

Abstract

Apoplastic barriers (exodermis and endodermis) are primarily used to regulate the free movement of substances within apoplast due to modifications of cell walls. While at the anatomical level, the barriers are studied for a long time, only recently the molecular mechanisms that are behind the emergence of these modifications are gradually identified. The most important modifications are Casparian strips that fill the space between the adjacent cells in exodermis and endodermis. Casparian strips are lignin-based structures formed with the help of CASP proteins located in equatorial region of plasmalema (called CSD membrane domain). In addition to CASP proteins, the formation of Casparian strip involves activity of site-specific enzymes of lignin synthesis (PER64 peroxidase, NADPH oxidase RBOHF). In these cell layers shortly after differentiation of Casparian strips, the deposition of suberin occurs between plasmalema and primary cell wall leading to formation of suberin lamellae also serving to block the apoplast. Next step of differentiation is the formation of U-shaped tertiary thickenings that are formed by deposition of secondary cell wall, whose formation mechanism in the root endodermis is not yet well-known. Processes responsible for formation of apoplastic barriers are thus related to the synthesis and deposition of lignin, suberin and secondary cell walls. The function of apoplastic barriers in regulation of root solute uptake is related also to the polarity of membrane transporters occurrence (lateral polarity of plasmalema) and other molecular mechanisms that are summarized in this thesis.

Key words

Casparian strips, Suberin lamellae, Apoplast, Apoplastic barrier, Exodermis, Endodermis, Lignin, Suberin