AJARCDE
ASIAN JOURNAL OF APPLIED RESEARCH FOR COMMUNITY DEVELOPMENT AND EMPOWERMENT

Journal home page: http://ajarcde-safe-network.org ISSN 2581-0405

Application of Trichoderma Composting Technology in the Women's Farmer Group, Sanur Kauh Village, South Denpasar District, Denpasar City, Bali Province

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ARTICLE INFO

Article History
Received: 19 March 2023
Final Revision: 03 June 2023
Accepted: 19 June 2023
Online Publication: 20 June 2023

KEYWORDS

Sanur Kauh, fertilizer, compost, Trichoderma, fungi

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A B S T R A C T

The problem being faced by farmer groups in the rainy season is the increased growth of fungi that cause plant diseases, such as Rigdiforus ligneous fungi, Fusarium oxysporum, Rizoctonia solani, Fusarium monilifome, Sclerotium rolfsii, and Sclerotium rilfisil fungi. With the concept of controlling plant-disrupting organisms (OPT) naturally, to get healthy plant cultivation free from disease (especially plant diseases caused by pathogenic fungi), Trichoderma compost (TrichoCompost Fertilizer) is applied. Interviews, face-to-face, counseling, and direct practice methods will do the method to implement this training. This activity aims to train participants to understand how to make Trichoderma compost as organic fertilizer to get healthy organic vegetables. The output target to be achieved is using appropriate technology in cow manure processing technology into compost plus Trichoderma sp. Based on the results of activities, Trichoderma compost can suppress pathogenic fungi by 98.53% so that farmer groups produce healthy plants free of pathogenic diseases.

1. INTRODUCTION

1.1. Research Background

Many high-quality organic fertilizers have been created due to technological advancement by converting trash that pollutes the environment into organic fertilizers packed with macro and micro elements that plants can immediately use. According to the study, organic materials and fertilizers act as biological buffers to enhance the soil's physical, chemical, and biological characteristics and enable it to supply nutrients balanced. Adding fertilizers to the soil is the most practical way to increase soil fertility. To ensure that the fertilizer used is effective and efficient, paying attention to the balance of soil fertility is vital. The physical fertility of the soil will be harmed by the addition of inorganic fertilizers that only offer ready-to-eat mineral ions, making the soil hard and dense. As a result, using organic fertilizers will greatly enhance soil quality [1]. However, if raw organic matter is included during the application, organic fertilisers take much longer to break down into mineral ions. To hasten decomposition and maintain soil fertility, it is necessary to boost the soil's microbial content [2].

The fungus Trichoderma sp. is one useful microbe well-known as a biological fertilizer for soil [3]. Trichoderma sp. is a species that can act as a biological agent, a plant growth promoter, and a decomposing organism [4]. Trichoderma sp. species that are broad-spectrum in different crops, as T. harzianum, T. viridae, and T. konigii, have been identified as biological agents [5]. The planting area is given a culture of the fungus Trichoderma sp., which decomposers to turn organic waste (dropping leaves and old twigs) into high-quality compost [6]. It can also function as a biofungicide, which helps to keep harmful organisms that cause plant illnesses under control. Several pathogen-causing fungi, such as Rigidiforus lignosus, Fusarium oxysporum, Rizoctonia solani, and Sclerotium rolfsi, can be prevented from growing on plants by Trichoderma species [7]. Trichoderma sp. acts as a biological controller and promotes plant development, plant roots, and crop yield. This characteristic suggests that Trichoderma sp. also promotes plant development [8].

The Women's Farmer Group "O Yes" is in Denpasar's Sanur Kauh Village. Established in June 2021, this 12-person team looks for 40 acres. The group also grows corn, long beans, kale, spinach, eggplant, and green vegetables. The organization grows organic crops using organic waste, including dry leaves, domestic debris, canning milk residue, and cow and poultry dung.

