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Isolation of Trichoderma sp. as a Biological Agent in the Pudak Lestari Agro Ornamental Plant Farmer Group

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A B S T R A C T

Agro Pudak Lestari, an ornamental plant farmers group, has been cultivating chrysanthemums for an extended period. The Agro Pudak Lestari farmer group had various challenges during the growing of chrysanthemums, including inadequate yields that failed to satisfy market standards due to white rust disease. The presence of antagonistic bacteria, specifically Trichoderma sp., Implementing efficient strategies for managing white rust disease. Consequently, farmer collectives will be instructed to utilize Trichoderma sp as a biological agent. The community service initiatives conducted at the Pudak Lestari Agro Ornamental Plant Farmer Group in Pancasari Village, Sukasada District, Buleleng Regency have been executed efficiently and effectively. Partners have demonstrated a high level of awareness, up to 87%, about using Trichoderma sp mushrooms as biological agents. Additionally, farmer groups have successfully implemented techniques to get Trichoderma strains from natural sources and propagate them in the present rice cultivation medium. The Trichoderma sp fungus will be employed as Trichocompost to mitigate the white rust disease in chrysanthemum plants, hence enhancing agricultural productivity.

1. INTRODUCTION

1.1. Research Background

Cut flowers are one of the ornamental plant commodities that are currently very popular among the community. Chrysanthemum flowers consist of single colors such as white, yellow, red, and purplish and mixed colors. This flower has an appeal to its beauty, diversity of shapes and colors. The quality of chrysanthemums, both in terms of beauty and longer freshness, is a benchmark in choosing chrysanthemums. Chrysanthemum is a popular flower commodity today because it has advantages, including various shapes and types [1]. Many hotels in Bali need chrysanthemum flowers as decoration and room freshener. According to Ref. [2], one of the consumers of chrysanthemum flowers is a florist; in addition to florists, chrysanthemum cut flowers are hotels, restaurants, and households. Production of chrysanthemums in Indonesia in 2015 was 442,698,194 stalks and increased by 3.62% from the previous year [3].

Pancasari Village, Sukasada District, Buleleng, is a highland area producing cut chrysanthemum flowers in Bali with a land area of 7.16 Ha. Based on ornamental plant production data obtained from the Buleleng Regency Agriculture Office, the total production of chrysanthemums in 2017 in Pancasari Village, Sukasada District, was 184,800 stalks. The ornamental plant farmer group Agro Pudak Lestari has long cultivated chrysanthemums. In cultivating chrysanthemums, the Agro pudak lestari farmer group experienced several obstacles, namely crops that did not meet market criteria.

Chrysanthemum flower plants are susceptible to rust caused by the fungus Puccinia horiana P., the main disease in chrysanthemums. Although not deadly to plants, fungal infections will reduce the health and strength of plants so that they affect the production and quality of flowers, and reduce the aesthetic value of chrysanthemums due to pustules (rust).

Damage symptoms are dirty white pustules on the lower leaf side of varying sizes. Fused pustules can cause necrotic spots and leaf death. Attacks on the leaves around the flower decrease the aesthetic value and commercial value of the flower. Yield loss due to the disease attack reaches 30 percent to 100 percent [4]. Cultivation techniques can sometimes be used in disease control, significantly reducing the number of inoculums. Pirates of the lower leaves followed by spraying fungicides benomyl and mancozeb is a treatment that can reduce the intensity of rust disease attacks on chrysanthemum plants [5].

Trichoderma sp. is one type of antagonistic fungus that can be used as a biological fungicide for plants. This fungus has been widely tested for its effectiveness in controlling plant pathogenic fungi. Ref. [6] reported the fungus Trichoderma sp. is an antagonistic agent that is quite effective in inhibiting the development of the pathogen Fusarium oxysporum, which is the cause of wilt disease in chrysanthemum plants. In addition, this fungus can also provide plant nutrients needed to support the growth of vegetative and reproductive organs through the decomposition process of organic matter given to the growing media. [7] also reported that the fungus Trichoderma sp. isolated from the phylosphere of maize plants has an excellent antagonism to isolates of pathogenic fungi Phytophthora capsici. [8] experimented on the inhibitory power of the fungus Trichoderma sp. isolated from plant roots against several isolates of pathogenic fungi such as Fusarium sp., Phytophthora sp., Colletotrichum capsici, Pythium sp., and Sclerotium rolfsii. The result is the fungus Trichoderma sp. The tested ones have good inhibitory power against all pathogenic fungal isolates in vitro.

