Proceedings of the International Plant Sulfur Workshop

Luit J. De Kok
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Molecular Physiology and Ecophysiology of Sulfur

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In Memory of Our Dear Colleague

Michael T. McManus
(3rd September, 1957–16th July, 2015)
Professor of Plant Physiology
Massey University, Palmerston North, New Zealand

Preface

This proceedings volume contains a selection of invited and contributed papers of the 9th International Workshop on Sulfur Metabolism in Plants, which was hosted by Heinz Rennenberg, Albert-Ludwigs-University Freiburg, and was held at Schloss Reinach, Freiburg-Munzigen, Germany from April 14–17, 2014. The focus of this workshop was on molecular physiology and ecophysiology of sulfur in plants, and the content of this volume presents an overview on the current research developments in this field.

We are delighted to dedicate this volume to Prof. Dr. Sara Amâncio, University of Lisbon, Portugal and Prof. Dr. Jean-Claude Davidian, SupAgro /INRA, Montpellier, France. Both of them have significantly contributed to the understanding of the regulation of uptake and assimilation of sulfur in plants and the success of the Plant Sulfur Workshops over more than two decades.

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Contents

Foreword: The Value of Sulfur for Grapevine

Sara Amâncio

Abstract The response to sulfate deficiency (−S) and sulfate resupply (+S) was analyzed in a cell system of *Vitis vinifera* cv. Touriga Nacional by measuring sulfate influx and the expression of sulfate transporter transcripts. After 24 h in −S medium, cells showed a significant increase in sulfate influx rate and the relative expression of sulfate transporters confirmed their strong de-repression in −S conditions. It was verified that in *V. vinifera* cell systems and leaves the sulfur-containing antioxidant metabolite glutathione (GSH), which participates in antioxidant homeostasis, is also a crucial player in the regulation of sulfur metabolism. Antioxidant phenylpropanoid compounds, namely flavonoids and stilbenes, are present in most grapevine tissues, accumulating in response to biotic and abiotic stress. Grapevine plantlets are a suitable model for studying the interplay between the phenylpropanoid pathway and nutrient deficiency. It was verified that *V. vinifera* under sulfur deficiency allocates resources to the phenylpropanoid pathway, probably consecutive to inhibition of protein synthesis, an eventually advantageous strategy to counteract oxidative stress symptoms evoked by −S conditions.

Introduction

Plants are able to reduce sulfate (SO_4^{2-}) to sulfide (S^{2-}), which is incorporated into cysteine; so the greater part of S from SO_4^{2-} absorbed by plants is ultimately used for protein synthesis. Organic sulfur is also found in the form of glutathione (GSH), the thiol-tripeptide that mediates redox reactions by the interchange of dithiol-disulfide.

Traditionally grapevine (*Vitis vinifera* L.) received large S inputs from copper sulfate and S° applied as fungicides. S° is probably the oldest pesticide unexpectedly produced as a component of plant defense system against vascular pathogens (Williams et al. 2002). In fact, sulfur applied to vine leaves and berries significantly

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