The Great Plains Inoculant Forum was developed to provide a platform to discuss the practical aspects of plant-growth-promoting (PGP) inoculant research. Although the inoculant industry represents a relatively small segment of the agri-food sector, the potential for increasing productivity and profitability of field crops continues to grow in the Great Plains region of North America. On a global basis, the potential to reduce nitrogen and phosphate fertilizer inputs through the use of nitrogen-fixing rhizobial and phosphate-solubilizing inoculants will contribute to economic gains, and to moderation of undesirable environmental effects of agriculture. The purpose of the forum was to strengthen and establish active linkages between researchers, inoculant manufacturers, and farm producers so that these potentials might be fulfilled.

A look back at the history of PGP inoculants reveals a phenomenon with an lengthy heritage, leading up to more recent understanding of the beneficial interaction of the microorganisms and plants. Research and development work on inoculants has examined the impact of a number of factors on the success of various rhizobia/legume associations. These factors include rhizobial inoculant formulations, seed treatments, inoculant rate and placement, mixing granular inoculant with fertilizer, inoculant strain × host cultivar interactions, the effects of rhizobia inoculation on endophytic bacteria in subsequent crops, and selection of beneficial associations compatible with different crop rotations. The general concerns about environmental issues influence strategies for developing viable inoculant formulations. The development of granular compost-based inoculants, research on the potential of organic wastes as low-cost culture media for the production of rhizobia, and the potential for using rhizobia in soil bioremediation represent such strategies.

Environmental factors that negatively influence the growth and performance of rhizobia or the host plant also adversely affect symbiotic nitrogen fixation. A strong case can be made for matching host and rhizobia, with consideration given to environmental stress conditions, host/strain compatibility, and soil and rhizosphere colonization. Molecular techniques may also provide a short cut to obtaining information that will allow systematic selection of inoculant strains.

Extensive research has shown that phosphate inoculants based on Penicillium bilaii consistently increase the availability of phosphate to crops in northern Great Plains, but there is need for the development of microbial inoculants for a range of other crop production systems. Understanding the role of arbuscular mycorrhizae fungi in the soil nutrient cycle and in the promotion of plant health and crop yield in low-input systems continues to be a topic of interest in agriculture.

Legume producers in the northern Great Plains have a practical interest in the nitrogen and non-nitrogen benefits of legume crops on subsequent non-legume crops. The fertilizer nitrogen replacement value of legume crops in rotation needs to be quantified in relation to non-nitrogen benefits. Also, legume producers want to be assured that high quality legume inoculants and pre-inoculated seed products are available. The competent quality control during manufacture and maintenance of legislated regulation of inoculant quality are imperative.