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Organization of the Microtubule Cytoskeleton during the Formation of a Casparian Band in Root Endodermal Cells of *Allium cepa*

This thesis is focused on the process of Casparian bands initiation in radial and transverse cell walls of the root endodermis of *Allium cepa*. The Casparian band is characterized by a chemical modification of the cell wall in the position of the Casparian band followed by the formation of the tight binding of a plasma membrane to the cell wall. We assume that cortical microtubules can play an important role in both processes searching for changes of cortical array during the development of proendodermis and during the foundation of the Casparian band in the endodermis.

The classical method of the microtubules visualisation in roots was modified by the application of microwaves during the process of fixation. The tissues were observed with the fluorescence and confocal microscopy. Image postprocessing and construction of 3D-models were subsequently used.

Proendodermal cells in *Allium cepa* are recognized for the first time among other root cells in the distance of about 2 mm from the root tip. The Casparian band is firstly detected in the distance of about 8 mm from the root apex by means of autofluorescence of the Casparian band. The cell wall of the Casparian band appears wavy on the longitudinal section.

The arrangement of the cortical microtubules during the development of the proendodermal cells, i.e., the endodermal cells was studied. In the distance of about 2 mm from the root tip of *Allium cepa*, extensive bundling of microtubules was observed. Microtubular bundles are arranged parallelly to each other and oriented perpendicularly to the main axis of the root in the early differentiation of the endodermis. In the distance of about 6 mm from the root apex, the cortical microtubular array is reorganized. The bundles are oriented obliquely to the main axis, which is typical for the endodermis with the Casparian band.

The cortical microtubules of the endodermis with created Casparian band are arranged in parallel bundles, which are oriented obliquely to the main axis of the root, forming a helix beneath the plasma membrane. Bundles of the cortical microtubules are concentrated just in the site of depressions of the wavy cell wall. To our knowledge, no information concerning the arrangement of cortical microtubules and its changes during the development of the endodermis was found in literature. The presence of the microtubular bundles in the

depressions of the wavy cell wall of the Casparian band is described in this thesis rather for the first time.

Key words:

Allium cepa, Casparian band, chemical modification, cortical array, cortical microtubules, endodermis, microtubule bundles, proendodermis, tight binding of plasma membrane and cell wall