Redundancy and crosstalk within the thioredoxin and glutathione pathways: a new development in plants

J-P Reichheld, Talaat Bashandy, Wafi Siala, Christophe Riondet, Valérie Delorme, A Meyer, Yves Meyer

Abstract:

Thioredoxins (Trx) and glutaredoxins (Grx) are major disulfide reduction enzymes occurring in all living organisms that regulate the redox state of thiol groups of proteins. Initially discovered as a reductant of ribonucleotide reductase (RNR), an enzyme necessary for DNA synthesis, it is now established that they are involved in various biological processes. Trx and Grx have their own reduction system: typically, in most organisms and in the cytosol and mitochondria of plants the Trx pathway (NTS) comprises a redox cascade including NADPH, Trx reductase (NTR), and Trx, while the Grx pathway (NGS) is composed of NADPH, glutathione reductase (GR), glutathione (GSH), and Grx. These two systems act in parallel and have several common target proteins as shown by biochemical and genetic studies. Recent genetic studies in Arabidopsis show that the cytosolic Trx and Grx reduction systems are in fact more complex. In the cytosol, in absence of NTR, Trxs are reduced by a GSH-dependent pathway, while in the absence of GR oxidized glutathione (GSSG) is reduced by the NTR Trx pathway. By contrast in the chloroplast, Trxs have evolved a specific function of control of the light dark metabolism.

Published In:

Advances in Botanical Research , 52 , 253-276