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REGULAR ARTICLE

EXPLORATION AND IDENTIFICATION OF BIOLOGICAL CONTROL AGENT *Trichoderma* sp. IN-VITRO FROM BAMBOO PLANT

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ABSTRACT

Plant disease control using biological agents is an effort to control plant diseases without harming the environment. One of the biological agents that is widely used is the *Trichoderma* sp. It is known that *Trichoderma* sp. has high antagonism ability against microorganisms that cause plant diseases. In this study, *Trichoderma* sp. was explored from bamboo plantation soil samples from Surabaya city using a diagonal technique with five composite sample points in each plant area. Isolation was then carried out using the dilution method and continued with the spread plate technique on Potato Dextrose Agar media. In the isolation results, 2 fungal isolates were found that had macroscopic and microscopic characteristics consistent with *Trichoderma* sp. The macroscopic appearance found is that the hyphae colonies are white to dark green in color which have clear color gradation boundaries, and have rough-looking fibers. The microscopic appearance found was green fialid stem hyphae with an oval-shaped group of conidia.

Keywords: *Trichoderma* sp., exploration, identification, microscopic, macroscopic

INTRODUCTION

Research on controlling plant diseases using biological agents has become an important focus in the field of plant protection because this approach offers environmentally friendly solutions. One effort to control plant diseases that is increasingly popular is the use of the fungus *Trichoderma* sp. as a biological agency. *Trichoderma* sp. is known for its ability to control various plant pathogens through antagonism mechanisms, which include competition for space and nutrients, production of antimicrobial compounds, and induction of resistance in host plants (Syamsuri et al., 2022). *Trichoderma* sp. is one of the biological agents that is widely used in controlling plant diseases because of its extraordinary ability to inhibit the growth of pathogens. Various studies have shown that *Trichoderma* sp. can produce hydrolytic enzymes and antibiotic compounds that are effective in suppressing the development of pathogenic microorganisms (Ribera et al., 2017). In addition, *Trichoderma* sp. also can form symbiosis with host plants, improve plant health, and increase plant resistance to pathogen attacks (Oyesola et al., 2024). Thus, the use of *Trichoderma* sp. not only reduces dependence on chemical pesticides but also increases the sustainability of agricultural systems.

Apart from its high ability to control pathogens, *Trichoderma* sp. It also has the potential to increase plant growth through various mechanisms. Several studies have shown that *Trichoderma* sp. can increase nutrient absorption by plants, improve soil structure, and increase the activity of beneficial soil microorganisms (Conte et al., 2024). The use of *Trichoderma* sp. as a biological agency in controlling plant diseases not only provides benefits in terms of controlling pathogens but also contributes to improving overall plant health and productivity. In this study, macroscopic and microscopic identification was carried out from the exploration results of *Trichoderma* sp. in soil samples from paddy, maize, chili, and bamboo plantations.

MATERIAL AND METHODS

Exploration of Fungi Isolates in Soil

Exploration was carried out on bamboo land in the city of Surabaya. Soil samples were taken from bamboo fields at 5 sampling points diagonally. 500 gr of soil was taken from each point and then composited. The composite soil samples were diluted to the 8th series. The dilution technique was carried out according to the method by (Lestari et al., 2022). Isolate dilution and isolation techniques were carried out at the Technical Implementation Unit for Food Crop Protection and Horticulture in East Java Province.

Isolation of Exploration Results of Fungi

The suspension resulting from the dilution is then spread on Potato Dextrose Agar (PDA) media which is made by boiling 250 gr of potatoes in 1 L of distilled water, the potato juice is then mixed with 15 gr of agar and 20 gr of dextrose, and chloramphenicol is added when it is warm. The suspension resulting from the dilution was then poured onto the perfectly solid PDA using the spread plate method and incubated for 3 days.

Identification of *Trichoderma* sp. Isolates.

After incubation, isolate colonies were identified macroscopically and microscopically. Macroscopic identification is carried out by observing colony shape, color, and size. Microscopic identification is carried out by looking at the hyphae, conidia, and spores with the help of a microscope at 40x magnification.

