

PROTEASE PRODUCTION AND PHOSPHATE SOLUBILIZATION FROM POTENTIAL BIOLOGICAL CONTROL AGENTS *TRICHODERMA VIRIDE* AND *AZOMONAS AGILIS* FROM VETIVER RHIZOSPHERE

Vanlada Sunantapongsuk¹, Pracha Nakapraves¹, Siangjeaw Piriyaaprin¹ And Leka Manoch²

1 Department of Land Development, Ministry of Agriculture and Cooperatives,
Bangkok 10900, Thailand

2 Department of Plant Pathology, Faculty of Agriculture, Kasetsart University,
Bangkok 10900, Thailand

Abstract

From 2002-2004, six species of *Trichoderma* and one species of *Azomonas* were isolated from rhizosphere soil samples of 20 *Vetiver zizanicides* ecotypes and 11 *V. nemoralis* ecotypes in Prachuab Khiri Khan Province, Thailand. *Trichoderma viride* showed highly effected antagonistic activity in tests against some plant pathogenic fungi, such as *Phytophthora palmivora*, *P. parasitica*, *Pythium sp.* and *Rhizoctonia solani*. Furthermore, *T. viride* produced moderate amounts of protease and organic acids for phosphate solubilization. *Azomonas agilis* produced large amounts of organic acids to solubilize phosphate and calcium to increase soil fertility and enhance plant production.

Introduction

Protease has an important role to decompose protein substance. In the condition of biodegradation, microorganisms capable of degrading protein are fungi, bacteria, and actinomycetes (Alef et al, 1995). For the agricultural application, there is mentioned in the role of protease producing by microorganisms as biological control agents for eradication of some fungal plant pathogens (Stephen and Kevin, 2001). Furthermore, phosphate solubilizing microorganisms can be as biocontrol agent and solubilise phosphorus compound to available phosphate form for plants (Whitelaw et al., 1999).

Materials and methods

Experimental plan : *Trichoderma viride* and *Azomonas agilis* were isolated from vetiver rhizosphere (Sunantapongsuk et. al., 2002). The test of antagonism reaction between *T. viride* and *A. agilis* with some plant pathogenic fungi. The ability of microorganisms to solubilise insoluble phosphorus and protein were tested in calcium phosphate and skim milk liquid medium respectively (Alef and Nanripereri, 1995). Organic acids production were also tested by using bromtymol blue as indicator.

Data collection : The antagonism reactions were observed. Analysis of microbial activities were protease, organic acids and releasing available phosphate.

Results and Discussion

Trichoderma viride had highly affected to inhibit and destroy some plant pathogens such as *Phytophthora palmivora*, *P. parasitica*, *Helminthosporium maydis*, *Pythium sp.* and *Rhizoctonia solani* (Stephen and Kevin, 2001). Protease was the highest released 63.84 mU/ml during 5 days of incubation period (Figure 1). This enzymes lyzed the surface of plant pathogen hyphae and had effect the loss of protoplasm in the hyphae (Harman, 2000). *Azomonas agrilis* had shown more the width of clear zone as 6.75 mm than *T. viride* as 3.57 mm (Whitelaw et al., 1999) as shown in Figure 2. Moreover, *A. agrilis* produced organic

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acids to solubilise insoluble phosphorus and released available phosphate 734.52 ppm at 24 hr. of incubation time where as *T. viride* less released phosphate 359.18 ppm at 48 hr. (Figure 3).

Conclusions

1. Protease were released by *Trichoderma viride* to play an active role in the biological control of some plant pathogens.
2. *Azomonas agilis* had potent phosphate solubilization and also strongly produce some organic acids.
3. Both *T. viride* and *A. agilis* could be applied as biocontrol agent and phosphate solubilizer for soil improvement.

