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## Making Trichoderma Compost for Disease Control and Increasing Rice Production in Subak Taman, Taman Village, Abiansemal, Badung

AAS Putri Risa Andriani<sup>1\*</sup>, Ni Ketut Sri Rukmini<sup>2</sup>, Ni Ketut Mardewi<sup>2</sup>, Desak Nyoman Triyana<sup>1</sup>, Irma Yustika Bulu<sup>1</sup>, Yulianti Dahung<sup>1</sup>

<sup>1</sup>Agrotechnology Department, Faculty of Agriculture, Science and Technology, Warmadewa University, Denpasar, Indonesia

<sup>2</sup>Animal Husbandry Department, Faculty of Agriculture, Science and Technology, Warmadewa University, Denpasar, Indonesia

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### CORRESPONDING AUTHOR

\*E-mail: [putri\\_risa69@yahoo.com](mailto:putri_risa69@yahoo.com)

### A B S T R A C T

This community service program was implemented as a form of university contribution to assist farmers in Subak Taman, Taman Village, Abiansemal District, Badung Regency, Bali, in increasing rice productivity while addressing plant disease problems, particularly those caused by soil pathogens. This activity focused on training and mentoring in making compost enriched with *Trichoderma* sp., a biological agent proven effective in controlling plant diseases such as root rot and blast disease in rice. In addition to being a biological agent, *Trichoderma* is also able to accelerate the decomposition of organic matter, increase soil fertility, and support natural plant growth. This activity began with socialization regarding the benefits and role of *Trichoderma* in an environmentally friendly agricultural system. Next, technical training on making compost based on agrarian waste enriched with *Trichoderma*. After that, direct practice of making compost with Subak Taman farmers was carried out. The results of the activity showed enthusiasm and active participation from Subak members. Farmers expressed interest in continuing to use *Trichoderma* compost because they saw its potential benefits for plant health and production results. The target achieved from the activity is that the partner's knowledge of liquid organic fertilizer production technology has increased from 40% to 80%. The use of trichocompost fertilizer in organic rice farming systems can increase dry grain yields by 4.4% to 17.4%. Trichocompost promotes sustainable agriculture by reducing the need for pesticides and synthetic fertilizers, resulting in reduced environmental contamination and preservation of the soil ecosystem.

### Contribution to Sustainable Development Goals (SDGs):

**SDG 11:** Sustainable Cities and Communities

**SDG 13:** Climate Action

**SDG 15:** Life on Land

## 1. INTRODUCTION

### 1.1. Research Background

Technology has enabled the development of many high-quality organic fertilizers that utilize polluting waste to create products rich in macro- and microelements readily usable by plants.

Research indicates that these organic materials and fertilisers serve as biological buffers, enhancing the soil's physical, chemical, and biological properties to provide a balanced supply of nutrients. While applying fertiliser is a highly effective way to improve soil fertility, maintaining balance is crucial for the fertiliser's effectiveness and optimal efficiency. The exclusive use of inorganic fertilisers, which only provide ready-to-use mineral ions, can harm the soil's physical structure, making it compact and



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rigid. Therefore, applying organic fertilisers is crucial for significantly enhancing soil conditions and ensuring long-term soil health.[1]. However, organic fertilisers are slower to decompose into mineral ions, especially when the application consists only of adding raw organic materials. Therefore, the content of soil microorganisms also needs to be enriched to accelerate decomposition, thereby maintaining soil fertility [2].

