Preface

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In 2000, this Journal published a special issue on Allelopathy that resulted from the 2nd World Congress on the topic held in Canada in 1999. We focused then on what we perceived were the best papers presented, and the Journal made a clear statement about what types of papers we wished to consider in the future, thus emphasizing the need to “raise the beam” (Romeo, 2000, *J. Chem. Ecol.* 26(9):2011–2014).

At the 6th World Congress on Allelopathy in Guangzhou, China in December, 2011, a group of concerned scientists (Steve Duke, Francisco Macias, Anne Osbourn, Margot Schulz, Leslie Weston, Rensen Zeng, and I) met to discuss the state of the science in this sub-discipline of chemical ecology. This special issue on “Allelochemical Interactions in Agro- and Natural Ecosystems” grew from those discussions.

Clearly, some significant strides have been made since 2000. There is renewed interest in soil ecology. Roles of microorganisms, both beneficial and pathogenic, in particular, are no longer being ignored or dismissed. Developments in molecular genetics and omics biology have proceeded at a rapid pace. Breeding studies and application of molecular technology are now commonplace. Extensive research in agrosystems, much of it prompted by environmental and sustainability concerns, a gradual acceptance of GMO plants in many parts of the world, and the recognition that chemical ecology can be the foundation for “sustainable intensification of food production” (Pickett, 2012, *J. Chem. Ecol.* 38(9):1071) have brought such agrosystem research to the forefront. The concept of focusing allelochemical studies under the broader umbrella of chemical ecology, and indeed ecology in its broadest sense, is becoming accepted.

The papers in this special issue cover both agro- and natural ecosystems. Regarding the former they: summarize years of research and several long-term studies on major food crops — specifically, sorghum, rye, rice, and other cereals; address

emerging problems of soil legacy effects, and fungal diseases that threaten other foods such as bananas; and demonstrate the recent development of an effective herbicide from a natural product. Regarding natural ecosystems: problems of invasive plants that impact succession phenomena and established communities are discussed; a re-examination of a previously studied system in which new experimental data were obtained leads to a different conclusion; and a review of the importance of multifunctional flavonoids in rhizosphere interactions is stimulating reading.

Three papers focus on methods, both complex and simple that range from RNAi silencing and the use of ¹³C isotope discrimination analysis to a novel simple cup design for doing soil bioassays. Two papers focus on modes of action that affect processes as diverse as the role of plant hormones and the uptake, translocation, and metabolism of a rare compound. The concluding review paper brings together for the first time anywhere the role of omics methods for determining modes of action of both synthetic and natural phytotoxins.

As in any such endeavor thanks are due to several people, but primarily to four. Steve Duke and Leslie Weston, past and current Presidents of the International Allelopathy Society, not only wrote review papers, but solicited contributions, reviewed manuscripts, and provided guidance at all stages of the process. Rensen Zeng, host organizer for the past conference, was the prime mover with the original idea, and both he and Margot Schulz were involved as writers and continuously as astute referees.

We believe that the seven review papers and nine research papers presented in this compendium are representative of some of the best current work on allelochemical interactions. This collection is not meant to be a comprehensive summary of all recent studies. We hope, however, it will help direct future studies in the field, and be useful not only to those with an interest in rhizosphere biology, but also to all ecologists and readers of the Journal.

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