REGIONAL CENTRE FOR BIOTECHNOLOGY
Seminar series

"*Nitric oxide* in *plants*: the biosynthesis and cell signalling functions of a *fascinating* molecule in plants"

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Friday, 14th, February, 2014
11:00 AM
Seminar Room

Abstract

The free radical nitric oxide (NO) emerged as an important signal molecule in plants. Various reductive, oxidative pathways operative for NO biosynthesis. The reductive pathway utilizes nitrite as substrate, which is exclusively produced by cytosolic nitrate reductase (NR) and mitochondria. Using plant mitochondria, we show that nitrite reduction to NO is strongly increased with the decrease in oxygen, which is a general consequence under flooding stress. The reaction is linked to ATP synthesis under hypoxia. NO diffuses from the mitochondria to the cytosol where it is scavenged to nitrate by the non-symbiotic haemoglobins. I will present experimental data supporting these reactions and showing that under low oxygen, the plant mitochondrion serves as a nitrite: NO reductase and becomes a major component in the anoxic nitrogen cycling where it directly contributes to a decrease of cell reduction level and to a limited ATP synthesis. We also found that NO inhibits aconitase and increases in citrate levels which then act as a potent inducer of AOX pathway. The NO production, inhibition of aconitase, and induction of AOX leads to a shift of plant metabolism towards amino acid biosynthesis. Under normoxic conditions NO regulates respiration, internal oxygen, carbohydrate utilization, and ROS levels in roots. We show that a decrease in NO, leads to a drop in internal oxygen, an increase in glucose consumption, further elevation of ROS. Thus, NO is required for maintaining steady-state oxygen concentrations and to keep ROS low. Under pathogen attack nitric oxide is important signal for plant resistance and development of hypersensitive response and NO also play role in suppression of high concentration of NO induced by root pathogens.