

Suspension cell cultures as a model for investigation of mitochondria participant in extreme temperatures plant response

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Study of the functioning of intracellular structures using suspension cell cultures allows you to analyze cell response simultaneously at the biochemical, molecular and cytological levels. To date, it is not known whether the mitochondria functioning can influence the choice of a cell stress strategy between an adaptive response and activation of the death process. We used the method of polarographic, fluorescence microscopic and Western blot analysis. With *Arabidopsis*, Winter wheat and Sugar cane cell cultures we revealed that cooperative functioning of complex I and alternative cyanide-resistant oxidase (AOX) provided gradual realizing of cell death process and adaptive plant cell response to temperature stress. At the early death stage cells maintained a high electrochemical potential on the inner mitochondrial membrane, which was a consequence of a disruption of the ATP-synthase function. High rates of respiration were supported by stable AOX activity. If cells could not provide timely detoxification of ROS formed due to high mitochondrial functioning, then it led to the cytochrome c release from mitochondria to the cytosol and further collapse of cell metabolism.

The main publications of authors on the subject of the abstract:

Lyubushkina I.V. et al. Temperatures induces ROS generation and damage to respiratory activity in *Saccharum officinarum* suspension cells // J. of Siberian Federal University. Biology (2021) 14: 354-369. doi:10.17516/1997-1389-0355

Lyubushkina I.V. et al. Mitochondria and cell death in suspension culture of *Saccharum officinarum* L. under subzero temperature treatment // Rus. J. Plant Physiol. (2022) 69: 113. doi: 10.1134/S1021443722060188

Take-home message:

Maintaining a balance between the energy supply of cellular metabolism and the processes of ROS detoxification is one of the key switching points between the ways of adaptation and death of a plant cell under conditions of temperature stress.

