Preface

Sulfur is one of the four major essential elements in the plant life cycle. Its assimilation in higher plants and its reduction in metabolically important sulfur compounds are crucial factors determining plant growth and vigor and resistance to stresses. The range of biological compounds that contain sulfur is wide. Sulfur serves important structural, regulatory, and catalytic functions in the context of proteins and as a cellular redox buffer in the form of tripeptide glutathione and certain proteins such as thioredoxin, glutaredoxin, and protein disulfide. In a cascade of enzymatic steps inorganic sulfur is converted to the nutritionally important sulfur-containing amino acid cysteine. Cysteine is the essential precursor of all organic molecules containing reduced sulfur; these range from the amino acid methionine to peptides such as glutathione, or phytochelatins, protein, vitamins, cofactors such as s-adenosyl methionine (SAM), and hormones. Cysteine and derived metabolites have the ability to regulate and repair abiotic stress-induced reactive oxygen species. They regulate the expression of many gene-encoding antioxidants, defense proteins, and signaling proteins. The information on sulfur assimilation can be exploited in tailoring transgenics for efficient sulfur utilization and in applied approaches for the sustenance of agricultural productivity through nutritional improvement and increased stress tolerance. The chapters in this book deal with the importance of sulfur in sustainable crop production, the role of sulfur-derived compounds in abiotic stress tolerance, and the enzymology of sulfur assimilation and its importance in stress tolerance. The physiology of sulfur assimilation in lower plants has also been discussed. Chapters 1 to 4 include the physiological aspects of sustainable crop production with sulfur. In addition, Chapter 4 deals with sulfur deficiency in agricultural soils and its impact on crop yield loss. Chapters 5, 6, and 7 describe the physiology of sulfur-metabolizing enzymes in abiotic stress management. Chapter 8 deals with stress-induced redox signals generated in chloroplast and modulation with sulfur metabolism. Chapters 9 and 10 are concerned with the role of cysteine and glutathione, respectively, in abiotic stress tolerance. The aspects of metal tolerance and its relationship with sulfur assimilation are described in Chapters 11, 12, and 13. Chapters 14 and 15 describe the physiology of sulfur assimilation in lower plants. Chapter 16 addresses the key problem of xenobiotic detoxification, as well as the potential role of the apoplast and possible links with sulfur metabolism. Chapter 17 is concerned with the interaction of sulfur and nitrogen.

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