RESULTS AND DISCUSSION

Based on macroscopic and microscopic observations, 2 isolates of *Trichoderma* sp. from bamboo fields. The results of macroscopic observations that can be seen from the results of the isolates are that they have white to dark green characteristics, look like fine fibers are a little rough, and look like spots or rounds. This is following research conducted by Suanda (2019) which reported that *Trichoderma* sp. It has a flat, round, rough, and fibrous colony surface which is smooth at the edges of the colony. The colony is initially white at the edges of the colony and the center is light green which over time changes to dark green. Macroscopic appearance of *Trichoderma* sp. isolates is presented in Figure 1.

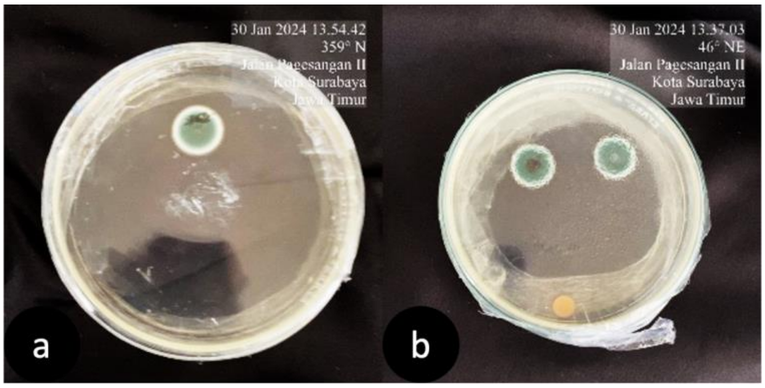

Figure 1. Isolate of *Trichoderma* sp. (a) Isolate *Trichoderma* sp. A01 (b) Isolate *Trichoderma* sp. A02

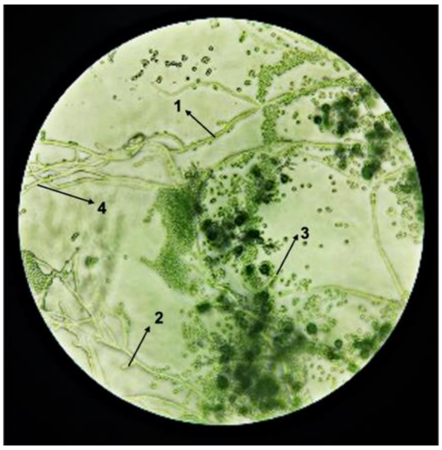

Figure 2. Microscopic appearance of *Trichoderma* sp. isolates (1) conidiophores; (2) fialids; (3) conidia/phialophore; (4) conidiophore branches

The microscopic characteristics of *Trichoderma* sp. that is, visible hyphae that are partitioned and branched. Hyphae of *Trichoderma* sp. flat, insulated, and branched to form a web called mycelium (Rizal & Susanti, 2018). Oyesola et al. (2024) stated that *Trichoderma* sp. has branched conidiophores like a pyramid shape, at the bottom the lateral branches have repeated branching, while the closer you get to the tip, the shorter the branching becomes. The fialids look slender and long, especially on the branch fialids, the conidia have a semi-round to perfectly round or oval shape and the conidia walls are smooth. *Trichoderma* sp. develops asexually, namely by producing branching conidiospores (Suanda, 2019). Microscopic appearance of *Trichoderma* sp. presented in Figure 2.

Isolation is a process of activities to separate or move certain microbes from their habitat environment so that pure cultures or pure cultures can be obtained from research in artificial media. The process of isolating antagonistic fungi is carried out by diluting rhizosphere soil samples. The rhizosphere itself or what is also called the area around plant roots is a habitat for soil microbes. The rhizosphere is the area around plant roots which is an ideal area for the development of soil microbes, including biological agents (Conte et al., 2024).

CONCLUSION

This research concludes that 2 fungal isolates from exploration have macroscopic and microscopic characteristics such as *Trichoderma* sp. The macroscopic appearance found is that the hyphae colonies are white to dark green in color which have clear color gradation boundaries, and have rough-looking fibers. The microscopic appearance found was green fialid stem hyphae with an oval-shaped group of conidia.

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