

## **ABSTRACT**

The formation of plant root system is an important ecophysiological and agronomical parameter and also an actual topic of developmental plant biology. Lateral roots are its very important part which creates majority of the main absorbent portion of the plant surface in the rhizosphere. One of the few described mutants (except the model plant *Arabidopsis thaliana*) with impaired development of lateral roots in early postembryonic development is maize (*Zea mays*) mutant *lrt1* (*lateral rootless 1*). Our detailed anatomical-morphological study of *lrt1* provides new insight into LRT1 gene function. We found out that initiation of *lrt1* primordia takes place and is strongly dependent on environmental conditions. The structure of primordia, also their emergence and later development is strongly affected. On the contrary, the main roots do not show so strong influence by this mutation, although some disruptions were found in surface root layers. These disturbances were connected with induced lignification, increased activity of peroxidase and with changes in permeation of root surface.

Changes in permeability of surface layers led us to the issue of apoplastic barriers, what was dealt to the traditional and previously tested another genotype of maize (*Z. mays*). Our work provides a unique insight into the creation of these barriers not only in the context of the whole root system but fills in a most important gap about lateral roots of different orders. Moreover, it summarizes the influence of eight most frequently studied conditions. These conditions caused significant changes in the formation of endodermis and exodermis. The largest differences were observed between short lateral roots. The behavior of long branched lateral roots was very similar to the described characteristics of main roots.

The technique of permeability tests was used during these studies. However, we found out high variability in the results according to kind of tested apoplastic probes. Although this method is often used, there is no comparative study dealing with some conflicting results of some published works yet. This is the reason why we chose the most frequently used candidates of these probes and compared their behavior on two different plant species with differently permeable surface layers. The results were compared and discussed with the outputs of other published work. Our results show the significant effect of plant species, used concentration, time of penetration and individual properties of the apoplastic probe.