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Influence of Natural Media Types on Growth and Development of Entompathogen Fungus Verticillium lecanii (Zimmermann) Viegas

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ABSTRACT

The aims of this research are: (1). To find out the income of shallot farming in Wanasaba District, East Lombok Regency. (2). To determine the feasibility of shallot farming in Wanasaba District, East Lombok Regency. (3). To determine the behavior and structure of the shallot market in Wanasaba District, East Lombok Regency. The method used in this research is descriptive method. The research was conducted in Wanasaba District, East Lombok Regency in two villages, namely Wanasaba Village and Wanasaba Daya Village, based on the highest production volume purposive sampling, the unit of analysis used was producing farmers and marketing institutions involved in marketing shallots. A sample of 40 farmer respondents and 26 marketing agency respondents determined the number of respondents by quota sampling. Intake of respondents by accidental sampling for farmers and snowball sampling for marketing agencies. The type of data used is quantitative and qualitative data. Sources of data used are primary data and secondary data. The analytical method used for shallot farming and marketing in Wanasaba District is descriptive. The research results show that (1). The income of shallot farming in Wanasaba District, East Lombok Regency is IDR 21,978,644 per cultivated land area or IDR 115,677,073 per hectare per planting season. (2). Shallot farming in Wanasaba District, East Lombok Regency is economically feasible to cultivate because it has an R/C ratio >1. (3). The marketing behavior of shallots in Wanasaba District, East Lombok Regency, shows that price changes at the consumer level are perfectly transmitted to the farmer (producer) level with relatively efficient marketing margins in the second shallot marketing channel and a market structure that leads to high concentration oligopsony.

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1. INTRODUCTION

The entomopathogenic fungus Verticillium lecanii (Zimmermann) Viegas was first known as Chephalosporum lecanii in 1861, is cosmopolitan and found in insects. This fungus can cause disease in insects in tropical and subtropical climates. This fungus is a potential biological agent for pest control. The fungus V. lecanii has a fairly wide range of hosts, namely mites (Acari; Tetranychidae) and the order Homoptera, for example Aphis gossypii. Dinata (2004) reported that

the fungus V. lecanii was also effective for controlling insect pests from the order Hemiptera and various species from the orders Diptera, Hymenoptera, and Lepidoptera.

The results of Prayogo's research (2004) showed that the application of the fungus V. lecanii in a greenhouse with a concentration of 10 x 107 conidia/ml could cause the death of Riptortus linearis imago up to 81%. It was further reported by Prayogo (2004) that the fungus V.

So far, pest control efforts against R. linearis still use insecticides. The use of insecticides can cause negative impacts such as the occurrence of resistance, pest resurgence, and environmental damage. While biological control using microorganisms is still rarely done. Besides being parasitic on various types of insects, the fungus V. lecanii is also hyperparasitic in Green mold disease.

The results of Prayogo and Suharsono's (2005) study showed that the medium used for the multiplication of the fungus V. lecanii was rice, while the age of the fungus used in greenhouse applications was two weeks or 14 days after inoculation (HSI). The research media used for V. lecanii multiplication was corn rice with a culture age of three weeks (21 HSI). Until now, research on the types of natural media that are suitable for the growth and development of V. lecanii fungus has not been widely studied.

Based on these considerations, an idea arises to conduct further research to find out about the effect of natural media types on the growth and development of the entomopathogenic fungus V. lecanii, so that a good type of media is obtained for the growth and development of the entomopathogenic fungus V. lecanii, as well as easy application. and relatively cheap and easy to obtain. a biological agent will be easily adopted by users, if the biological agent has several advantages, including being effective against target pests, easy and fast to propagate, cheap, easy to adapt to the local environment, compatible with other control methods, and does not have a negative impact on the environment.

2. METHOD

2.1 Types of research

This research is an analysis using the Honest Significant Difference (BNJ) test.

2.2 Research Variables

The variables of this study consist of independent variables which test the classification of mushrooms, legumes and rice.

2.3 Research design

The research method used a simple completely randomized design (CRD) with three replications and then the analysis used the Honest Significant Difference (BNJ) test. The treatment consisted of green beans (KH), soybeans (KK), peanuts (KT), white cowpeas (KTP), red tuntung beans (KTM), white beans (KP), red beans (KM), rice (BB).), brown rice (BM), corn rice (JG), and Potato Dextrose Agar (PDA) as controls.

2.4 Sampling Locations

The samples used in this study were mushrooms and several types of nuts, and rice.

2.5 Time and Place of Research

The research was conducted from January to June 2007. This research was carried out in the Phytopathology Laboratory, Department of Plant Pests and Diseases, Faculty of Agriculture, Brawijaya University, Malang and in the Phytopathology Laboratory of the Legumes and Root Crops Research Institute (BALITKABI), Malang.