Solutions must be discovered to deal with the group's issue of expanding pathogenic fungi that harm plants. Compost made from Trichoderma offers a solution to these issues. We can utilize Tricho compost fertilizer to manage plant-disrupting organisms naturally (OPT) to acquire healthy plant cultivation free from diseases (particularly plant diseases caused by pathogenic fungi). Trichoderma sp., a biological agent, creates this fertilizer inside the combination. Tricho compost fertilizer has various advantages, including stopping or lessening the spread of diseases from and in the soil, enhancing soil quality and fertility, and improving soil structure and texture. Trichoderma compost can improve soil, preserve microbial balance, feed plants, prevent infectious diseases, and fertilize soil [8]. According to the study, Trichoderma compost can 98.53% effectively control pathogenic fungi [9] [10].

1.2. Research Objectives

The study aimed to see the ability of Trichoderma compost "Tricho Kompos" produced by farmer groups in suppressing pathogenic fungi on their vegetable crops.

2. MATERIALS AND METHODS

2.1. Implementation Method

The method of implementing community service activities is 1). Interview and discussion methods to be able to find out the problems experienced by partners. 2). Face-to-face method and provide direct counseling so that partners gain knowledge about pathogenic fungus control with Trichoderma and 3). Direct practice is guided by instructors who are competent in their fields so that partners can directly apply the methods provided.

2.2. Activity Plan and Procedure

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

1. Approach the group, selecting places and selecting participants, which will be referred to as training participants.
2. Interviews and questions and answers about problems faced by partners, as well as planning activities that show steps to solve the problems faced.
3. Partners will first be given material prepared by the team in the form of modules on using Trichoderma, how to make *Trichoderma* compost and its application in vegetable planting.
4. Direct application to groups starts from counseling and direct practice. Here is how to make Trichoderma compost which consists of 3 stages, as in the flow diagram in Figure 1.

2.2.1. Isolation

The medium used to isolate and subculture Trichoderma is PDA Medium. Isolation of Trichoderma is carried out using the method of dilution and the method of direct isolation. In the dilution method, 1 gram of each soil sample is dissolved in sterile aquades, sufficient to a volume of 100 ml, and the serial dilution method is carried out until the dilution factor is 10-3, then 2 drops are taken using a sterile drip pipette and then spread it on PDA medium. The direct isolation method takes 1 gram of soil for each sample, spreads and flattens it on the PDA medium, and then incubates it at room temperature.

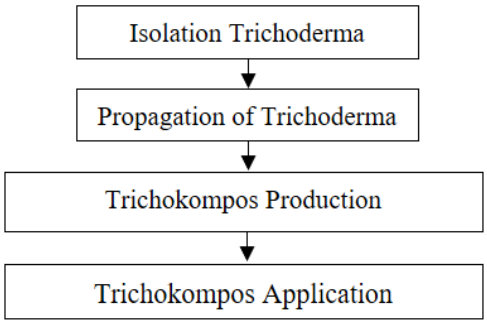

Figure 1. Flow Diagram of Trichocompost Making Practice

2.2.2. Trichoderma *Propagation*

Trichoderma propagation in rice or corn media can be done by washing corn rice thoroughly, soaking for 12 hours (overnight), Steam for 15 minutes, remove, and cool. Put in a plastic bag, 1/2 bag, sterilize with an autoclave. Cool, laid out in racks or plastic baskets. After cooling the medium is inoculated with Trichoderma in laminar flow or enkas. Each inoculated plastic bag is sealed using a sealer. Incubation is placed in plastic racks/baskets at room temperature and not exposed to direct sunlight. Incubation is carried out for seven days.

2.2.3. Making Trichocompost

The method for making trichocompost is as follows:

- Combine husk charcoal and cow dung.
- Combine EM4, Molases, and rice washing water.
- Sprinkle the mixture containing EM4 on cow dung, then insert *Trichoderma sp* again.
- Mix everything until evenly distributed using a scope.
- If the humidity is lacking, water can be added.
- After the mixture of ingredients is moist, a pile as high as 1 meter is made, then covered with plastic/tarpaulin. Incubate (grow) for three weeks and stir once every 3 days.

2.2.4. Application of Trichocompost in Plants

Giving Trichoderma is easiest by making rich compost then given to plants, the dose adjusts to the type of plant cultivated, which is 10-20 tons / ha.

