Deutscher Tropentag, October 11-13, 2005, Hohenheim

"The Global Food & Product Chain—
Dynamics, Innovations, Conflicts, Strategies"

Opportunities for Nematode Biocontrol in Lowland Rainfed Rice Using Bacterial Endophytes

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Abstract

Meloidogyne graminicola is an important pest in several rice producing areas of South and Southeast Asia, particularly in lowland rainfed rice production systems where early season soil flooding is intermittent or absent. Cultural practices associated with lowland rainfed rice — seedling establishment in nursery beds, cut-root transplantation, and post-transplant soil flooding — present interesting opportunities for biologically controlling this and other plant-parasitic nematodes. A research project was recently initiated at the Institute for Plant Protection, University of Bonn to investigate bacterial endophytes of rice for biological control of *M. graminicola* and *Hirschmanniella oryzae*, with a focus on utilising bacterial endophytes to protect the rice seedling root system during critical early season growth. In *in vivo* screening tests, *Bacillus megaterium* was found to have high activity against *M. graminicola*. Rice seedling inoculation with this bacteria significantly reduced nematode galling severity and J2 penetration compared with non-inoculated controls. Additionally, *in-vitro* tests using cultural filtrates of *B. megaterium* significantly delayed nematode egg hatch and reduced J2 mobility. The goals of the project are to isolate and screen bacterial endophytes from upland and lowland rice producing zones for their antagonistic potential and to develop effective and low-cost means for delivering the endophyte to the seed at nursery establishment and to the seedling at transplanting. This paper will discuss concepts of endophytic biocontrol of nematodes, methods for introducing endophytes in rice roots, and modes of action through which *B. megaterium* impacts *M. graminicola* activity, and strategies for combining biocontrol with floodwater management to control nematode damage in rice.

Keywords: Bacterial endophyte, biological control, rice, root-knot nematode

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