A book review on

Principles of Plant-Microbe Interactions: Microbes for Sustainable Agriculture

Edited by Ben Lugtenberg, Leiden: Springer, 2015, 448 pp. ISBN 978-3-319-08574-6

The significance of plant-microbe interactions in sustainable agriculture is enormous. These interactions may be negative such as the host-pathogen interactions leading to the disease development in plants or positive like the interaction of the plants with the beneficial soil microbiota for stimulating the plant growth, conferring biotic, and abiotic stress tolerance in plants and helping the plants for the revitalization of contaminated and degraded soils (Abhilash et al., 2012). Apart from that, the beneficial microorganisms influence the resource allocation between root and shoot, biodiversity and also mediate the above-ground below ground interactions with herbivores and other natural enemies of the plants. Moreover, such dialogues between plant and
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performance of these inoculums. Interestingly, the Editor has paid attention to detail the next generation ideal bioinoculants with
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Protection Organization, process of registration, and the global commercialization of the microbial inoculums in detail. The major
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growth promoting microorganism and arbuscular mycorrhizae in host plant nutrients, water use efficiency and rhizoremediation (v)
merit and the challenges in recent techniques like culture independent molecular tools and confocal microscopy for unraveling the
rhizosphere microbiome and its interaction with the host plant (vi) the commercialization of microbial inoculum for the plant growth
and disease control (vii) harnessing of plant-microbe interactions as a low-input biotechnology and finally (viii) manipulating the
plant-microbe interactions for human wellbeing.

The book starts with the fundamentals of the plant-microbe interactions by unraveling the rhizospheric, phyllospheric, and
endospheric microbial world associated with the plant system. The book helps in exploring the diverse microbial partners, its
importance's and mechanisms of the actions for proper understanding of the topic. It also elucidates the structural and functional
details of microbial cell surfaces and its role in exchanging the signals from the exterior to the intracellular milieu. Interestingly, the
book also exploring the role of myriad phytopathogens such as bacteria, fungi, nematodes, viruses, and pests its symptomatology,
importance's and mechanisms of the actions for proper understanding of the topic. It also elucidates the structural and functional
infections mechanisms along with plant immune response to infections and disease control mediated by the biocontrol agents.

Apart from the biocontrol activity, the editor has also made an attempt to address the role of the plant associated microbiome for
solubilizing the essential nutrients in soil and also for promoting the plant growth and yields even under adverse environmental
conditions. The book also reminds that certain modifications in the microbial traits and rhizosphere environment will enhance the
productivity of the agroecosystems. Importantly, the students and restoration workers will get in depth knowledge about various
strategies for reshaping the rhizosphere microbiome. Similarly, transferring the genetic machinery of the nitrogen fixation in to non
legume plants also provides new vistas in sustainable agriculture.

The book also unveil the concepts and issues related with the formulation, efficacy testing based on the European Plant
Protection Organization, process of registration, and the global commercialization of the microbial inoculums in detail. The major
global producers of the microbial inoculums are also detailed in this book. Although microbes like *Pseudomonas* sp., *Bacillus* sp.,
and *Trichoderma* sp. are the most suitable bio-inoculants, there are always outstanding concerns regarding the shell-life and field
performance of these inoculums. Interestingly, the Editor has paid attention to detail the next generation ideal bioinoculants with
the concepts of the enhanced stability, carrier suitability, spore forming capability, better inoculation strategies, seed–soil
inoculation, microbial inoculants consortium application including bacteria, and fungi.

It has been generally postulated that under changing climatic conditions, the increasing atmospheric CO will have a fertilization
effect on plants and will increase the allocation of nutrients in above- and belowground parts. Hence, it is unclear how such change will go to affect the plant-microbe interactions at ecosystem level (Abhilash and Dubey, 2014). Although such changing conditions will have a significant impact on plant-microbe interactions, the present book does not shed light on this important issue. Similarly, the exploitation of plant-microbe interactions for the clean-up of contaminated soils has been presented in accordance to the clean-up of organic pollutants with little emphasis on heavy metal and mixed pollutants (organic and inorganic) contaminated soil. Furthermore, in a time when next generation sequencing technologies have been completely revolutionized the microbial community analysis, the current book describes the microbial community analysis mainly on the basis of Denaturing Gradient Gel Electrophoresis. Nevertheless, we enjoyed reading this book as the editor tried to cover almost all fundamental and applied aspects of the plant-microbe interactions. As a final word, the book can be described as a book for all.

Author Contributions
RD, VT, and PA wrote the review.

Conflict of Interest Statement
The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Principles of Plant-Microbe Interactions: Microbes for Sustainable Agriculture Softcover reprint of the original 1st ed. 2015 Edition. by Ben Lugtenberg (Editor). “The book helps in exploring the diverse microbial partners, its importance’s and mechanisms of the actions for proper understanding of the topic. ... we enjoyed reading this book as the editor tried to cover almost all fundamental and applied aspects of the plant-microbe interactions. As a final word, the book can be described as a book for all.” (Rama K. Dubey, Vishal Tripathi and P. C. Abhilash, Frontiers in Plant Science, Vol. 6, 2015). From the Back Cover. Plants interact with small organisms in their environment, such as bacteria, fungi, oomycetes, nematodes and insects. The molecular mechanism of the agronomically important nutritional and defensive plantmicrobe symbioses are reviewed. These symbioses are based on the signaling interactions which result in the development of novel tissue/cellular structures and of extended metabolic capacities in the partners which improve greatly the adaptive potential of plants due to an increased tolerance to biotic or abiotic stresses. The molecular, genetic and ecological knowledge on plant-microbe interactions provide a strategy for a sustainable crop production based on substituting the agrochemicals (mineral fertilize