PHENOTYPE OF SOME MICROMORFOLOGY OF SOME *PAPAVERACEAE* SPECIES EXPRESSED AS PROTECTIVE SEMINAL LAYER

CLAUDIA VORNICEANU, NAELA COSTICĂ, ION I. BĂRA

Abstract: The present paper represents a contribution to the identification of new descriptive criteria and to the detection of the micromorphological specificity of the testa's epidermal cells at the seeds that belong to the following four *Papaveraceae: Chelidonium majus* L., *Glaucium flavum* Cr., *Papaver rhoeas L.* şi *Papaver somnifemm* L.

Key words: *Papaveraceae*, seeds, testa, epidermis, micromorphological specificity

INTRODUCTION

The morphology and the seed structure of *Papaveraceae* are detailed in classical botanical and vegetal anatomy studies /1,4,5/. With references to the seminal layer, a conclusion came up together with the application of the scanning electronic microscopy in the seed issued researches: the description of the layer micromorphology is useful in taxonomy, allowing some evolutionary interpretations, too. Moreover, the research of the fossil seed's micromorphology benefits of a high interest (Boulter, 1986, cf. Barthlott, 1981 / 3 /.

The descriptive terminology for the micromorphological diversity of the epicuticular structures was set up by Metcalfe, Chalk (1979) and Barthlott (1981) /cf. 3/.

In the micromorphological analysis, a special attention is granted to the cuticle. Up to present, there were elucidated a series of details regarding: its structure and chemical composition (Bowen and Walton, 1988; Riederer şi Schonherr, 1988), water permeability (Becker et al. 1986,) and its sorption properties (Riederer and Schonherr 1986; Schonherr and Riederer, 1986 /2/. In the specialized literature, the seed's examination at *Papaveraceae* is scarcely broached. Disparate information regarding this issue is presented with the occasion of studying some particularities of the capsule's differentiations and re-differentiations, at some species of Papaveraceae /7/. Other preoccupations are concerning descriptions of the micromorphology of the seeds that belong to plants from different botanic families.

MATERIAL AND METHOD

The analyzed material was represented by the seeds that belong to four species of *Papaveraceae: Chelidonium majus* L., *Glaucium flavum* Cr., *Papaver rhoeas L.* şi *Papaver somnifemm* L. It was harvested, from the experimental cultures of the year 2001. The seeds at *Papaveraceae* are small, reniform with reticulate or smooth tegument where the hilum may be observed; the seeds have a developed endosperm and the embryon located in it. /1/

On the surface of the seminal tegument, it may be observed at *Chelidonium* species a formation named elayosom, a strophyola type where oils are accumulated.

At *Papaver somniferum*, the seeds are small, reniform with a network like alveolar surface, with a blue gray color, with the following dimensions: L – 1 / 1,5 mm, l - 0,8/1mm, g - 0,6/0,8 mm.

The seeds of *Papaver rhoeas* have a reniform profile, slightly curved, narrowed towards one of the extremity; the seeds' surface is strongly and obviously reticulated, the lobes being bigger and with an almost squared shape; the walls that separate the lobes are slightly undulated.

The seeds were prepared for examination according to the classical working procedure used in the scanning electronic microscopy /6/: the samples were dehydrated through physical methods, stick on aluminum supports, thereafter plated with silver. The plating procedure was realized with a plating system provided by the Electronic Microscopy Laboratory. This laboratory belongs to the Faculty of Light Industry from "Gh. Asachi" Technical University of Iasi. Subsequently, the seeds were examined at different magnifications, on their lateral, dorsal and ventral sides.

The graphs provided by the Tesla BS-300 scanning electron microscope were undertaken over a high resolution monitor and they were photographed with a Praktica camera. Representative photos are grouped in four plates.

RESULTS OF THE OBSERVATIONS

Up to present, in the specialized literature, the description of the morphological features at the seeds that belong to the examined *Papaveraceae* species is a classical one. Within these descriptions there were noticed the seeds' shape, the aspect of the tegument during the process of observance with the magnifying glass, the presence of the fleshy annexes /1/. With reference to the micromorphology analysis at these seeds, there were not identified special studies within the consulted bibliography. In order to fill in the morphological picture and to provide exact identification landmarks for *Papaveraceae*, we are suggesting to use the following three-dimensional analysis criteria:

- Shape and profile of the epidermal cell of the testa
- Aspect of the external periclinal walls of the epidermal cell of the testa
- Aspect and thickening level of the anticlinal walls of the epidermal cell of the testa
- Aspect of the cuticle that covers the external surface of the epidermal cell of the testa
- Aspect of the epicuticular formations that are on the surface of the epidermal cell of the testa
- Depth of the concavity which is on the ventral side of the seeds
- Orientation of the epidermal cells of the testa related with the long axle of the seeds
    - At the side of the micropyle-hile axis (on the ventral side)
    - Opposite the micropyle-hile axis (on the dorsal side)

For a synthetic and easy to follow presentation, we are making up the following table that includes the results of our examinations made on the basis of the above criteria:

CONCLUSIONS

At a macromorphological level, the seeds of the analyzed *Papaveraceae* species differ through general shape, dimensions, volume and depth of the concavity from the ventral side, flexion level of the dorsal side and presence/absence of the flesh annexes.

From a micromorphological point of view, the seeds of the analyzed species are clearly differentiated through the identified and analyzed criteria of the present paper. It may be observed a specificity of the micromorphological features of the testa's cells, at a species level. It may be noticed that the typical presentation of the epidermal cells of the testa is observed and representative at the dorsal side of the seeds.

