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The impact of reactive oxygen species (ROS) on the induction bioelectric signals in the liverwort *Conocephalum conicum*

Many of the key processes in the plant cell occur by the reactive oxygen species (ROS). The role of ROS as a signaling molecules is extremely important, but still little understood. ROS take part both in the development processes as well as are involved in the response reactions to biotic and abiotic stress.

One of the earliest and quickest plant response to the varying environmental factors is the change of the transmembrane potential. Transmembrane potential changes occur between a few seconds (abiotic stimuli) and a few minutes (biotic stimuli) from the activation of the stimulus. The transport proteins are responsible for the activation of action potential, i.e. ion channels, transporters and pumps involved in the passing / moving ions.

It was proved that hydrogen peroxide (H_2O_2) induces changes in the activity of the channels that are permeable to calcium ions in *Arabidopsis thaliana* and *Vicia faba* and potassium channels in *Arabidopsis thaliana* as well as both calcium and potassium channels in *Lilium longiflorum*. Studies of the hydroxyl radical (•OH) demonstrate that it affects the permeability of the low selective NSCCs-type calcium channels and potassium channels in *Arabidopsis thaliana*, as well as the calcium and potassium channels in maize, peas, clover, wheat and spinach.

The studies that were carried out in this dissertation indicate a similar mode of action for both hydrogen peroxide and hydroxyl radical on bioelectrical response in the liverwort *Conocephalum conicum*. Both ROS molecules triggered either one or a series of action potentials (APs), appearing on the background of slow increase of membrane potential. The difference was noted for the concentration ranges; hydrogen peroxide induced this effect at

concentrations above 10 mM, whereas hydroxyl radical at concentrations higher than 1 mM. Thus, it can be assumed, that both hydrogen peroxide and hydroxyl radical affect the activation of ion channels that are involved in the formation of AP in the cell membrane of the liverwort *Conocephalum conicum*. However, the overall impact of both ROS is too broad to allow indicating their effects on a particular channel. Furthermore, it was demonstrated using the technique of black lipid membranes (BLM) that hydrogen peroxide does not cause lipid peroxidation, which are the major component of the thylakoid of the grana of the chloroplast i.e. monogalactosyl diacylglycerol (MGDG) and digalactosyl diacylglycerol (DGDG).