**Mass scale multiplication of Plant Growth Promoting Bacterial (PGPR) & development of consortium formulations with suitable carriers**

**Project Code**  
BFNet IITD

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**Abstract**

In phase-II of the ISCB project, the project partners had used charcoal based formulations of the PGPR's (R62 & R81) which were made by GBPUAT using King's-B medium for field trials. IIT Delhi worked on development of appropriate synthetic medium in collaboration with Neuchâtel group for mass multiplication. The bio-inoculants grew well in the modified synthetic medium without the need of pH control in shake flask as well as in fermentor. Both the bio-inoculants produced good cell yield, as well as, other primary and secondary metabolites in the production medium.

IIT group did not use charcoal powder as a carrier due to the carrier's draw backs in the formulation development work. The bio-inoculants of the PGPR's (R62 & R81) were integrated with inorganic carrier based formulations (talc & aluminium silicate powders). These formulations were used with GBPUAT group in pot & field trials on *Vigna mungo* & wheat crops. In the field, consortium of the bio-inoculants with talc powder based formulation, improved the wheat grain yield by about 45%. The shelf life of the talc powder based formulation was better than that with aluminium silicate. Issues related to mixed formulation of PGPR's have to be resolved. The PGPR's formulation had poor shelf life under harsh conditions. A suitable insulated packaging showed promising results which needs to be further investigated.

In the mass multiplication of the PGPR's in fermentors, foaming was severe. How to achieve foam control, without the addition of excess of antifoam is of prime importance since the antifoam makes a coating around the cells and slows down transport rates of nutrients this major task will be complete by IIT Delhi in phase-III. In phase-II, we had identified that both the bio-inoculants produce rhamnolipid like bio-surfactant whose presence in broth will produce sever foaming in fermentor operations. Continuous culture studies will be done to ascertain optimal conditions for suppression and production of the bio-surfactant. The bio-surfactant also help to control the pathogen in the rhizosphere. The conditions will be used in batch culture fermentation where bio-surfactant production will be kept suppressed during active growth phase and its production in the near stationary phase by IIT group in phase-III.

IIT Delhi will contribute to the new ISCB bio fertilizer network (phase-III) by conducting trouble free mass multiplication of PGPR's bio-inoculants at pilot scale fermentor, making formulation of consortium of PGPR's and developing appropriate packing.

The new formulation of the PGPR's will be sent to other Indian partners to check their efficacy under pot and field trials on wheat-rice system and other crops by networked partners. Based upon the outcome, IIT Delhi, in conjunction with TERI, would give a technology package R62+R81 and AMF on talc based formulation or fly ash based formulation. In case the mixed formulation (PGPR+AMF) fails due to lack of cold delivery chain, IIT Delhi would focus on developing packaging aspects, which might give a solution.

This project would add value in order to achieve the overall objectives of the biofertilizer network by filling technology gaps related to mass multiplication, leading to finalization of a suitable technology package.