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QUANTIFICATION OF β -1, 3-GLUCANASE, CHITINASE AND PEROXIDASE ACTIVITY IN RICE SHEATH TISSUES INDUCED BY MICROBIAL ANTAGONISTS UNDER FIELD CONDITIONS

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Induction of defence mechanisms in plants against infestation by pathogens through application of microbial antagonists is a novel strategy in disease management. The objective of the present study was to determine the influence of application of selected antagonists on the development of defence enzymes, namely β -1, 3-glucanase, chitinase and peroxidase against *Rhizoctonia solani*, the pathogen of rice sheath blight.

Talc-based spore formulations of a fungal antagonist, *Aspergillus niger* and a bacterial antagonist, *Bacillus megaterium* which showed successful control of rice sheath blight under field conditions in previous studies were used to determine the development of defence enzymes in rice variety Bw 361. The experiment was conducted in the *yala* season of 2012 at the Rice Research and Development Institute, Batalagoda. Four treatments including positive and negative controls were used in triplicate according to a randomized complete block design. Plants in all treatments except the negative control were inoculated with *R. solani* at 43 days after transplanting (DAT). Talc-based formulations were applied at 45 DAT and repeated thrice thereafter at weekly intervals. Development of β -1, 3-glucanase, chitinase and peroxidase activity in sheath tissues under different treatments were quantified spectrophotometrically using standard protocols at 1, 3, 5 and 7 days after the 1st, 2nd, 3rd and 4th application of antagonists respectively. The effectiveness of the treatments in controlling sheath blight was quantified in terms of disease incidence (as % diseased hills per plot) and severity (quantified as % of infected tillers per hill and average lesion length on the rice sheath).

Talc-based spore formulations of *A. niger* (T1) and *B. megaterium* (T2) reduced the percentage of infected tillers per hill by 19% and 28% respectively in comparison to plants inoculated with the pathogen, but not treated with antagonists (positive control). With respect to disease severity in terms of average lesion length, T1 reduced the disease severity by 37% and T2 by 41%. β -1, 3-glucanase, chitinase and peroxidase activities in rice sheath tissues showed significant variation between treatments. In all treatments, the β -1, 3-glucanase activity reached a maximum at 55 DAT (3 days after the 2nd treatment application) and decreased thereafter. At 55 DAT, *A. niger* (T1) treated plants had significantly greater glucanase activity than the rest. The highest chitinase activity was also observed in plants treated with *A. niger* (T1) on the majority of measurement days. Plants treated with *A. niger* showed a significantly greater peroxidase activity at 73 DAT (i.e. 7 days after the 4th application antagonists) when the peroxidase activity was maximum in all treatments.

The findings revealed the ability of *A. niger* as a talc based formulation to induce the activity of defence related enzymes and thereby achieve an appreciable level control of rice sheath blight disease. On the other hand, our results also showed that the ability of the talc-based formulation of *B. megaterium* to control rice sheath blight could largely be due to its direct antagonism against *R. solani* rather than through induction of defence chemicals.

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