2.6 Tools and materials

The tools used in this study were petri dishes, Bunsen lamps, measuring cups, media bottles, test tubes, stirrers, pans, wrapping, measuring cups, fial films, cover glasses, rulers, electric scales, electric stoves, autoclaves, ose needles, haemacytometer, 10 ml pipette, 1000 ml beaker glass, camera, tray, hand counter, laminar flow cabinet, and microscope. The materials used in this study were Potato Dextrose Agar (PDA) media, green beans, soybeans, cowpeas, red beans, corn rice, rice, 70% alcohol, cotton, tissue paper, liquid soap, chlorox, spiritus, mushroom isolate. V. lecanii, and sterile aquadest.

2.7 Research procedure

Introduction begins Tool sterilization is carried out on tools used as a place for mushroom propagation or media, namely petri dishes, test tubes, media bottles. The tools to be sterilized are washed thoroughly and then soaked in chlorox solution for 24 hours. The media material is PDA which consists of 200 g of potato, 20 g of agar, 20 g of dextrose and 1 liter of distilled water. Peel

the potatoes, cut into small pieces and wash thoroughly. Boil with 600 ml of distilled water until boiling, after boiling the potatoes are removed and filtered. The natural media used are green beans, soybeans, peanuts, white cowpeas, red cowpeas, white beans, red beans, corn rice, rice, brown rice (200 g each), and each type of media added approximately 240 ml of distilled water.

For inoculation purposes, pure culture of V. lecanii fungus was used from PDA media which was 21 days old. Inoculation of V. lecanii fungus into the treatment media was carried out by means of pure culture of V. lecanii fungus which was cut into pieces using a cork borer with a diameter of 5 mm. Observations were made on: the number of conidia per gram of treatment medium, the percentage of conidia germination, and the development of V. lecanii colonies in the treatment medium, the morphology of the V. lecanii fungus from the treatment medium microscopically.

2.8 Data analysis

The data obtained from the observations were analyzed for variance (F test), if they were significantly different it was continued with the BNJ test at the α level of 5%.

3. RESULTS AND DISCUSSION

3.1 Research result

The fungus V. lecanii has a broad spectrum of hosts, many of which include mites and aphids. This fungus is also effective for controlling insect pests from the order Hemiptera and various species from the orders Diptera, Hymenoptera, and Lepidoptera and the composition of the nutrients contained in the natural propagation media will affect the growth and development of entomopathogenic fungi. High nutrition will lead to high germination, sporulation, and virulence as well. Plant media for fungi are legumes such as green beans, soybeans, cowpeas, red beans, white beans, peanuts and rice.

3.1.1 Number of Conidia of V. lecanii per Gram of Species

The results of the analysis of variance showed that the type of growing media had a significant effect on the number of conidia V. Carbohydrates are a source of carbon which is needed in large quantities as a source of energy for metabolic processes and as a constituent of cell walls, therefore about half of the dry weight of fungal cells consists of carbon, which means This shows that carbon compounds have an important role in fungal cells. In addition, the water content in KH media affects the process of cell metabolism, where water is needed in the growth process.

Table 1. Analysis of Conidia Conidia Number V. lecanii per gram of Treatment Media at 7 HSI hours.

SK	DB	JK	KT	F Count
Treatment	10	0.2885	0.0289	2.5721*
Error	22	0.2468	0.0112	
Total	32	0.5353		

Information :
* = Significantly different in the F test with a significance level of 0.05 and 0.01

Table 1 explains that the V. lecanii fungus grown on KTP media could produce the highest number of conidia, although initially more were grown in the KH treatment. The V. lecanii fungus grown on peanut (KT) media grew faster than the treated media another because apart from the available nutrients that have been decomposed, the porosity conditions of the KT media support the development of the V. lecanii mycelium. lecanii was highest in KH media. This is presumably because the V. lecanii fungus found in KH media reached the highest conidia production after all the nutrients, especially carbohydrates contained in KH media, supported the formation of conidia.

3.1.2 Conidia Germination Percentage of V. lecanii per Gram Type of Media

Observation of conidial viability of V. lecanii showed that conidia from all treatments were able to germinate and analysis of variance on the percentage of conidia germination from all treatments showed that 4 were significantly different and 6 were not significantly different. This meant that all treatments contained enough nutrients needed in the process respiration to produce energy which is partly stored in conidia and will later be needed in the germination process.

