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Some aspects of symplasmic communication during somatic embryogenesis of tree fern *Cyathea delgadii*

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Somatic embryogenesis is an asexual way of plant propagation in which the somatic cells differentiate into embryos bypassing the fusion of gametes. The phenomenon mimics many of the events of sexual reproduction and, as such, represents a model for studying the morphological and molecular regulation of the process. So far, for those examinations model plants belonging to spermatophytes have been used. The last achievements showed that the tree fern *Cyathea delgadii* provides an excellent and effective pattern for both the induction and production of somatic embryos (Mikuła et al., 2015). Discoveries that single epidermal cells of *C. delgadii* stipe explants begin to differentiate into somatic embryos opened new fields of studies of the mechanisms controlling the somatic embryogenesis, including an analysis of symplasmic communication during this process. In multicellular organisms intercellular communication is a key factor for coordination of developmental processes. In plants, a system of cell cytoplasm connected by plasmodesmata (PDs) called the symplasm, is a convenient and precise way of information exchange between cells (Wróbel-Marek et al., 2015). Such exchange of signals through PD is called symplasmic communication. Molecules that pass through the PD include ions, some hormones, minerals, amino acids, and sugars but also proteins including transcription factors, and different classes of RNA, and as such, PD can participate in the coordination of plant growth and its development (Marzec and Kurczynska, 2014). It is known that cell differentiation is correlated with the changes in symplasmic communication (Zambryski and Crawford, 2000).

Explants of *C. delgadii* during the culture (methods described by Mikuła et al., 2015) were analysed with the use of low-molecular weight fluorochromes and confocal microscopy. Within the explant, cell distribution of fluorochromes was not uniform and changed spatiotemporally during the culture. The most intense fluorescence signal was detected within the cells which were engaged in somatic embryo formation. They were well distinguished from other cells of the explant. After the division of these cells, daughter cells included in the embryogenic complex showed different patterns of fluorochrome distribution. Some of these cells were characterized by an intense fluorescence signal in comparison to other cells of the complex. In a more advanced culture with well visible somatic embryos at the globular stage of development, the distribution of fluorochromes indicated that the movement of symplasmic tracers between the embryo and the explant tissues had occurred.

The obtained results show that within an explant tissue, differentiation of cells in various directions is correlated with the changes in the plasmodesmata permeability. This suggests that one of the factors controlling cell differentiation in the case of fern somatic embryogenesis, is symplasmic communication and its changes.

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