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RESEARCH ARTICLE

Effect of endophytic fungi on plant growth and blast disease incidence of two traditional rice varieties

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Abstract: Traditional rice varieties, although low producers of yield, are more amenable to organic farming practices that cause less damage to the environment and human health. Improved growth and reduced disease incidence would produce higher yields, and endophytic fungi have proven to be effective in achieving these ends in wheat. With this in view, endophytic fungal assemblages of two traditional rice varieties of Sri Lanka i.e. Suwandel and Kaluheenati were evaluated for their effect on the growth and disease incidence of rice plants, because the endophytic mycoflora of these two traditional rice varieties and their effects have not been studied before. The most common and the highest occurring endophytes of both rice varieties i.e. *Absidia* and *Cylindrocladium* were tested to determine their effect on rice plant growth and the results showed that the plants inoculated with both fungal isolates showed significant increases ($p \leq 0.05$) in plant height, fresh weight and dry weight. Twenty two endophytic fungal isolates common to both rice varieties were screened using dual culture assay for their ability to control the mycelial growth of *Magnaporthe grisea,* the causative agent of rice blast disease. All tested endophytes controlled pathogen growth by coiling the hyphae around the pathogen and forming clamps and loops. However, *Absidia* and *Acremonium* showed the highest growth inhibition of the pathogen (100 %) and showed an abundance of the above inhibitory structures. The effect of crude culture filtrates of thirteen endophytic fungi tested using the diffusion plate method indicated antagonistic activity against the rice pathogen. *In planta* tests were carried out to assess the effect of three endophytic fungi i.e. *Acremonium*, *Absidia* and *Penicillium* on infection by *M. grisea*. Disease symptoms were observed only on the leaves of the rice plants grown from *Penicillium* inoculated seedlings and on plants used as controls sprayed with a 1×10^7 spores/mL suspension of the pathogen. Pre-inoculation with *Acremonium* and *Absidia* were effective in preventing infection by the blast fungus. No disease symptoms were observed in plants pre-inoculated with endophytes and in plants used as controls sprayed with a 1×10^5 spores/mL suspension of the pathogen. Twenty one endophytic fungi common to both rice varieties were assessed by the culture plate method in this study.

Keywords: Disease incidence, endophytic fungi, Kaluheenati, *Magnaporthe grisea*, Suwandel, traditional rice cultivation.

INTRODUCTION

Traditional rice varieties are amenable to organic farming practices. Therefore, they can be grown using organic cultivation systems, which cause minimal damage to the environment and consumers. In addition to general organic soil management (i.e. incorporating organic residue to soil, improving soil structure with compost etc.), organic rice farming requires specific fertilization and nutrient management (Naturland, 2002). This is achieved by adding organic nutrient sources to the soil and allowing the soil to feed the rice crop. Green manure is preferable to other organic fertilizers because it is easier to handle, comparatively free of harmful microorganisms and more effective in supplying nutrients. Compost of rice straw and animal manure, e.g. poultry manure and cow dung, can also be added if necessary (Naturland, 2002). However, traditional rice cultivation using such practices produces a low yield, which is insufficient to fulfill the current consumer demand. Therefore, it is important to increase the total production and minimize the loss due to diseases.

Plant-associated microorganisms play essential roles in agriculture and food safety, and contribute to maintain environmental equilibrium. Such beneficial microbes can increase the root growth and nutrient uptake of plants, fix nitrogen, decrease plant stress and disease incidence and thus will have a strong influence on the plant growth, development and yield. Some of them can also be useful for developing management strategies for protection against numerous pathogens (Montesinos, 2003).

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