

Preface

The development of tools and practices that improve sustainability of farming is a prevailing trend for the agriculture and food industries in the twenty-first century. Plant biostimulants, as a group of molecules promoting plant growth and health, are an element of the portfolio of measures that aims to enhance the profitability of crop production in a context of reduced input and increased sustainability. The concept of biostimulants has evolved over the years, and now not only includes small chemicals and metabolites, but can also consist of microbes. Among the scientific community and policy makers, it is acknowledged that biostimulants do not promote plant growth by means of providing nutrients, instead their active ingredients stimulate the plant biochemical pathways in a positive manner. As a result, plants cope better with unfavourable or stress conditions, and growth and development are promoted. The research and development of biostimulants is greatly facilitated by chemical biology, shaped by the discovery of synthetic compounds with bioactivity reminiscent of various plant growth regulators. The positive effects of biostimulants on plant growth resemble those of synthetic small molecules, since they are active at low concentrations and show a high level of selectivity. However, not every aspect of biostimulants is phenocopied by synthetic chemicals and in particular, the possibility that combinations of compounds are required to support specific bioactivity remains a hypothesis to be proven. Numerous studies have reported on different sources of biostimulants and their effects on improvements of nutrient use efficiency, resistance to abiotic stress and crop growth. It should be noted that the investigations are largely focussed on describing the impact on plant physiology and development, and very few really address the underlying mechanism.

In the book *The Chemical Biology of Plant Biostimulants*, different aspects of biostimulants are brought together, providing an overview of the variety of materials exploited as biostimulants, their biological activity and agricultural applications (Part I, IV and V). Microbes are excluded because their modes of action are likely to be more complex and different from chemical biostimulants. As different groups of biostimulants display different bioactivity and specificity, advances in biostimulant research are illustrated by different examples of biostimulants, such as humic substance, seaweed extracts and substances with hormone-like activities (Part II). Moreover, methods to screen for new biostimulant compounds by exploring natural sources are reported in Part III.

The readers will find in this book both summaries of publications reporting on biostimulants and their activity, as well as insights into the mechanisms by which these products

act at the various levels of the plant. We hope that this will be informative for a wide range of readers, scientists and industrialists alike, as well as interested agricultural practitioners looking for more knowledge about the development and application of biostimulants.

Our book reassembles the expertise from a panel of internationally-renowned scientists and entrepreneurs in the area of biostimulants and biofertilizers. We would like to thank and acknowledge all the contributors for their efforts and input to create the content for this book. As biostimulants are an emerging field it has not been easy to gather and evaluate the literature and generate the various types of input for the chapters. We also would like to acknowledge the Flemish Research Foundation (FWO) for supporting our biostimulant research.

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May 2019

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