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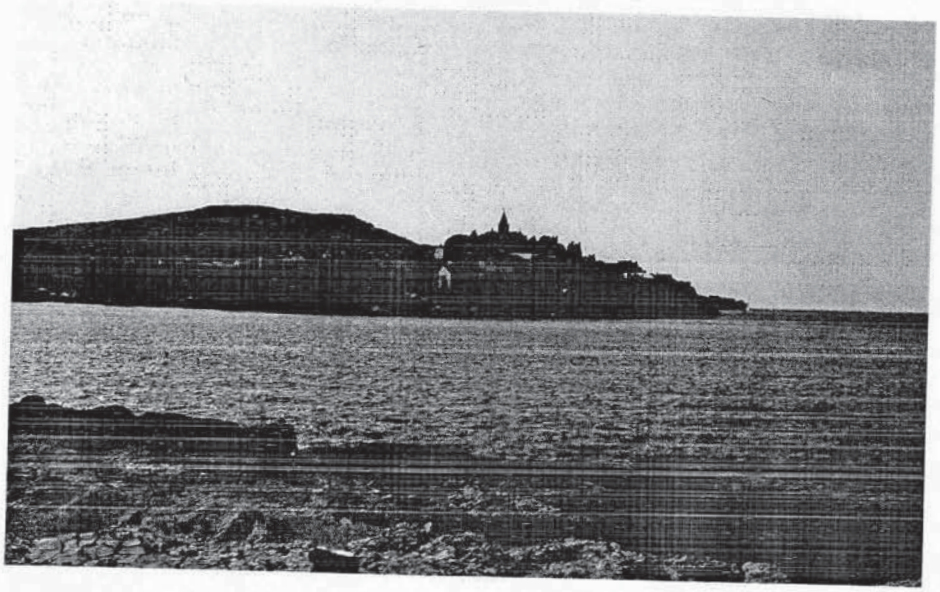
BOOK OF ABSTRACTS



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Different roles of carbohydrates in the redox metabolism of plants

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Redox processes and the metabolism of carbohydrates are two intertwined components present within the mechanisms of plant homeostasis and stress response. The redox poise of the extracellular compartment of plants is regulated by cell wall carbohydrates – pectin and mannan. They bind redox active metals, such as iron and copper, which react with H_2O_2 in a Fenton-like system. This process buffers perpetual physiological generation of H_2O_2, but also results in the cleavage of carbohydrate chains and consequent cell wall loosening, which represents a crucial event in plant cell growth. Plants can regulate steady-state H_2O_2 concentration and cellular growth by modifying the composition and chemical properties (*e.g.* by methylation) of cell wall carbohydrates. This is particularly important for seasonal adaptations to abiotic stressors, such as low temperatures. Fructose and its phosphorylated derivatives represent the regulators of intracellular redox status of plants. They scavenge hydroxyl radical and superoxide, and bind catalytically active metals, thus protecting the cell from (a)biotic stress-provoked oxidative damage. Some carbohydrates are known to be involved in different signaling pathways. We have shown recently that pectic fragments released from damaged cell wall can transform the hydroxyl radical into superoxide, which is further dismutated to H_2O_2 by extracellular superoxide dismutase. H_2O_2 represents a crucial signaling molecule in plants being capable of entering the cell and (in)activating enzymes and gene expression important for stress response and adaptation. Hence, pectic fragments could represent the initiators of redox signaling cascades in stress response, with H_2O_2 being a downstream secondary messenger. The current state of the art of two-way interactions between carbohydrates and reactive species in plant physiology and pathophysiology will be discussed in details.