One of the functional microorganisms widely known as a biological soil fertilizer is the fungus *Trichoderma* sp. [3]. *Trichoderma* sp. species, in addition to being a decomposing organism, can also function as a biological agent and plant growth stimulator [4]. Several species of *Trichoderma*, such as *T. Harzianum*, *T. Viride*, and *T. Koningii*, have been reported as biological agents with a broad spectrum of activity against various crops [5]. *Trichoderma* sp. fungal cultures are applied to planting areas and act as biodecomposers, decomposing organic waste (such as fallen leaves and old twigs) into high-quality compost [6]. Additionally, it can serve as a biofungicide, playing a role in controlling pathogenic organisms that cause plant diseases. *Trichoderma* sp. can inhibit the growth of several fungi that cause disease in plants, including *Rigidiforus lignosus*, *Fusarium oxysporum*, *Rhizoctonia solani*, and *Sclerotium rolfsii* [7]. In addition to its role as a biological control, *Trichoderma* sp. has a positive impact on plant roots, growth, and crop production. This property indicates that *Trichoderma* sp. also plays a role as a Plant Growth Enhancer [8].

Taman Village is a village or sub-district in the Abiansemal sub-district, Badung Regency. It consists of three traditional villages and 11 hamlets (banjar). The majority of the population is comprised of farmers, who have extensive agricultural land mostly planted with rice. The distance from Denpasar to the partner location is approximately 30 km. The farmer group formed the Subak organization. Subak is a traditional irrigation system used by the Balinese people to grow rice and secondary crops. Subak is an indigenous community organisation that regulates the irrigation system through mutual cooperation and collaboration.

The problem faced by Subak Taman is acidic rice paddy soil (pH=5). This is caused by continuous rice cultivation without alternating with secondary crops or leaving the fields fallow. Furthermore, diseases affecting rice plants are caused by pathogenic fungi. The excessive use of chemical fertilizers and pesticides has led to declining soil quality and pathogen resistance. Therefore, the PKM team proposed a solution using tricompost to address the problems faced by Subak Taman members, thereby increasing rice production.

*Trichoderma* compost is a solution to overcome these problems. To naturally control plant pests (OPT) and achieve healthy plant cultivation, free from disease (especially plant diseases caused by pathogenic fungi), we can use Tricho Compost fertiliser. This fertiliser is made by utilising biological agents, specifically *Trichoderma* sp., in its formulation. Tricho Compost fertiliser offers several benefits, including preventing or reducing diseases that spread through the soil, improving soil structure and texture, and enhancing soil quality and fertility. Other uses of *Trichoderma* compost fertiliser include soil improvement, maintaining soil microbial balance, providing nutrition to plants, controlling soil-borne pathogens, and fertilising the soil [8]. Based on research results, *Trichoderma* compost fertilizer can suppress pathogenic fungi by 98.53% [9].

## 1.2. Research Objective

This research aims to provide partners with knowledge on manufacturing compost fertilizer using *Trichoderma* and its application to rice plants to enhance productivity.

## 2. MATERIALS AND METHODS

The method for implementing PKM activities will be carried out in several stages using the following methods:

1. Conduct surveys, interviews, and discussions at potential partner locations to determine the partner's situation and identify their problems.
2. Establishing partner locations and creating proposals
3. Face-to-face methods and direct counselling are used to ensure partners understand and master the processes of making liquid organic fertiliser, testing fertiliser quality, and evaluating the effectiveness of organic fertiliser on rice plants.
4. Direct practice guided by instructors who are competent in their fields, so that partners can directly apply the methods provided to livestock.

The stages of PKM activities that will be implemented are:

1. Approaching partners, selecting a location, and selecting participants, who will hereinafter be referred to as training participants.
2. Interviews and Q&A sessions regarding the problems faced by partners, as well as planning activities that outline solution steps to the encountered problems.
3. Partners will first be provided with materials prepared by the team in the form of modules (leaflets) on the quality of liquid organic fertilizer. As the activity comes to a close, participants will be given several tools to support and expedite the production of liquid organic fertiliser.
4. Conduct laboratory testing of liquid organic fertilizer produced by partners.
5. Provide periodic assistance and monitoring during the activity process, and evaluate the results.