Ref. [9] reported that the antagonistic microorganism Trichoderma sp. effectively controls white rust disease by 17.71 %. Therefore, the Faculty of Agriculture, Warmadewa University carries out community service with the Department of Science and Technology, Central Bicol State University of Agriculture, Philippines, in the form of training and public education on the use, isolation, and propagation of antagonistic fungi Trichoderma sp. in Pudak Lestari Agro Ornamental Plant Farmer Group. This activity is considered very necessary, mainly because of the ability of Trichoderma sp as a controller of pathogenic fungi that cause rust disease in chrysanthemum flowers and can be isolated from plant roots so that it has the potential to be used as an excellent biological fungicide to overcome the problem of rust disease in chrysanthemum plants.

2. MATERIALS AND METHODS

The activity was carried out at the Pudak Lestari Agro Ornamental Plant Farmer Group in Pancasari Village, Sukasada District, Buleleng Regency. The method of carrying out propagation activities of Trichoderma sp fungi as biological agents uses interviews, face-to-face (counseling), and direct practice. Interview and discussion methods to be able to find out the problems experienced by partners. Face-to-face method and provide direct counseling so that partners learn how to propagate Trichoderma sp mushrooms as biological agents. Direct practice is guided by instructors who are competent in their fields so that partners can apply directly the methods provided. Direct practice is isolating Trichoderma from nature at the farmer level and propagation of trichoderma on rice media.

The procedure of isolating Trichoderma from nature at the farmer level is carried out by the following steps, as in Figure 1.

