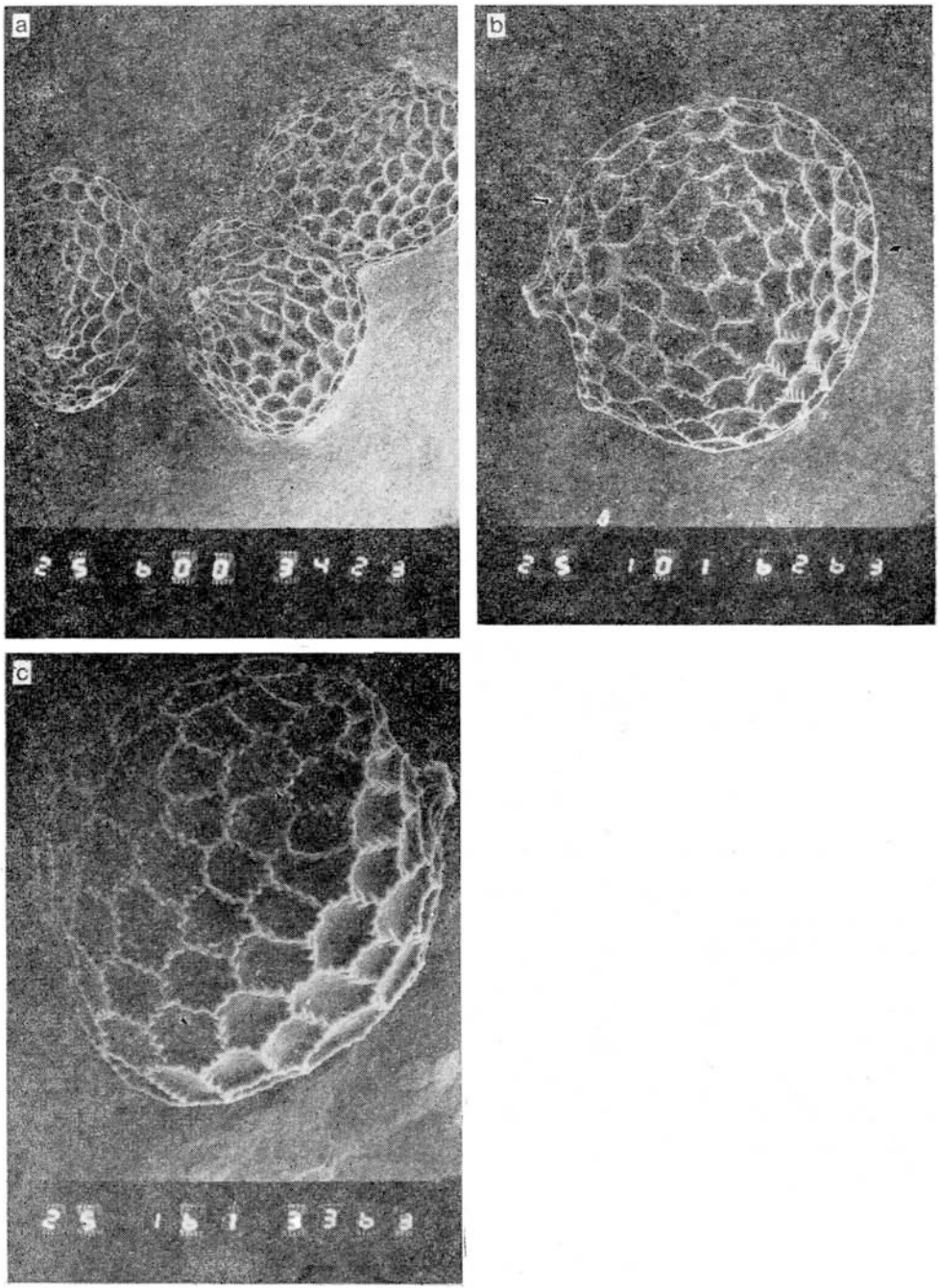

Fig. 1. The structure of the seed surface in petunias. a — *Petunia hybrida hort.* Vilm. cv. 'Koronkowy Welon' (60×); b — *Petunia hybrida hort.* Vilm. *superbissima* (100×); c — *Petunia axillaris* Juss. (160×)

