ULTRASTRUCTURAL CHANGES IN THE CELLS OF RHIZOMES OF
POLYPODIUM VULGARE L. AFTER CONSECUTIVE DEHYDRATIONS

AGNIESZKA BAGNIEWSKA-ZADWORNA and ELŻBIETA ZENKTELER
Adam Mickiewicz University, Faculty of Biology, Laboratory of General Botany, al. Niepodleglosci 14, 60-241 Poznań, Poland

The aim of our study was to investigate the influence of consecutive dehydrations and rehydrations on cell survival. The material used for the study was rhizomes of *Polypodium vulgare*. This poikilohydric fern is well adapted to low water conditions. The rhizomes were dehydrated 3 times in a hypertonic solution of mannitol (20%), and subsequently rehydrated. Half of the rhizomes were preincubated in abscisic acid (ABA, 2 mg l⁻¹). Rhizome fragments from each combination were fixed with a 4% glutaraldehyde and 4% paraformaldehyde mixture (1:1), and postfixed with 2% osmium tetraoxide for 2h at room temperature. They were then dehydrated in a graded acetone series and embedded in Spurr’s resin. Ultra-thin sections were cut using an ultramicrotom (Leica Reichert, Austria) and contrasted with uranyl acetate and lead citrate (10'/10'). They were examined using a JEM 1200 EX II (Jeol, Japan) transmission electron microscope.

Two types of cells were observed – those of the vascular bundle, and parenchymatous cells of the cortex with starch-containing plastids. The rhizomes are polistelic: the endodermis, pericycle, phloem and xylem are visible in each stele. The endodermis consists of elongated cells with suberized Casparian Strips along its anticlinal walls. The pericycle is 1 or 2-layered. The sieve elements of the phloem are centrifugally distributed. Xylem vessels with spiral thickenings occupy the central part of the vascular bundle.

After the first dehydration, we observed normal plasmolysis and shrinkage of cells. After the third dehydration, some symptoms of apoptosis were visible, e.g. condensation of the chromatin on the flange of the nucleus, and degradation of cytoplasmic structures and internal membranes. The parenchymatous cells were damaged to a greater degree than the vascular bundle cells. The starch grains in the amyloplasts had declined in number, and the structure of the starch had probably altered to phenolic compounds. This was a crucial moment for cell survival, but the cells’ reactions to the treatments varied. In some cells, the damage was limited or non-detectable. Furthermore, we found that ABA-treated rhizomes showed a smaller degree alteration than untreated ones.