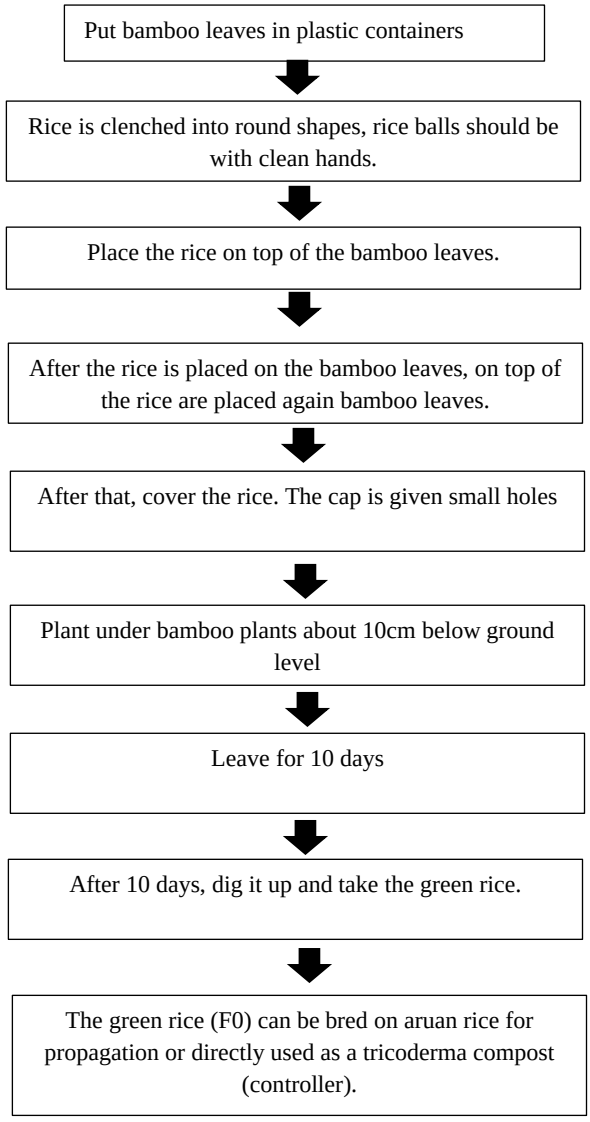

Figure 1. The procedure of isolating Trichoderma from nature at the farmer level

After isolating Trichoderma from nature, then Trichoderma can be propagated. The propagation procedure of Trichoderma sp fungi as biological agents is carried out using aruan rice media. The media used is aruan rice because it is high in carbohydrates, so it becomes a suitable growing medium for Trichoderma sp. The steps of trichoderma propagation in aruan rice media can be seen in Figure 2.

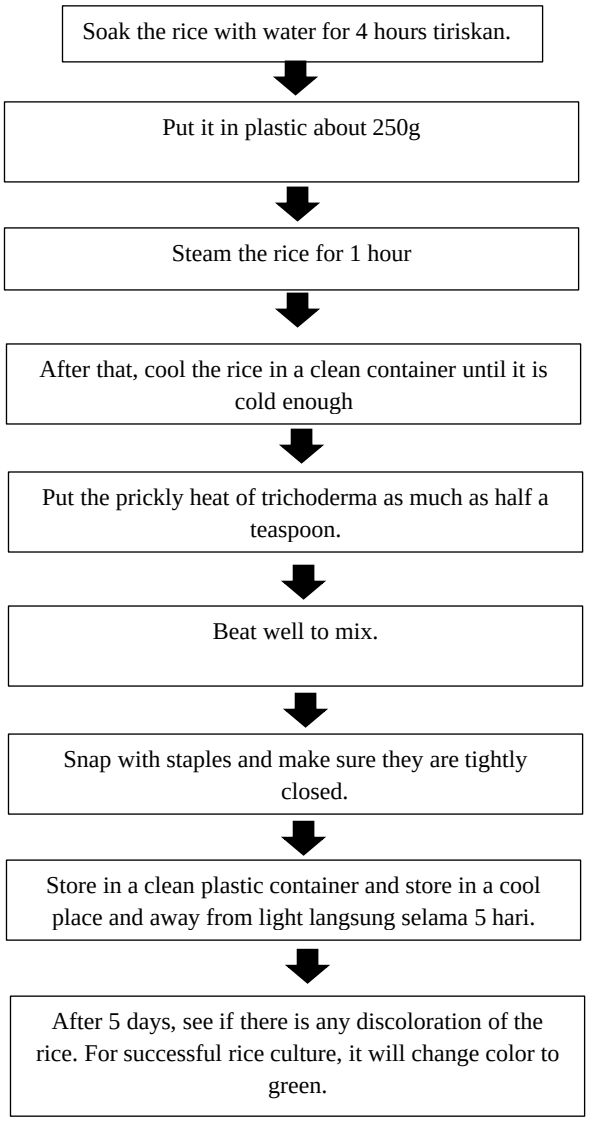

Figure 2. The procedure for propagating the fungus Trichoderma sp.

3. RESULT AND DISCUSSION

Community service activities occur at the Pudak Lestari Agro Ornamental Plant Farmer Group in Pancasari Village, Sukasada District, Buleleng Regency. The activity began with counseling in the form of providing material on the use of Trichoderma sp mushrooms as biological agents. The main problem in chrysanthemum farming is the attack of white rust disease. White rust disease, caused by the fungus Puccinia horiana P. Henn., is the most critical disease in chrysanthemum plants because its presence damages the leaves markedly and decreases the quality of flowers. Attacks on the leaves surrounding the flower decrease the aesthetic and commercial value by 100% [10]. Symptoms of the disease are usually easily visible on the underside of the leaf surface, in the form of white pustules, then turn brown. The development of the disease begins with the attachment of uredospores/teliospores on the lower surface of leaves through splashing water, followed by the formation of white spots. The spots then develop into small white pustules. Over time, pustules will enlarge, which in advanced stadia change color to brown. The boil collected a mass of teliospores ready to spread to other plants through wind, water, and insects. Pustules will arise within 5-13 days after infection [11].