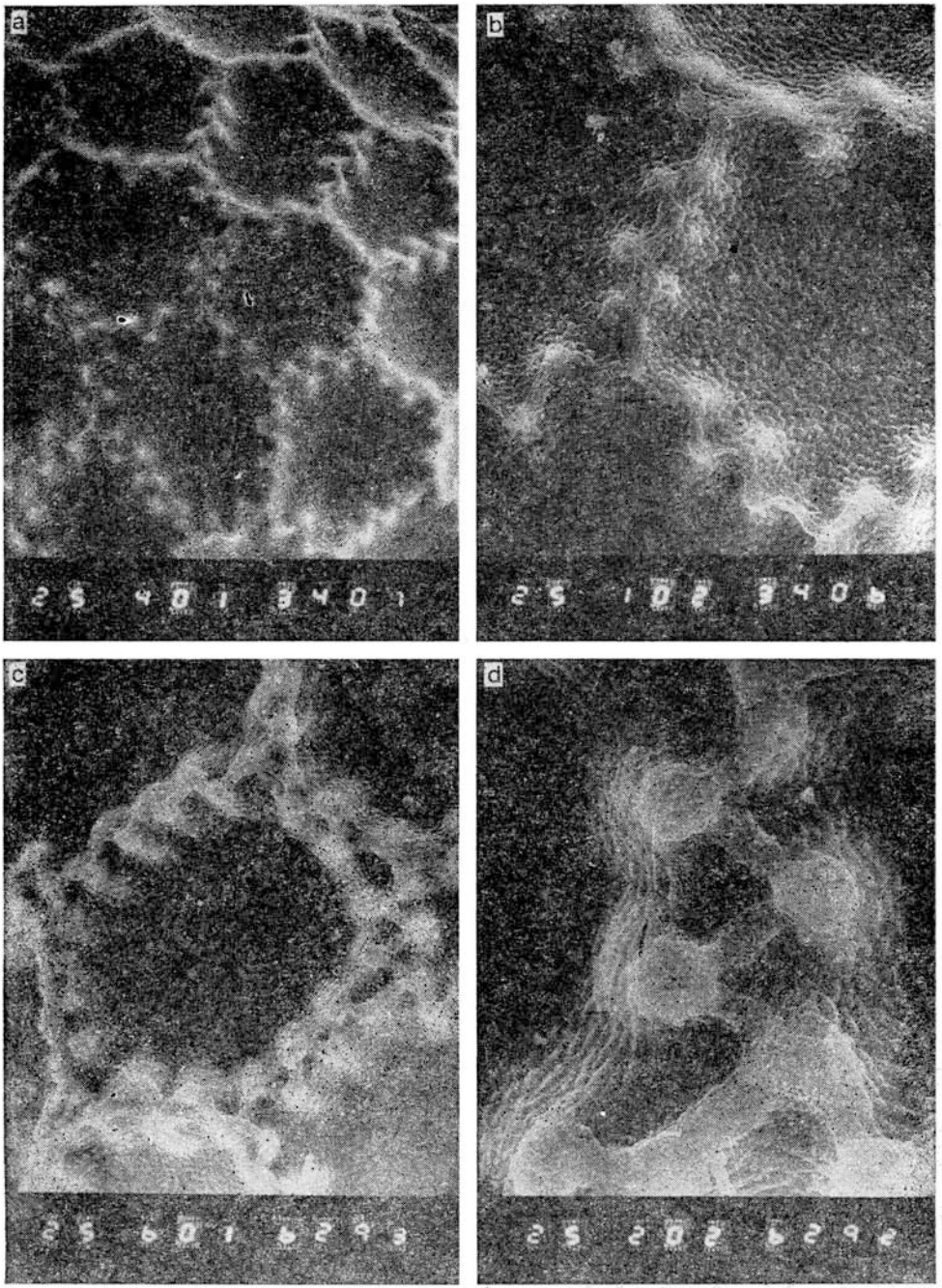

Fig. 2. Details of the seed surface in petunias. a — the polygons formed by sinusoidal ridges in cv. 'Rotes Meer' (400×), b — ridges in the same cultivar as in a (1000×), c — a polygon formed by doubled ridges in *P. h. superbissima* (600×), d — detail of the former (2000×)

