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The Control of Pathogenic Fungi with Trichoderma in Banjar Pinge, Tabanan of Bali Province

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A B S T R A C T

Pinge is one of traditional sub-village (banjar) in Baru Village, Marga Subdistrict, Tabanan Regency of Bali Province. There are 36% of villagers living below the poverty line where 85% of them are farmers who cultivate fruit and flowers. They have many problems with fruit and flower production as the yields is low due to natural disasters and poor agricultural practice and support. Some flower growers often complain of low flower production, especially Marigold flowers due to the attack of pathogenic fungi that cause flower blight. The solution to solve the problems faced by partners is: by providing Appropriate Technology in the processing of cow dung into compost fertilizer plus *trichoderma* sp antagonist microorganisms. External targets to be achieved are the use of appropriate technology in the processing technology of cow dung into compost plus Trichoderma sp. Based on the results of activities as much as 70% understand and are able to apply pest and disease control to flowers by utilizing biological agents. Trichoderma can reduce the intensity of disease above the ground by 50.00% and suppress the intensity in the soil by 34.48%. In addition, giving Trichoderma sp. can increase the fresh weight of the plant by up to 30.75%.

1. INTRODUCTION

1.1. Research Background

Bali Province is a tourism development area in Indonesia, one of the districts in Bali that began to actively develop the tourism sector is Tabanan Regency [1]. Tabanan Regency is one of the Nine Regencies/Cities in Bali, in addition to being an agricultural area also has considerable agrotourism potential to be developed, both in terms of its natural beauty and in terms of its deep-rooted cultural arts in the community based on Hindu philosophy [1]; [2]. The development of agricultural-based tourist villages will provide many benefits both for tourism and Balinese society and culture. Village development realizes the equitable development of tourism and its benefits, as aspired by Law No. 10 of 2009 and Bali Regional Regulation No. 3 of 2001 concerning Pakraman Village. Tourist villages are also one way to reduce "leakage" of profits outside the area, so that the benefits can be enjoyed by the surrounding community more directly or through a higher multiplication effect. The development of agricultural-based tourist villages is expected to also stimulate development in the countryside, as well as the excavation of various potentials that have been lacking or have not received attention [3]. According to Ref. [4], the development of agriculture-based tourism will directly touch and involve the community, thus bringing various impacts to the local community, both positive and negative.

Pinge is one of the official *banjar* in Baru Village, Marga Subdistrict, Tabanan Regency. The area of the Baru Village is: 400 Ha. Administratively, The Baru Village is divided into 4 (Four) Banjar Offices / Hamlets which include: Banjar Dinas Baru., Banjar Dinas Raden, Banjar Dinas Pinge, Banjar Dinas Susut, which is located in Tabanan Regency Marga District which is famous for having ancient customs. 36% of rural communities live below the poverty line with 85% being farmers, most of whom face problems with fruit and flower production, leading to low yields due to natural disasters and poor agricultural

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engineering and support. Some flower growers also often complain of low production of good flowers due to the attack of pathogenic fungi that cause flower blight (Figure 1). In Pinge Village there are Marigold flower plants that are affected by leaf blight caused by pathogenic mushrooms and partners do not yet know how to overcome the problem. In addition, in Pinge Village there are cow dung and chicken manure that has not been utilized to the maximum so that there are still many that are thrown into the river so as to damage the view of Pinge Village as a Tourist Village.

Figure 1. Diseases in Marigold Plants due to Pathogenic Fungi in Pinge Village

1.2. Literature Review

In terms of tourism development itself, tourism is one way to develop tourist villages which is one of the efforts to open new market share of tourism in Bali. In addition, tourist villages are also one of the attractions of tourist estimates that have reached saturation point for various forms of conventional tourism and began to be more oriented towards 'alternative. One alternative to tourism is to develop tourist attractions based on agricultural activities [5].

1.3. Research Objective

The solution done to solve the problems faced by partners is: Providing Appropriate Technology in the processing of cow dung into compost fertilizer plus antagonistic microorganisms *Trichoderma* sp.; Targets and the outcome that are to be achieved or that will be produced in accordance with the activity plan are partners able to make *trichoderma sp* biologicalertilizers. Independently and able to apply to plants, especially Marigold flowers. Compost with Trichoderma can also be applied to seasonal plants such as soursop, chocolate, durian so that increased crop production in Pinge Village.

2. MATERIALS AND METHODS

2.1. Implementation Methods

The method of implementing community service activities is 1). Methods of interviews and discussions to be able to find out the problems experienced by partners; 2). Face-to-face method and direct counseling, so that partners gain knowledge about the control of pathogenic mushrooms with trichoderma; and 3). Direct practice, guided by instructors who are competent in their field, so that partners can apply directly the given methods.

2.1.1. Plan and Procedure of Activities

Plans and Procedures for community service activities that will be carried out are:

1. Approach to the group, selection of places while choosing participants, who will then be referred to as trainees. Interview and Q&A about the problems faced by partners, as well as planning activities that show the steps of solutions to the problems faced.
3. Partners will first be given material that has been prepared by the team in the form of modules on the control of pathogenic mushrooms with trichoderma.
4. Direct practice of pest and disease control in flowers with the Bioagents Trichoderma consists of 3 stages as in the flow chart in Figure 2.