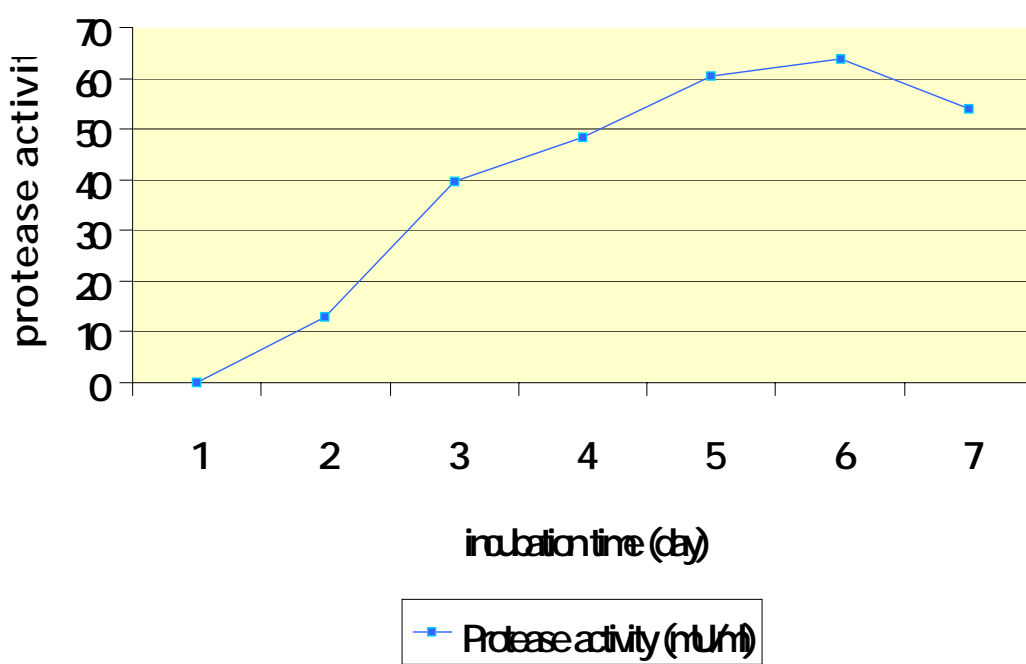


Figure 1. Change of protease activity produced by *Trichoderma viride*

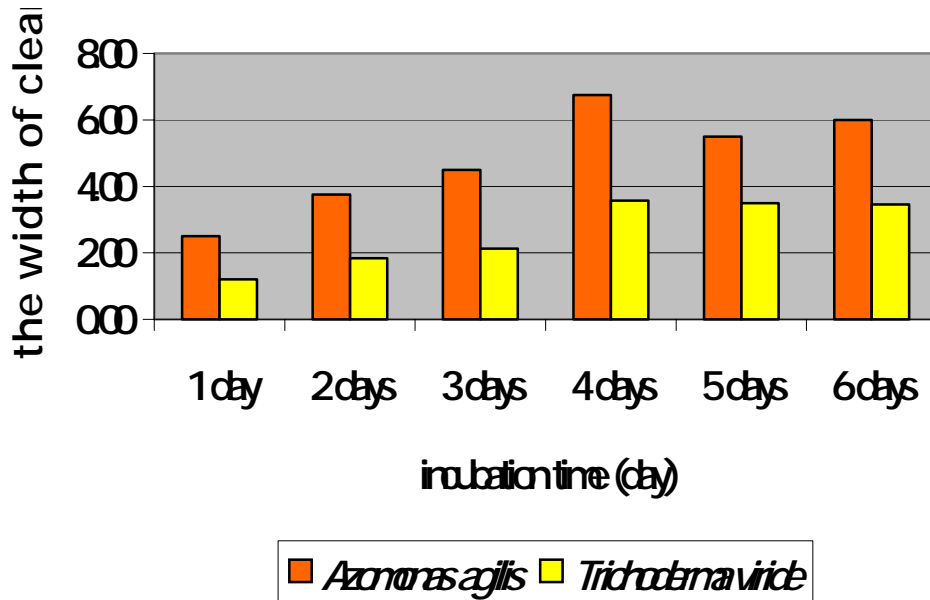


Figure 2. Change of the width of clear zone appearance by phosphate solubilizer

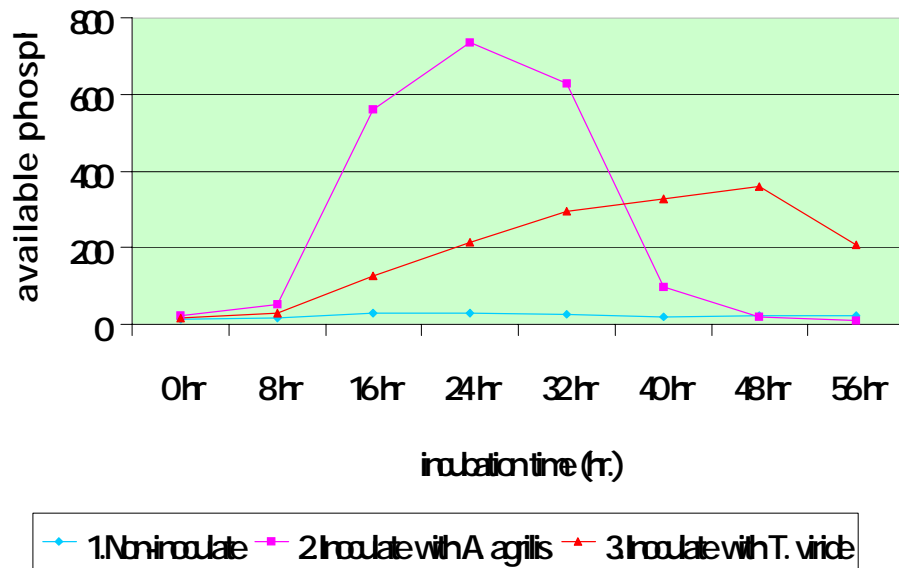


Figure 3. Change of amount available phosphate in liquid media by *Azomonas agilis* and *Trichoderma viride*

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