

Bacteria in Agrobiology: Stress Management

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Editor

Bacteria in Agrobiology: Stress Management

 Springer

Editor

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Cover illustration: Optical micrograph showing cross sections of intercellular colonization rice calli and regenerated plantlets by *A. caulinodans*: CS view of root uninoculated control; magnified cross section view of leaf colonized by *A. caulinodans* in regenerated rice plant; possible sites of infection and colonization of rice root (from left to right); see also Fig. 3.1 in “Endophytic Bacteria – Perspectives and Applications in Agricultural Crop Production”, Senthilkumar M, R. Anandham, M. Madhaiyan, V. Venkateswaran, T.M. Sa, in “Bacteria in Agrobiolgy: Crop Ecosystems, Dinesh K. Maheshwari (Ed.)”

Background: Positive immunofluorescence micrograph showing reaction between cells of the rhizobial biofertilizer strain E11 and specific anti-E11 antiserum prepared for autecological biogeography studies; see also Fig. 10.6 in “Beneficial Endophytic Rhizobia as Biofertilizer Inoculants for Rice and the Spatial Ecology of this Bacteria-Plant Association”, Youssef G. Yanni, Frank B. Dazzo, Mohamed I. Zidan in “Bacteria in Agrobiolgy: Crop Ecosystems, Dinesh K. Maheshwari (Ed.)”

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Preface

In general, weather, water availability, pests, and pathogens are the major constraints responsible for affecting the agriculture sector adversely. With the advent of climate change, global agriculture faces a multitude of challenges. The so-called Green Revolution brought more productive wheat, corn, and rice varieties that relied on “high levels” of chemical fertilizers and pesticides; boosted agricultural production and productivity were often accompanied by negative effects on agricultural natural resource base so serious that they jeopardize its productive potential due to various abiotic and biotic stress factors. Abiotic stress influences physiology and ecology and biotic stress mainly affects the ecology of organisms. Long-term alternative technology in the agro-ecosystem is required to ameliorate the ill effects of such stresses.

Prokaryotic organisms including bacteria are well known for their high degree of stress adaptability due to their unique genetic set up and their ability to survive under extreme environmental conditions. It is the vitality in the agro-ecosystems that researchers are investigating for opportunities to enhance agricultural inputs in the form of plant growth promoting Rhizobacteria (PGPR). Such benign biological agents are able to mitigate various abiotic and biotic stress, are in *mojo* presently.

The book comprises various chapters on the role of the beneficial bacteria (PGPR) in alleviating abiotic stress in general and biotic stress in particular. Their products can be a significant component of management practices to achieve the attainable yield in degraded soil. The success lies in their aggressive root colonization potential around the rhizosphere. Atmospheric threats coupled with edaphic stresses mainly due to anthropogenic activities pose severe challenges to food production. Microbes have devised a sophisticated signaling system for eliciting an adaptive response to stresses. The most dramatic of these behaviors are the purposeful migration or movement of the cells toward favorable conditions. With the aid of ACC deaminase-containing bacteria, such stresses are alleviated because of involvement of their cellular and molecular machinery. An account is provided with respect to ACC deaminase gene transfer into plants used in the phytoremediation of heavy metals to regulate ethylene level under abiotic stress.

Also, such bacteria can be exploited as a successful strategy for protecting the plants against the deleterious effects caused by soil-and seed-borne deleterious plant pathogens. Thus, the PGPR biotechnologies can be exploited as a low-input, sustainable, and environment friendly technology for stress management in plants.

Researchers, teachers, and students of life sciences, especially of microbiology, biotechnology, agricultural sciences, and environmental sciences, will find this book extremely informative and relevant.

I would like to extend my gratitude to all contributors for their authoritative and up to date scientific information organized in a befitting manner. Thanks are due to my students Dr. Abhinav Aeron, Dr. Sandeep Kumar, Mr. Rajat Khillon, and Mr. Narendra K. Maheshwari for assisting me in the compilation of the book. Valuable cooperation extended by Dr. Jutta Lindenborn, Springer, in multifarious ways is gratefully acknowledged.

Last but not the least, I owe thanks to my wife Dr. Sadhana Maheshwari and my son Ashish for taking care of me during this project.

Uttarakhand, India

Dinesh K. Maheshwari

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