Future Prospects

The huge prospective applications of the endophyte \( P. \) \textit{indica} provide the perspective that an appropriate mutualist might be discovered for many crops plants. Research related to it however may not only enable new crop production strategies but additionally may significantly expand our basic knowledge on host-microbe interactions. Further, recent discovery of fungus-associated endobacteria demonstrates that the fungus can participate in a more complex symbiosis. In addition, it is obvious that \( P. \) \textit{indica} shows properties that clearly contrast with those ascribed to AM fungi:

1. In comparison to known endophytic strategies, \( P. \) \textit{indica} requires host cell death for successful plant colonisation, implying that fungal effector molecules interfere with the host cell death machinery.

2. \( P. \) \textit{indica} conveys systemic disease resistance to fungal leaf pathogens, which has rarely been observed in monocotyledonous plants.

3. \( P. \) \textit{indica} is the sole fungal mutualist identified to date that colonizes \textit{A. thaliana} and mediates a type of systemic resistance to powdery mildew which depends on jasmonate signal pathways.

In view of multifarious plant growth promoting activities of the model fungus \( P. \) \textit{indica}, it is need of the hour to understand the functions and the principles behind these activities, so as to use this endophytic fungus more and more efficiently for the betterment of nutritional securities and medical applications. The potential use of this fungus has been not only emphasized with the plants but also is reported to possess massive immunoregulatory properties along with a good quantity of anti-oxidants.

Although major properties of this fungus are known, yet the working principle behind these activities has to be studied for an efficient use of the fungus in the service on humanity.

1. \( P. \) \textit{indica} serves as model fungus to understand the mechanism of molecular aspects of pre-symbiotic and symbiotic phases and their biotechnological applications under the basis of microbe-microbe and plant-microbe interactions.

2. Use of molecular, biochemical and enzymological techniques may open an important area of research of \( P. \) \textit{indica}. This study will open up several novel
pathways, which can be explored to fill up the lacunae in molecular aspects of arbuscular mycorrhizal research since *P. indica* mimics various AM characters.

3. The expression pattern of gene responsible for growth promotion as well as disease control needs to be studied. Roles of these genes in symbiosis and localization in host plants during symbiosis need to be revealed.

4. The fungus also demands for construction of genomic libraries to study genomics and proteomics. By using molecular marker like restriction fragment length polymorphism (RFLP), random amplification of polymorphic DNA analysis (RAPD) and amplification of short repeated sequence (microsatellites) further genetic polymorphism within species and their southern blot analysis can be assayed.