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“Development on the margin”

Role of *Pythium* Spp. in Yield Decline in Aerobic Rice in the Tropics

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Abstract

The aerobic rice production system is directed towards a new way of growing high-yield and nutrient responsive varieties in non-flooded aerobic soil under supplementary irrigation in the water shortage areas. Recently in the tropics, yield decline in aerobic rice system has been recorded in continuous monocropping because of the so-called soil sickness. In this study, we characterised 22 *Pythium* strains which were collected from diseased aerobic rice fields of International Rice Research Institute (IRRI) to identify their accurate species belongs to *Pythium* and to test their pathogenicity on aerobic rice possibly leading to yield decline. The internal transcribed spacer regions (ITS1 and ITS2) including the 5.8 gene of ribosomal DNA of all *Pythium* strains were sequenced after PCR amplification using universal primers ITS1 and ITS4. The DNaseasy Plant Mini Kit (Quigen) was used to extract DNA according to the manufacturer specifications. Phylogenetic analysis of ITS sequences using TreeCon software showed genetic similarity with *Pythium arrhenomanes*, *Pythium graminicola* and *Pythium inflatum* which were represented nineteen, two and one *Pythium* strains respectively under this investigation. *In vivo* Pathogenicity test was conducted through inoculating the soil mixture with mycelium suspension at the pre-emergence state of aerobic rice seedlings. The test confirmed that *Pythium arrhenomanes* and *Pythium graminicola* were pathogenic among three identified *Pythium* spp., causing seedling damping-off with reduced root and shoot growth of aerobic rice. Moreover, the present study demonstrated the association of *Pythium arrhenomanes* and *Pythium graminicola* with pre-emergence seedling damping-off causing yield decline in aerobic rice system in the tropics.

Keywords: Aerobic rice, ITS regions and Pathogenicity, *Pythium*