A comparative micromorphological analysis of the seeds that belong to some species of *Papaveraceae* (*Chelidonium majus, Glaucium flavum, Papaver rhoeas, Papaver somniferum)*

Comparison criteria	*Chelidonium majus* Pl.I	*Glaucium flavum* Pl.II	*Papaver rhoeas* PL.III	*Papaver somniferum* Pl.IV
The shape of the epidermal cells of the testa	- usually, it is a pentagonal one, rarely a hexagonal one	- usually it is a rectangular one	- usually it is a rectangular one	- a pentagonal, or a hexagonal one
The profile of	Linear	Undulate	Visible undulate	Slightly undulate

Comparison criteria	*Chelidonium majus* Pl.I	*Glaucium flavum* Pl.II	*Papaver rhoeas* PL.III	*Papaver somniferum* Pl.IV
the anticlinal walls				
The thickness of the anticlinal wall	Thin	Relatively thick	Thick	Relatively thick
The concave level of the periclinal walls	Reduced	Moderate	Accentuate	Moderate
The aspect of the cuticle	Smooth	Slightly striated on a general examination; frequently granulated on a detailed examination	Frequently granulated	Slightly striated on a general examination; frequently granulated on a detailed examination
The aspect of the epicuticular formations	Rare granulations	Rare granulations	Rare granulations	Without epicuticular formations
The concavity from the ventral side of the seeds	Not to obvious; there are present elayosoms	Slightly represented	Deep and narrow	Large and not to deep
The orientation of the epidermal cells of the testa related with the long axis of the seeds, on the ventral side	Cells with the long diameter parallel with the long axis of the seeds	Cells with the long diameter perpendicular on the long axis of the seeds	Cells with the long diameter perpendicular on the long axis of the seeds	Approximately isodiametric cells
The orientation of the epidermal cells of the testa related with the long axis of the seeds, on the dorsal side	Oblong cells, with the long diameter parallel with the long axis of the seeds	Less oblong cells, with the long diameter perpendicular on the long axis of the seeds	Rectangular cells, with the long diameter parallel with the long axis of the seeds	Approximately isodiametric cells

BIBLIOGRAPHY

Anghel, Gh., Bâlteanu, Gh., Bucurescu, N., Burcea, P., Teodorescu, Doina, Natalia Vasiliu, 1962. *Îndrumător pentru determinarea semințelor de plante cultivate.* Ed. Agro-Sivică, Bucureşti

Barthlott, W., 1989. *Cuticular surfaces in plants*. Progess in Botany. 51: 49 -54

Barthlott, W., 1981. *Epidermal and seed surface caracters of plants: systematic applicability and some evolutionary aspects*. Nordic J. Bot., 1: 345 – 355

Corner, E.H. H., 1976. *The seeds of dicotiledons. Vol. I – II*, Univ. Press, Cambridge

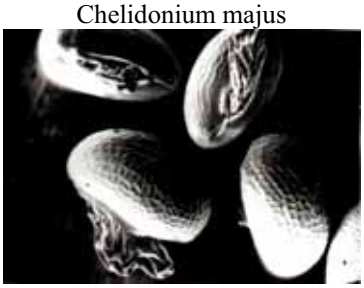
Netolitzsky, F., 1926. *Anatomie der Angiospermen Samen* In Handbuch der Pflanzenanatomie, 10, Abt. II, 2 Teil, Borntraeger, Berlin

Ploaie, G.P., Petre, Z., 1979. *Introducere în microscopia electronică cu aplicaţii în biologia celulară şi moleculară.* Ed. Acad. Române, Bucureşti

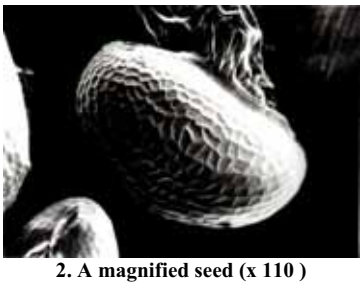
Toniuc, Angela, 1998. *Micromorphological consideration of seed surface in some Campanula species in Romania.* Rev. Roum.Biol., ser. Bot, 43 (2):

Vântu, Smaranda and Costică, Naela, 1998. Histological aspects of differentiation and redifferentiation in *Papaver somniferum and Papaver pseudoorientale.* Bul. Gr. Bot., Iaşi, **7**:59-63.

Plate I
Micromorphology of the seeds at Chelidonium majus



1. Seeds – general aspect (x 60)



2. A magnified seed (x 110)

3. Seminal tegument – detail (x 380)

Plate II
Micromorphology of the seeds at Glaucium flavum

1. Seeds – general aspect (x 60)

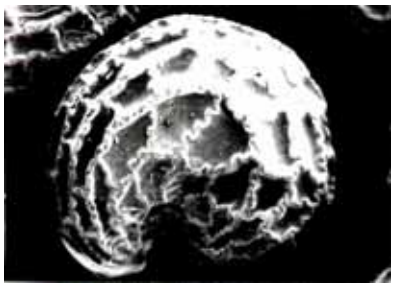
2. A magnified seed (x 120)

3. Seminal tegument – detail (x 360)

Plate III

Micromorphology of the seeds at Papaver rhoeas

1. Seeds – general aspect (x 103)

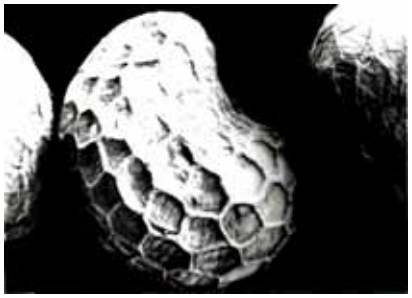


2. A magnified seed (x 240)

3. Seminal tegument – detail (x 570)

Plate IV

Micromorphology of the seeds at Papaver somniferum



1. Seeds – general aspect (x 70)

2. A magnified seed (x 140)

3. Seminal tegument – detail (x 540)