

Biological control of *Ustilaginoidea virens*, the pathogen of rice false smut

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Rice is one of the most important staple food crop of the world including India. Among the various diseases affecting rice, false smut caused by *Ustilaginoidea virens* has recently gained attention due to its widespread occurrence. The disease is characterized by appearance of orange coloured spores covering the infected grain which gradually turned into black mass of powdery spores (Fig.1). A slight external disturbance will lead to the dispersal of the spores to nearby or far locations.

Keywords: Rice false smut, *Ustilaginoidea virens*

AMONGST the methods available for management of diseases, biological control is by far the most practical and eco-friendly method. Therefore, experiments were conducted both *in vitro* and field conditions to evaluate and validate the bio-agents having best potential to manage the false smut pathogen, *Ustilaginoidea virens*. The method involved *in vitro* screening of the bio-agents against *Ustilaginoidea virens* by

dual culture method. The bio-agents used in the study were *Pseudomonas*, *Bacillus*, *Trichoderma* and *Dendryphiella* obtained from National Rice Research Institute, Cuttack. The promising bio-agents were then evaluated in the field to validate their efficacy using a susceptible rice genotype. The preliminary evaluation of the bio-agents *in vitro* conditions revealed that *Trichoderma harzianum* showed

the most promising control of the pathogen as it indicated 66.88% inhibition percentage, followed by *Trichoderma atroviride* (51.16%), *Dendryphiella sp* (41.50%), *Bacillus amylolique faciens* (36.56%) and *Bacillus subtilis* (36.40%) (Fig.2).

The efficacy of the five potential bio-agents against *Ustilaginoidea virens* was validated in field condition on Maudamani variety. The mechanisms of action observed in



Fig. 1. Growth inhibition of *U. virens* by *Trichoderma harzianum* at 15 days after inoculation.



Fig. 2. Growth inhibition of *U. virens* by *Trichoderma harzianum* at 15 days after inoculation.

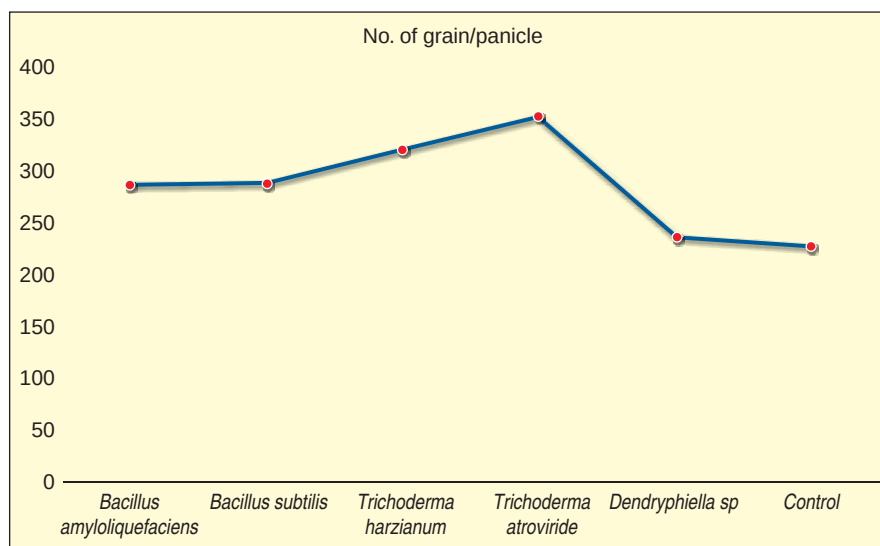


Fig. 3. Beneficial effects of bio-agents on rice and their ability to reduce false smut under field condition.

Trichoderma harzianum and *Trichoderma atroviride* were parasitism and production of volatile metabolites. Whereas *Bacillus subtilis* produced volatile metabolites to control the pathogen. All the bio-

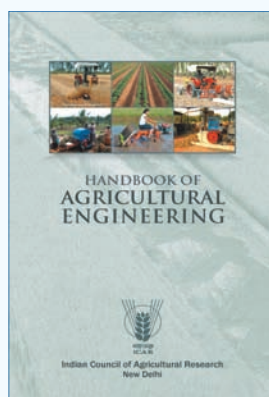
agents treated plants showed lesser disease severity than the control demonstrating their ability to suppress false smut incidence. Besides disease suppression, the bio-agents proved beneficial to rice production

by increasing the number of grains per panicle (Fig. 3).

Moreover, the chaffiness was much lower in *Trichoderma atroviride* and *Bacillus subtilis* treated plants with respect to the control. Therefore, *Bacillus subtilis* and *Trichoderma harzianum* were found to be the most potent bio-agents against false smut of rice. In conclusion, based on *in vitro* and field experiments, *Bacillus subtilis* and *Trichoderma harzianum* were the most promising bio-agents against false smut of rice. The mechanism of biological control was observed to be mycoparasitism, lysis and production of volatile metabolites, towards the target pathogen. Therefore, the future thrust could be refinement and development of bio-agent formulation for field application.

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TECHNICAL SPECIFICATIONS

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