



# PROCEEDINGS

## The German - DAAD Alumni Workshop



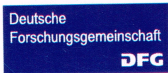
# Promoting Biodiversity, Inforest Protection, and Economic Development in Indonesia

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South East Asia-Germany Network-Indonesia

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# Promoting Biodiversity, Rainforest Protection, and Economic Development in Indonesia

IPB International Convention Center  
Bogor, October 6, 2009

Editors:  
Iskandar Z. Siregar  
Wolfram Lorenz  
Despal



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# The Use of Microbial Pesticides by Farmers in Indonesia as Utilization of Microbe Diversity: Plant Clinic Experience

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## Abstract

Farmers in some parts of Indonesia have applied microbial pesticides. Microbial insecticides applied by Indonesian farmers are *Beauveria bassiana*, *Spodoptera litura Nucleopolyhedrosis Virus (Sl NPV)* and *Spodoptera exigua Nucleopolyhedrosisvirus (Se NPV)*. Moreover microbial fungicides widely used by farmers are various species of *Trichoderma*, *Gliocladium*, fluorescent pseudomonads and *Bacillus* group. Experience of Plant Clinic of Bogor Agricultural University (IPB) in dissemination and application of microbial pesticides show promising results. Supporting and inhibiting factors, challenge and the future prospect an the role of plant clinic of IPB the use of microbial are discussed.

## Introduction

One of real utilization of biodiversity in agriculture in Indonesia is the use of microbial pesticides. Farmers field school integrated pests management (IPM) conducted since 1989 (resulted *ca.* one million trained farmers) is a key starting point for farmers to practice more ecologically-sound agronomical practices including microbial pesticides

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application. Microbial pesticides is mostly developed by universities and research institutes under Ministry of Agriculture and disseminated by universities, provincial and regional plant protection institutes, farmer organization, NGO and private sectors. In some area the use of biocontrol agent has made some success. However, it has still some technical and institutional problems.

### Microbial Pesticide Used by Farmers

*Beauveria bassiana* is the most widely used microbial insecticides by Indonesian farmers to control brown plant hopper and rice bug of rice. Generally this fungus is applied by farmers in powder formulation after grown in par-boiled rice culture. Genetic variation of isolates and mass production and formulation is the main problems (Santoso et.al, 2005). Other microbial pesticide is *Se NPV (Spodoptera exigua Nucleopolyhedrovirus)*. Shallot farmers in Brebes and Cirebon apply this bio-agent to control shallot armyworm (*Spodoptera exigua*). Diverse species and isolates of microbes are used by farmers as microbial fungicides. There are four groups of microbes of biocontrol agent *i.e.* rhizospheric/soil fungi, antibiosis-bacteria, plant growth promoting rhizobacteria (PGPR) and yeasts antagonists. Some species of *Trichoderma*, and *Gliocladium* are examples of soil/rhizospheric fungi which widely used by Indonesian farmers to control many soil-borne diseases (stem blight of chili, stem rot of peanut, wilt of tomato). Moreover, the antibiosis bacteria such as fluorescent pseudomonas have more limited application by farmers, generally also for controlling soil borne diseases.

The new generation of biocontrol agent in Indonesia, PGPR (*plant growth promoting rhizobacteria*) firstly developed by Department of Plant Protection Bogor Faculty of Agriculture IPB. It consists of two bacteria *Paenibacillus* and *Pseudomonas fluorescens*. Beside it's antibiosis advantage, PGPR induces systemic resistance of plant, therefore it is able to control diseases of aerial plant parts such as chili anthracnose and rice blast. PGPR is widely disseminated by Plant Clinic of IPB

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to farmers through numerous activities (Wiyono *et al.*, 2007). Yeast antagonist is being studied in the laboratory and in the field by Dept of Plant Protection of IPB.

The use of microbial pesticides in Indonesia has promising result. There is no available data of the number of applying farmers in Indonesia. Number of farmers assisted by Plant Clinic of IPB applied microbial pesticides and efficacy rate is depicted in Table 1. This table shows the effectiveness of microbial pesticides is high (42-90%).

Table 1. Application of Microbial Pesticides by Farmers assisted by Plant Clinic

Microbial Pesticides	Target pests	Crops	Number of applying farmers	Applied area (ha)	Efficacy rate (%)
PGPR	Antrachnose	Chili	125	55,3 (Bogor, Sukabumi Tegal)	59
<i>Trichoderma harzianum</i>	Stem blight	Chili	35	18,5 (Tegal)	62
SI NPV	Armyworm	Soybean, tomato	12	3,65	-
Se NPV	Shallot armyworm	Shallot	9	3,59 (Tegal, Brebes, Cirebon)	90
Yeast Antagonist* ( <i>Cryptococcus terreus</i> )	Petal blight	Orchid dendrobium	-	-	42
Yeast Antagonist* ( <i>Cryptococcus terreus</i> )	White rust	Chrysanthemum	-	-	53

Note: \*) still in field test, not used by farmers yet (Source: Wiyono *et al.*, 2007; Wiyono and Agustina, 2008)

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## Dissemination

There two ways for dissemination, firstly is a state-driven through national, provincial and regional plant protection institutes, and bio-agent posts managed by farmers. Second way is through private companies in which only limited microbial pesticides has registered in Indonesian Ministry of Agriculture, and sale commercially. Plant Clinic of IPB actively play important role in biocontrol agent dissemination through cooperation with plant protection institutes and also local plant clinic partners i.e. Plant Clinic of Tegal, Plant Clinic of UNS (Surakarta) and Plant Clinic of Pondok Pesantren Ushuludin Magelang. A farmers organization – Ikatan Petani PHT Indonesia-Association of IPM Farmers of Indonesia (IPPHTI) also intensively disseminate biocontrol agent for its members.

## Problems

The use of microbial pesticides is limited due to some reasons. Species and genetic diversity of applied isolates has made sometime varied results. Technique of mass production and formulation ensuring quality and storability are also still problems. Institution disseminating and producing microbial pesticides still has problems in ensuring the product in mass scale, therefore availability of ready-for used microbe pesticides is still a problem. The number of biopesticides registered in Ministry of Agriculture is still limited only 22 from total 1158 registered brand (1.90%) (Directorate General of Food Crops, Ministry of Agriculture, 2006). Better policy in research, mass production and distribution will favor the wider use of microbial pesticides.

## Challenge and Future Prospect

Increasing awareness of people on environment, the presence of some pests which can not be controlled chemically, and conducted governmental policy support are driving forces for development and uses of microbial pesticides. Massive campaign of chemical pesticides

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and problem of continuity of supply are the main inhibiting factors. The invention of new effective species or isolates of biocontrol agent, research on appropriate formulation are still important area for academia of universities. Improvement of supply mechanism and further policy support are needed to push the nation wide-use of microbe pesticides.

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