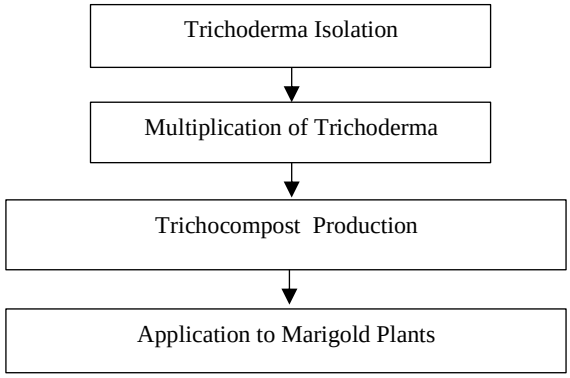

Figure 2. Flowchart of The Implementation of Trichoderma Manufacturing Practices

2.1.2. Trichoderma Isolation

The medium used to isolate and subculture Trichoderma is medium PDA. Trichoderma isolation is done using dilution methods and direct isolation methods. In the dilution method taken as much as 1 gram each soil sample dissolved in sterile aquades is sufficient up to a volume of 100 ml and carried out serial dilution method (serial dilution method) until the dilution factor of 10-3 is then taken 2 drops using sterile drip pipettes and spread on the PDA medium. The direct isolation method is to take 1 gram of soil each sample and then spread it and flatten it on the PDA medium and then incestated at room temperature.

2.1.3. Multiplication of Trichoderma

Propagation of Trichoderma pad rice or corn media can be done by way, Wash corn rice until clean soak for 12 hours (overnight), Steam for 15 minutes, lift, refrigerate. Put in a plastic bag, 1/2 bag, sterilize with autoclave. Refrigerate, placed in a plastic rack or basket. Once cold the medium is inoculated with Trichoderma in laminar flow or enkas. Each inoculated plastic bag is covered using a sealer. Incubation is placed in a plastic shelf /basket at room temperature and is not exposed to direct sunlight. Incubation is carried out for 7 days.

2.1.4. Trichokompos Production

The way to make trichokompos is as follows:

1. Mix the chaff charcoal and cow dung.
2. Mix EM4, Molasses and rice laundry water.
3. Flush the mixture containing EM4 in cow dung then put again *Trichoderma* sp.
4. Mix everything evenly using a scope.

5. If there is less moisture, water can be added.
6. After the mixture of materials is moist then made a pile as high as 1 meter, then covered with plastic / tarpaulin. Incubation (watered) for 3 weeks and stirred once every 3 days.

2.1.5. Application of Trichokompos on Plants

Application of trichoderma doses adjusts to the type of plant cultivated (Table 1).

Table 1. The Dosage Application of Trichokompos on Plants

Plant	Dosage	Application
Perennial Crop	5 ton/ha	Apply it once a year around the plant.
Annual Crop	10-20 ton/ha	Apply together when tilling the soil (Before planting))

2.2. Partner Participation

A total of 25 members of the group were trained in pest and disease control in flowers by the Agricultural Coordinator through cooperation with the Faculty of Agriculture and Agrotechnology, Universiti Teknologi MARA (UiTM) Shah Alam, Malaysia and other institutional specialists where possible. Monitoring and support will be provided after each training course.

3. RESULTS AND DISCUSSIONS

3.1. Implementation of Activities

Community service activities begin with counseling in the form of providing material about the use of trichoderma biological agents in disease pest control (Figure 3). The extension activity was carried out on October 25, 2021 at the Office of the Baru Village Head. The activity continued with the direct practice of making trichoderma biological agents by the pinge tourism village management group.

3.2. Trichoderma Isolation

Trichoderma isolation is done using dilution methods and direct insulation methods using PDA media. Mushrooms suspected of Trichoderma have characteristics such as light green color until old, hyphae spread quickly and evenly, round colony shape. Trichoderma that has grown on a PDA medium is then purified by being separated from other mushrooms and then grown on a new PDA medium. Each Trichoderma of different rizosfer origins is labeled on the petri dish and the date of purification. Macroscopic observation of fungi, namely by observing morphological shapes that include the shape of the colony, the shape of the edge of the colony, the upper surface of the colony, the color of the colony.