Table 2. Analysis of Conidia Conidia Number V. lecanii per gram of Treatment Media at 7 HSI

SK	DB	JK	KT	F Count
Treatment	10	1.1895	0.1189	3.6895**
Error	22	0.7093	0.793	

Total	32	1.8988

Information :
** = Very significantly different in the F test with a significance level of 0.05 and 0.01

The V. lecanii fungus grown on the treatment medium used in this study, its conidia were able to germinate by utilizing the reserve material present in the conidia itself. Although there were differences in the amount of nutrient content in each treatment medium, it did not result in

the differences were too significant. The differences in V. lecanii germination on the treatment media were thought to be due to differences in the ability to utilize nutrients during conidia germination. This is in accordance with the opinion of Bilgrami and Verma (1981), media nutrient materials are synthesized by fungi to form conidia cell organelles, and some are stored as food reserves or endogenous materials in conidia.

3.1.3 Development of Entomopathogenic Fungus V. lecanii Colonies on Various Types of Media

Development of Entomopathogenic Fungus V. lecanii Colonies in Various The type of media used started from observing the color of V. lecanii fungal colonies on PDA media as a control with natural media. On PDA media, V. lecanii colonies were whiter in color than natural media.

On natural media KH, BB, BM, and JG the fungal colonies were white like cotton which gradually became thicker. On KK media, the fungus colonies were slightly yellowish white, while on KM natural media, KTM colonies were white, slightly gray in color. On KT, KTP and KP media the fungal colonies are white and thicken over time.

In each treatment medium, there were differences. The development of V. lecani fungal colonies, the formation of V. lecanii conidia tended to form in places close to air cavities and easy to get light. This tendency is probably because the fungus V. lecanii is an aerobic organism which means it needs oxygen to obtain energy in the respiration process, and also the formation of fungal conidia occurs during periods of light or requires light. in KH and KT treatment media were better than other media. Microscopic observation shows that there are differences in the morphology of V. lecanii grown on various propagation media, especially on hyphae, conidiophores and conidia. This can be seen in Figure 10, where the thickness of the hyphae, conidiophores and conidia varies in each natural medium. But in general there was no difference in morphological form between V. lecanii grown on various treatment media and those grown on PDA media. Such porosity conditions can inhibit.

Mycelium development and the formation of V. lecanii conidia, due to the lack of space for the development of mycelium and air cavities to obtain the oxygen needed for respiration, where light also cannot enter the treatment medium. Meanwhile, on KP and KM media, the development of V. lecanii colonies was very poor. This was thought to be due to contamination in the media, resulting in competition between the contaminating fungi and V. lecanii fungi in obtaining nutrients, oxygen and light. In addition, even though the porosity of the KP and KM media was good, the development of the V. lecanii mycelium was still hampered due to the presence of contaminants. Contamination occurred allegedly because at the time of cooking the KP and KM media were not mature enough so that the fungi or pathogens present in the seeds did not really die.

3.2 Discussion

The results showed that the type of natural media had an effect on the number of V. lecanii conidia formed, the growth and development of the fungus, but the type of natural media had no effect on conidia germination. The higher the age of the fungus culture, the greater the number of conidia produced. The treatment media that support the formation of V. lecanii conidia are mung bean (KH), peanut (KT) and white cowpea (KTP) media which are quite influential in which every change in different fungi in each medium has differences such as growth and development. entomopathogenic fungus V. lecanii, the number of conidia of entomopathogenic fungus V. lecanii that formed and produced conidia was 21 days after inoculation and the germination of conidia of entomopathogenic fungus V.

Factors Influencing the Growth and Development of the Entomopathogenic Fungus V. Lecanii in all media are Water is required for the growth of the fungus in general just like any other organism. Fungi usually require the presence of a thin layer of water around their cells, which is especially necessary for the diffusion of nutrients into the fungal cells and for the release of extracellular enzymes. Temperature affects the germination and growth of entomopathogenic fungi. Most mushrooms grow well at temperatures of 5^{o}C– 35^{o}C.

High humidity is necessary for mold to germinate and cause disease. In addition, high humidity is also needed by the new conidia to spread and usually for the production of conidia with a substrate media having a pH of 4–8.5. Sometimes it is found that fungi grow at a pH of 3–9 and require an optimal pH between 5–7 which contains macro-essential elements such as N, P, C, O, K, H, S, and Ca , mineral elements and oxygen and the most The main thing is light to initiate stimulation.

4. CONCLUSION

The type of natural media had a significant effect on the growth and development of the entomopathogenic fungus V. lecanii, especially on hyphae, conidiophores and conidia. KTP) is the best treatment media in support conidia formation of the fungus V. lecanii. The best culture age for the entomopathogenic fungus V. lecanii in producing conidia was 70 days after inoculation with an average number of conidia on the 70th day of observation after successive inoculations on mung bean (KH), peanut (KT) and white cowpea (ID CARD).

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Further research is needed on the pathogenicity of the fungus V. lecanii grown on natural media of green beans (KH), peanuts (KT) and white cowpea (KTP). And it is necessary to analyze the nutritional content in the natural media of green beans (KH), peanuts (KT) and white cowpea (KTP).

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