



ON-FARM PRODUCTION OF FUNGI-ARBUSCULAR MYCORRHIZAE

By

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Abstract

Arbuscular Mycorrhiza Fungi (AMF) is one fungi that exhibits symbiosis with most plants, either of forestry or agricultural plants. The presence of such symbiosis has been proven to be able to improve the growth and health of the host plants. AMF could be mass produced as biological fertilizer so that it can reduce the use of chemical fertilizer. This research had the objective of producing AMF inoculum in the field by using sand medium, bacteria and fertilizer hyponex for stimulating the development of mycorrhiza. Results of the research showed that the use of bacteria could increase the percentage of root infection and number of spores in the plants *Pueraria javanica* and *Zea mays*. On the other hand, fertilizer Hyponex could increase the percentage of mycorrhizal infection.

Key words: arbuscular mycorrhiza, on farm production, biofertilizer

Introduction

The use of chemical fertilizer in the program for increasing agricultural production has been commonly practiced and has been proven to be able to increase yield. However, the impact, in the form of environment pollution and the negative effect on human health, could not be prevented. Therefore, the use of biological fertilizer as an alternative for reducing the use of chemical fertilizer is very important. Arbuscular Mycorrhiza Fungi is one form of biological fertilizer that has been proven to be able to increase crop production and reduce the use of chemical fertilizer (Gianinazzi et. al. 1990). To be processed into inoculum, these mycorrhiza fungi should be multiplied by using certain medium and suitable host plant. Increase of spore production could be accelerated



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by using bacteria (Budi et.al.1999) or by using fertilizer Hyponex (Anas and Tampubolon 2004). Media that area commonly used in this inoculum multiplication are among other things zeolite, expanded clay or mixture of soils and sands.

Technique of inoculum multiplication is usually conducted by using plastic pot or polybag filled with medium. This technique is successful enough, although it needs much funding for procurement of polybags or plastic pot. Therefore, for producing sufficient amount of inoculum with technique that is easy to be practiced by farmers, and does not need much cost, there is a need for improving the technique of this mass production. One technique being developed was constructing beds measuring 5 m X 1m filled with sand medium and was planted with host plants in the field.

The objective of this research was to learn the technique of mass production of inoculum of Arbuscular Mycorrhiza Fungi in the field by using various treatments to stimulate the spore development.

Materials And Methods

The experiment was conducted in the field of Gunung Walat Educational Forest, Faculty of Forestry Bogor Agricultural University. Materials used were sands; seeds of *P. javanica*; and *Zea mays*, inoculum of AMF containing mixed isolates (*Gigaspora rosea*, *Acaulospora tuberculata*, *Glomus manihotis*, and *Glomus etunicatum*); isolate Bacteria isolated from arbuscular mycorrhizal spores, staining solutions: 10% KOH, 2% HCl, glycerol, lactic acid, trypan blue, bayclean, and Hiponex with low P content.

Seeds of *P. javanica* and *Zea mays* were sterilized using bayclean then germinated on sterile sand. The germinated seeds were transplanted to the bed 1 x 5 m containing sands and at the same time were inoculated with a mixture of AMF inoculum, bacteria isolate, or hyponex according to the designated treatments. The treatments are: control, inoculated by bacteria isolate and fertilized by hyponex. The design was presented in Fig 1.



Fig 1 Inoculum Production of Arbuscular Mycorrhizae Fungi in the field. 4 months after planting

Each bed were planted with 50 seedlings and maintained for three months. The parameters measured were number of spores produced, and % root colonization. The intensity of mycorrhizal development was measured using a light microscope as the frequency of colonized root pieces.

Values obtained were analyzed by analysis of variance (ANOVA) and tuckey test was applied when the treatment significantly different.

Results And Discussion

Treatments of bacteria or Hyponex could increase the percentage of root infection and number of spores, either in plant *Puerearia javanica* or *Zea mays* (Table 1). Number of spores in the bacteria treatment was higher as compared with control and hyponex fertilizer treatment. This bacterium is very likely belonged to the group of Mycorrhiza Helper Bacteria (MHBs) due to the consideration that the bacteria used were isolated from AMF spores. This was in agreement with research by Lindermann and Meyer (1986), Budi et.al (1998a) and Budi et.al (1998b); and with phenomenon that the use of bacteria coming from spores or mycorrhizosphere could increase production of spores and infection percentage of the host plant roots. Beside that, MHBs generally function as bioprotector that could overcome root pathogens (Chiternezie et.al. 1996). Considering that the production of AMF inoculum requires long period of time and open places, then the chance of contamination by pathogen is very high. However, the use of these MHBs could overcome this problem.

Table 1 Effect of bacteria isolate and hyponex on mycorrhizal development after 12 weeks or spore production in the filed, * P≤0.05

Plant	Treatment	% roots infection	Spore production (spore/20 g sand)
<i>Purarea javanica</i>	Control	87	48
	Bacteria	99*	80*
	hyponex	98*	56
<i>Zea mays</i>	Control	77	72
	Bacteria	99*	86*
	hyponex	99*	48

The use of Hyponex could also increase the number of spores, but there is a tendency that this depend on the species of host plants used. Table 7.1 showed that in *Zea mays*, number of spores in control treatment was higher than that in hyponex treatment. This was possibly due to different physiological characters of the two host plants so that their respond on fertilizer application would be different. Beside that, *Pueraria javanica* is a leguminous plant that could fix free nitrogen from the air, so that the growth of this plant tends to be better and tend to give nitrogen to the fungi.