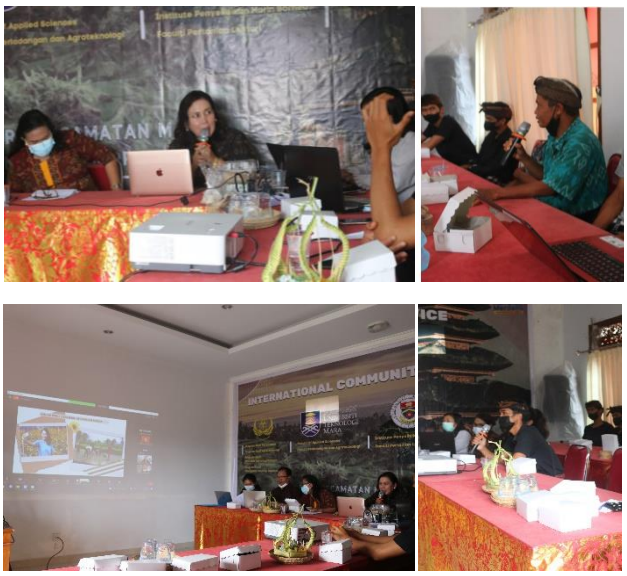

Figure 3. Provision of Material on the use of trichoderma biological agents in disease pest control in the pinge tourism village management group

3.3. Multiplication of Trichoderma

The propagation of Trichoderma in rice or corn media. Here are the results of propagation in rice media carried out by the group (Figure 4).

Figure 4. Results of Trichoderma propagation in Rice Media

3.4. Trichoderma application on compost

Composting is the process of decomposition of organic matter derived from agricultural waste. The composting process generates heat so that it will produce disease-free compost, weed seeds, reduces odor and is easier to apply in the field. In addition, by composting it will increase the availability of nutrients. One of the composting materials is from agricultural waste in the form of compost cattle manure derived from livestock manure that has been ready to be applied has the characteristics of cold, crumbs, the original form is not visible, and the smell has been reduced. If you do not have these characteristics, then the compost is not ready to use. The use of immature compost will inhibit plant growth, can even kill plants. The application of Trichoderma in composting can suppress the growth of pathogenic mushrooms thereby increasing production output. Giving *Trichoderma sp* can reduce the intensity of disease above the ground by 50.00% and suppress the intensity in the soil by 34.48% [6]. Ref. [7] also states *trichoderma sp.*can inhibit the pathogenic fungus Fusarium with a bland power of 61.82%.

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Trichoderma sp can inhibit *botryodiplodia theobromae* fungus by 94.58% and inhibit *Gliocladium sp* by 81.67% in antagonistic tests[8]. In addition, giving *Trichoderma sp.*can increase the fresh weight of the plant by up to 30.75% [6]. This is thought to be related to the ability of *Trichoderma sp.* in producing growth hormone. This is in accordance with the opinion of Ref. [9], that *Trichoderma* sp. is able to produce amoce among which is IAA. This hormone is able to increase lateral root growth, multiply buds and increase the biomasa of buds in arabidopsis plants. This is reinforced by Ref. [10] opinion, that *Trichoderma sp.* It is a mesophilic, non-pathogenic philosophic fungus, has the ability to hydrolyze cellulose and hemicellulose into glucose and xylose, and is widely used to produce cellulose enzymes thereby increasing plant biomass.

Figure 5. Trichoderma application on compost

3.5. Economic Impact

Community Partnership Program implemented in Pinge Tourism Village Manager, in Banjar Pinge, Baru Village Marga District tabanan provides benefits to partner groups, especially partners can produce environmentally friendly Trichoderma biological fertilizer independently until the packaging stage, with such progress spending on the process of producing vegetables, fruit, and flowers can be minimized, In the future, it is expected to produce more so that it can be marketed to the wider community. Based on the results of activities as much as 70% understand and are able to apply pest and disease control to flowers by utilizing biological agents so that flower production, especially Marigold flowers, increases.

3.6. Constraints

The obstacles faced in the implementation of PKM are still low public interest to apply the introduced technology, of the 25 members of the group trained, only 70% successfully apply up to the level of application, so it needs continued efforts for assistance, especially in solving the obstacles faced in theproduction of fertilizers and their application to plants.

3.7. Supporting Factors

The PKM program received support from the Tourism Village Manager and subak Farmers group, then supported by very large resources, especially land and equipment to continue the development of biological fertilizer manufacturing technology. Farmers' needs are very high for biological fertilizers for better development of bungan crops and control of plant diseases.

3.8. Strategic Steps for Further Realization

Our next strategy is to improve the quality of Trichoderma bio-fertilizer produced by carrying out various stages including testing and calculating macro and micro nutrients in fertilizers, the content of organic matter, and the potential of Trichoderma in both the total population and its potential in increasing plant growth. In addition, testing in the field with plant demplot is very important to test the quality of biological fertilizers directly. To improve the quality of the product it is very important to do attractive and economical packaging.

4. CONCLUSION

From the community partnership program that we conducted it can be concluded that the pinge tourism village management group is able to produce physical quality Trichoderma biological fertilizer. Economically, there is currently no visible impact because new fertilizers are utilized by some farmers, not yet towards the stage of production on a large scale. Members of the partner group have knowledge of the production of biological fertilizers and as many as 70% successfully apply up to the level of application. The bio-agent *Trichoderma* is able to suppress pathogenic mushrooms. *Trichoderma* can reduce the intensity of disease above the ground by 50.00% and suppress the intensity in the soil by 34.48%. In addition, the administration of *Trichoderma sp.*can increase the fresh weight of the plant by up to 30.75%.

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