3. RESULTS AND DISCUSSION

3.1. Implementation of Activities

Community service activities began with counseling by providing material on using trichoderma biological agents in pest control. The counseling activity was held at the Sanur Kauh Village Head Office.

https://doi.org/10.29165/ajarcde.v7i2.280

Figure 2. Provision of Material on the use of Trichoderma biological agents in pest control in the Women Farmer's Group "O yess"

The activity continued with the group's direct practice of making Trichocompost fertilizer. The stages of implementing the practice are as follows.

3.1.1. Insulation

Trichoderma isolation uses dilution and direct isolation methods using PDA media. Fungi suspected of Trichoderma have characteristics such as light to dark green color, hyphae spread quickly and evenly, round colony shape. Trichoderma grown on PDA medium is then purified by separating from other fungi and then grown on new PDA medium. Each Trichoderma of different rhizosphere origin is labeled on the petri dish and the purification date. Macroscopic observation of fungi, namely by observing morphological forms, which include colony shape, colony edge shape, upper surface of the colony, colony color.

3.1.2. Trichoderma Propagation

Trichoderma propagation on rice or corn media.

3.1.3. Application of Trichoderma to Compost

Composting is the process of decomposition of organic matter derived from agricultural waste. The composting process generates heat so that compost will be free of disease, and weed seeds, reduce odor and be easier to apply in the field. In addition, by composting, it will increase nutrient availability. One of the materials for making compost is from agricultural waste in the form of livestock manure Compost derived from livestock manure that has been ready to be applied has the characteristics of cold, crumb; its original form is invisible, and the smell has been reduced. If you do not have these characteristics, the compost is not ready for use. Using immature compost will inhibit plant growth and even kill plants. Applying Trichoderma in composting can suppress the growth of pathogenic fungi, thereby increasing production yields. *Trichoderma sp* administration can reduce the intensity of disease in the soil by 50.00% and suppress the intensity in the soil by 34.48% [11]. Ref. [12] also stated *Trichoderma sp*. can inhibit the pathogenic fungus Fusarium with an inhibitory power of 61.82%. *Trichoderma* sp can also inhibit the fungus Botryodiplodia theobromae by 94.58% and inhibit *Gliocladium sp* by 81.67% on. Antagonist test [13].

Figure 3. Trichoderma Propagation in Rice Media

Figure 4. Application of Trichoderma in Compost

3.2. Economic Impact

The Community Partnership Program implemented in the O yes women's farmer group "O Yess", Sanur Kauh Village Denpasar, provides benefits to partner groups, especially partners who have been able to produce environmentally friendly Trichoderma biofertilizer independently to the packaging stage, with such progress expenditure for the vegetable production process is minimized, in the future it is expected to produce more so that it can be marketed to the broader community. Based on the results of activities, as many as 82% understand and can apply pest and disease control to vegetables by utilizing biological agents so that vegetable production increases.

3.3. Constraints

The obstacle faced in the implementation of PKM is that there is still low public interest in applying the introduced technology, of the 12 group members trained, only 82% have succeeded in applying it to the application level, so further efforts are needed for assistance, especially in solving obstacles faced in the fertilizer production process and its application to plants.

3.4. Strategy Steps for Further Realization

Our next strategy is to improve the quality of Trichocompost fertilizer produced by carrying out various stages including testing and calculating macro and micronutrients in fertilizer, organic matter content, and the potential of Trichoderma in it both from the total population and its potential to increase plant growth. In addition, field testing with plant demplot practice is very important to directly test the quality of biological fertilizer. Carrying out attractive and economical packaging is very important to improve product quality.

4. CONCLUSION

Applied research in the community partnership program shows that the women's farmer group “O Yess,” Sanur Kauh Village, Denpasar, can produce physically quality Trichocompost. Economically, the impact has not yet been seen because new fertilizers are used by farmer groups, not yet reaching the large-scale production stage. Members of the partner group know biofertilizer production, and as many as 82% successfully apply up to the application level. The biological agent *Trichoderma* can suppress pathogenic fungi in vegetables. Trichoderma compost can suppress pathogenic fungi by 98.53% so that farmer groups produce healthy plants free of pathogenic diseases.

ACKNOWLEDGMENT

The author would like to thank the Rector of Warmadewa University, the Head of the Community Service Institute of Warmadewa University, the Dean of the Faculty of Agriculture, fellow lecturers for their support in this activity, younger students who were involved in this activity and the O yess farmer women's group as partners in this activity.

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