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interconversion; 2.6.1 Thioredoxins; 2.6.2 Glutaredoxins; 2.6.3 Omega and lambda-GSTs; 2.6.4 Protein disulfide isomerases
2.7 Peroxiredoxins, thiol/disulfide proteins in antioxidant defence2.7.1 1-Cys Prx; 2.7.2 2-Cys Prx; 2.7.3 Prx Q; 2.7.4 Type II Prx; 2.8 The thiol proteome of plants; 2.9 Thiol homeostasis in subcellular compartments; 2.10 Thiol-dependent redox regulation of gene expression; 2.11 Linking thiol regulation to metabolic and developmental pathways; 2.12 Outlook; 3 Ascorbate, tocopherol and carotenoids: metabolism, pathway engineering and functions; 3.1 Introduction; 3.2 Ascorbate; 3.2.1 Distribution and subcellular localisation; 3.2.2 Ascorbate biosynthesis; 3.2.3 Ascorbate recycling
3.2.4 Ascorbate and dehydroascorbate transport across membranes3.2.5 Enzymes involved in ascorbate oxidation; 3.2.6 Ascorbate catabolism; 3.2.7 Control of ascorbate synthesis and metabolic engineering; 3.2.8 The functions of ascorbate; 3.3 Vitamin E: tocopherols and tocotrienols; 3.3.1 Isoprenoid antioxidants; 3.3.2 Structure and antioxidant activity of tocopherols and tocotrienols; 3.3.3 Functions of tocopherol; 3.3.4 Biosynthesis of tocopherols and tocotrienols; 3.3.5 Control and engineering of tocopherol and tocotrienol biosynthesis; 3.4 Carotenoids; 3.4.1 Carotenoids as antioxidants
3.4.2 Carotenoid biosynthesis and metabolic engineering4 Ascorbate peroxidase; 4.1 Enzymatic removal of hydrogen peroxide in plants; 4.2 Functional analysis of APX; 4.3 APX structure; 4.3.1 Overall structure; 4.3.2 Active site structure; 4.3.3 Substrate binding; 4.4 Evolution of APXs; 4.5 Summary; 5 Catalases in plants: molecular and functional properties and role in stress defence; 5.1 Introduction; 5.2 Biochemistry and molecular structure of catalases; 5.2.1 Types of catalases; 5.2.2 Molecular structure; 5.2.3 Mechanism of the catalytic reaction and kinetic properties
5.3 Occurrence and properties of plant catalases

Sommario/riassunto

Reactive oxygen species (ROS) are produced during the interaction of metabolism with oxygen. As ROS have the potential to cause oxidative damage by reacting with biomolecules, research on ROS has concentrated on the oxidative damage that results from exposure to environmental stresses and on the role of ROS in defence against pathogens. However, more recently, it has become apparent that ROS also have important roles as signalling molecules. A complex network of enzymatic and small molecule antioxidants controls the concentration of ROS and repairs oxidative damage, and research is revealing t