## 3. RESULTS AND DISCUSSION

The PKM activity was held on Sunday, June 8, 2025, at Subak Taman, Taman Village, Abiansemal District, Badung Regency, Bali. This activity was attended by more than 15 Subak members, chaired by Nyoman Nyana. The first activity was a socialization activity from the Head of the Community Service Team, Ir. AA Sagung Putri Risa Andriani, M.Si, regarding the use of compost enriched with *Trichoderma* fungi, which is an environmentally friendly technology that has been proven effective in controlling plant diseases, especially root diseases and stem rot in rice plants. The next activity was a direct practice of making compost containing *Trichoderma*. Furthermore, the PKM team donated materials and tools for making *Trichoderma* compost. This donation of materials and tools is expected to encourage partners to produce *Trichoderma* compost.



Figure 1. Donation of tools and materials



Figure 2. Training Activities



Figure 3. Trichokompos fertilizer produced



Figure 44. Application to Rice Plants

The targets achieved from this activity are as follows.

- a. Partners' knowledge of liquid organic fertilizer manufacturing technology increased from 40% to 80%
- b. The use of trichokompos fertilizer in organic rice farming systems can increase dry grain yields by 4.4% - 17.4%.

Trichokompos has dual benefits: it acts as a biofungicide to combat various pathogens such as *Fusarium* and *Rhizoctonia*, and it also improves soil structure and fertility through the decomposition of organic matter.[10][11] It also increases nutrient uptake by plants by stimulating root growth and beneficial soil microbial activity. Furthermore, this technology reduces the use of chemical fertilizers and pesticides, which can potentially harm the environment.

In this activity, pH measurements were conducted with the community service team. The soil pH increased from 5 to 7 after four applications of trichocompost. These results are consistent with those expressed by Azzamy (2015), who stated that one of the benefits of trichocompost is increasing the pH of acidic soil. [12] The soil in the area was previously somewhat acidic due to the continuous use of chemical fertilizers. The addition of trichocompost and *Rhizobium* spp. Biofertilizer helped increase the pH from acidic to neutral.

The provision of trichocompost not only enriches the soil with nutrients but also plays a role in improving soil structure, air and water management, and binding nutrients, thereby providing food for microorganisms in the soil, which increases the role of microbes in maintaining soil fertility [13]. Making trichocompost is also relatively easy. Another advantage is that it is easily decomposed in the soil, thus accelerating the preparation of nutrients for plants. Therefore, the use of Trichokompo [14][15] can increase the growth and production of rice plants in Taman village. These results are in line with research by Yusman and (2020) that the provision of rice straw trichocompost has a significant effect on plant height, maximum number of tillers, number of productive tillers, number of full grains per panicle, percentage of whole grains, weight of dry milled grain per clump and has no significant effect on the weight of 1000 complete grains. The application of 100 g of rice straw trichocompost per plant (J2) gave the best results in plant height (110.70 cm), net assimilation rate (1.69 per week), maximum number of tillers (41.22 stems), number of productive tillers (30.33 stems), number of whole grains per panicle (147.70) and weight of dry milled grain per clump (73.95 g) [16].

Trichokompos fertilizer can improve rice growth and yields, while also strengthening plant resistance to diseases such as blast. *Trichoderma harzianum* is effective in suppressing *Fusarium* wilt in tomatoes and increasing crop productivity.

#### 4. CONCLUSION

Trichokompos, an organic compost enriched with **Trichoderma spp. fungi**, is an effective natural biofungicide and soil fertility booster. These microbes combat diseases such as damping off, fusarium wilt, collar rot, and root rot through various mechanisms, including **mycoparasitism** (parasitising other fungi), competition for nutrients, the production of antibiotics, and the induction of plant resistance. This approach promotes **sustainable agriculture** by reducing the need for chemical pesticides and synthetic fertilizers. This not only decreases environmental contamination but also helps maintain healthy soil

ecosystems. The application of Trichokompos in organic rice farming systems has been shown to increase dry grain yields by **4.4% to 17.4%**, making it a viable solution for improving crop productivity while protecting the environment.

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