Biological control with antagonistic microorganisms is an alternative plant disease control that is currently widely researched and used. Antagonistic microorganisms, namely microscopic living things, can cause unfavorable effects on other living things through parasitization, secretion, physical damage, and other forms of inhibition, such as competition for nutrients and growing space [12]. Trichoderma sp. is a saprophytic soil microorganism that naturally attacks pathogenic fungi and is beneficial to plants[13]. Trichoderma sp. It is one fungus found in almost all types of soil and in various habitats that can be used as biological agents to control soil pathogens [14]. The development of this fungus can be excellent and fast at the root of the plant. Mushrooms Puccinia horiana P. Henn and Trichoderma sp. are equal a fungus, where the fungus Puccinia horiana P. Henn is a pathogenic fungus on plants, and Trichoderma sp. is a fungus that is antagonistic to pathogens in plants [9] [15]. Based on the description above, assuming Trichoderma sp has antagonistic abilities against disease-causing pathogens.

The activity continued with the direct practice of obtaining the culprit of Trichoderma in nature and propagation of Trichoderma on the medium of rice flow. The study's results [16][17] show that bran, rice, sawdust, and rice husks can be used as propagation media for Trichoderma sp. Such materials contain carbohydrates, fiber, nitrogen, phosphate, and potassium, which are necessary for the growth and development of Trichoderma sp. [18] reported that rice media is the most effective medium for use to propagate Trichoderma fungi. According to Ref. [19], fungi can use organic carbon compoundse to make new cell material come from simple molecules such as simple sugars, organic acids, alcohol-bound sugars, short-chain polymers, and long-chain carbons. Complex compounds such as carbohydrates, proteins, lipids, and nucleic acids found in rice as nutrients can spur the growth of fungi. Fungi convert carbohydrates into simple compounds used as energy, as suggested by [20] that hyphal threads (mycelium) secrete enzymes that break down carbohydrate materials into simple compounds such as sugars that can be used as energy to metabolize.

Figure 3. The practice of isolating Trichoderma in nature at the farmer level

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Figure 4. The practice of propagation of Trichoderma in rice media

Figure 5. Trichoderma culture results in rice media

The objective that has been accomplished in community endeavors is that individuals within the partner group possess knowledge about utilizing Trichoderma sp mushrooms as biological agents, with a substantial proportion of 87%. Additionally, farmer groups have effectively implemented techniques for obtaining Trichoderma strains from the environment and propagating them in contemporary rice media. Trichoderma strains sourced from local environments are hypothesized to have enhanced efficacy in suppressing rust disease in chrysanthemum flowers within the community of sustainable agro pudak decorative plant growers, owing to their proximity and potential adaptation to the specific ecological conditions prevalent in the area.

The community service program provides significant benefits to partner groups, particularly those who have encountered Trichoderma culprit in their natural environment and are involved in the propagation of trichoderma in the present rice substrate. The partners anticipate ongoing support in utilizing Trichoderma biological agents to combat rust disease in chrysanthemum flower plants. The subsequent phase of the program entails providing instruction on the production of Trichocompos and their use in chrysanthemum cultivation to mitigate rust disease in chrysanthemums and enhance the overall quality and resilience of chrysanthemum crops within the Agro Pudak Lestari ornamental plant farmer group.

4. CONCLUSION

Community service activities at the Pudak Lestari Agro Ornamental Plant Farmer Group in Pancasari Village, Sukasada District, Buleleng Regency, have run smoothly. Partners have known about using Trichoderma sp mushrooms as biological agents as much as 87%, and farmer groups have succeeded in practicing getting Trichoderma culprit in nature and Trichoderma propagation in current rice media. Partners hope to receive continuous assistance in using Trichoderma biological agents to overcome rust disease in chrysanthemum flower plants. The next stage of the program is training on making Trichocompos and their application to chrysanthemums to overcome rust disease in chrysanthemums to improve the quality and strength of chrysanthemums in the Agro Pudak Lestari ornamental plant farmer group.

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