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# Prologue to book 'Seed Endophytes'

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**What are endophytes?**

Endophytes are those bacteria and fungi that exist within the tissues of plants without negative effects on host plants. They have been reported from all the plants examined to date. Some endophytes are vectored on or within seeds of plants. These microbes are acquired by plant seeds and suppose to be very crucial during seedling development. Endophytic microbes support the plant by nutrient mobilization from the soil, phytohormone production, protecting plants against biotic (plant pathogens or herbivores) and abiotic stresses. Seed associated microbes may be bacteria or fungi and play important role during seed germination and seedling developments. Further these microbes move into the plant body, protecting the plant from disease and improving the nutritional status of the plant. Endophytic bacteria stimulate the expression of host genes relating to nitrogen metabolism and hormone synthesis. Presence of endophytes also induces host defense genes in plants and makes them less susceptible to disease. Endophytic microbes produce large number of agriculturally important metabolites. Seed associated microbes are believed to be more adapted to plants and have ecological significance. Application of the seed microbiome in agriculture is needed at this time. We believe that seed and seedling microbes will ultimately replace the use of chemical fertilizers and pesticides degrade the environment.

**A new definition for seeds: a miniature ‘Noah’s ark’ for plant colonization**

A seed may be defined as a dormant embryonic plant supplied with nutrients enough to fuel early seedling growth and contained in a hardened protective coating. However, it is becoming increasingly clear that this definition is not complete; seeds also carry a community of symbiotic microbes that provide multiple critical functions for developing seedling—and without these symbiotic microbes seedlings are less likely to survive. In this respect a seed is like ‘Noah’s ark’ containing the plant and the microbes that are needed for growth and survival of the seedling as it colonizes in a new place.

### **The intention of this book**

With this book we intend to begin to complete the definition of a seed by revealing the many microbes transmitted in and on seeds—and their numerous functions in cultivated and non-cultivated species. We also intend to show the importance of the microbial components of seeds and the adaptations on/in seeds for vectoring microbes. Finally we intend to show how seed-vectored microbes can be used in biotechnologies to enhance cultivation of crop plants. This book contains chapters describing biology of endophyte communities, endophyte functions in plants, and applications in agriculture and biotechnology. This book will be useful to students, teachers and scientist working in the areas of plant microbe interactions and biocontrols. Since interactions of endophytic microbes with plants is relatively underexplored, people interested to work in this area will find this book useful.

*James Francis White and Satish Kumar Verma*

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