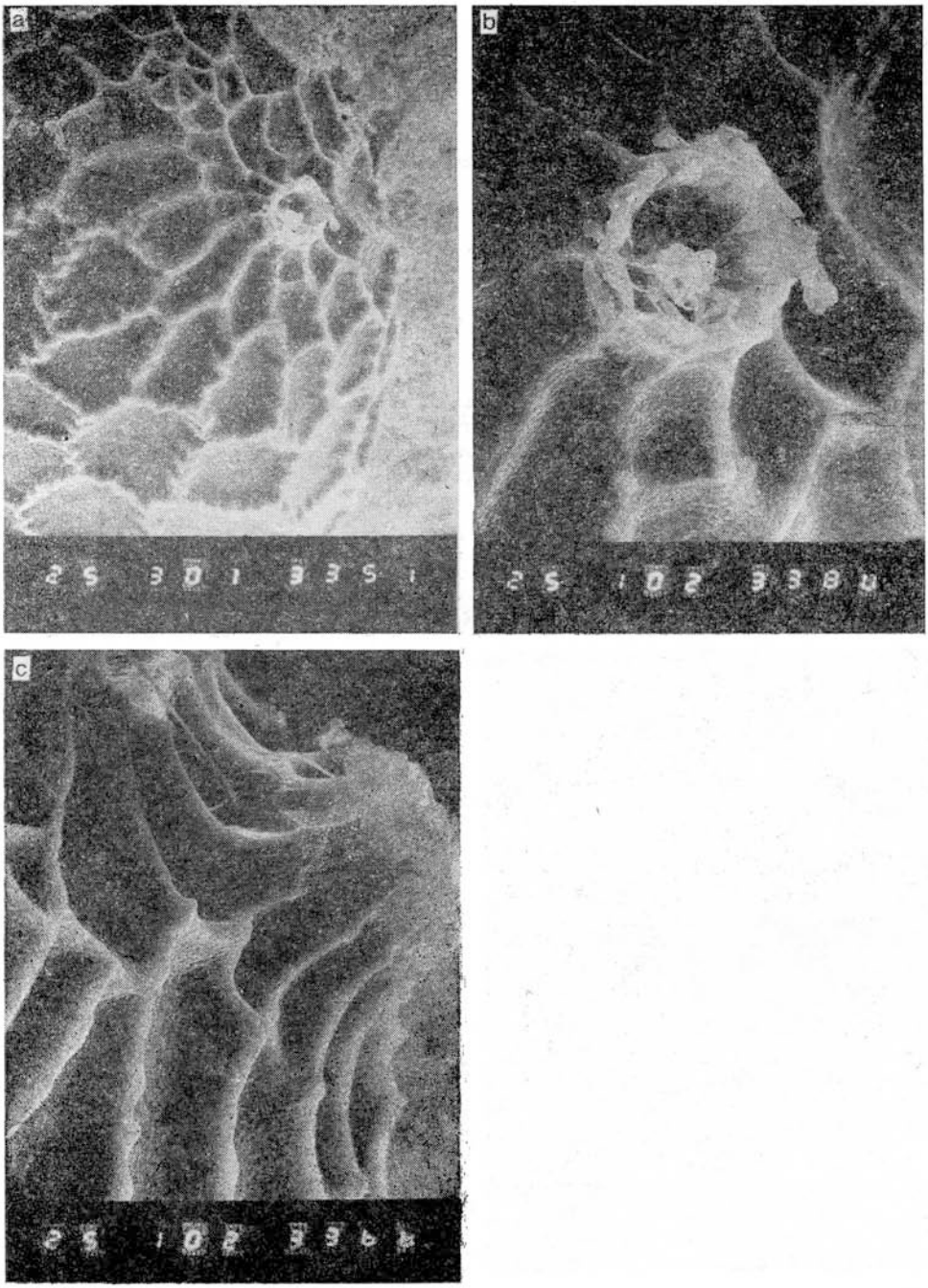

Fig. 3. Hilum in a seed of *P. axillaris* Juss. a — the hilum resembling a cone, and a micropyle surrounded by triangular polygons close to the hilum (300×), b — a detail of the hilum from above (1000×), c — a side view of the hilum (1000×)

Fully ripened and dry seeds were placed on microscopic holders which were previously covered with a silver paint. Then the holders with the seeds were moved into a vacuum duster and covered with carbon and silver at a pressure of 1.33×10^{-3} Pa. The seeds were then observed and photographed in a JSM-35 scanning electron microscope, operated at an electron tension of 25 kV.

RESULTS AND DISCUSSION

The seeds of the analyzed petunias were round or roundish in shape (Fig. 1a, b, c). The structure of the seed surface showed characteristic sculpturing, formed by a regular network of ridges which in turn formed a polygonal mesh (Fig. 2a, b, c, d). The ridges were sinusoidally twisted (Fig. 2a, b). This is in agreement with the observations of Wojciechowska (1972), who observed the seeds of *Petunia hybrida hort.* Vilm. in the light microscope at 25 × magnification. In rare cases, the ridges of two neighbouring polygons were separated by a furrow, showing a doubled structure (Fig. 2c, d.).

The surface of the polygons was covered by a dense layer of protrusions which were rather uniform in size and shape (Fig. 2a). The protrusions resembled small vesicals or warts. Only in the allotetraploid *P. h. superbissima* the protrusions were not so densely arranged and were more shallow than in the diploids.

The hilum was distinct, forming a cone protruding over the surface of the seed (Fig. 3a, b, c).

Although no differences between the analyzed petunias were found, more details were seen in SEM than in LM, thus suggesting the feasibility of SEM analysis of seed surface.

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Struktura powierzchni nasion u zawieratki dzikiej (*Petunia axillaris* Juss.) i ogrodowej (*P. hybrida hort.* Vilm.)

Streszczenie

Za pomocą elektronowego mikroskopu odbiciowego zbadano strukturę powierzchni nasion u kilku odmian zawieratki ogrodowej diploidalnej (*Petunia hybrida hort.* Vilm.) i allotetraploidalnej (*P. h. hort. superbissima*) oraz u gatunku dzikiego diploidalnego (*Petunia axillaris* Juss.). Nie stwierdzono różnic między porównywanymi nasionami.