

## Effect of Doses of *Lecanicillium Lecanii* on the Controlling of Rice Bug in Rice Plants

Nurlina, Sri Purwanti, Sri Hidayati, Bambang Gunawan, Mahrus Ali<sup>♥</sup>

Agrotechnology Study Program, Faculty of Agriculture, Merdeka University Surabaya, Indonesia

<sup>♥</sup>Corresponding author email: [sengkomahrus@gmail.com](mailto:sengkomahrus@gmail.com)

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**Abstract:** Bug is an important pest of rice plants because it can reduce the quality and quantity of production, so it is essential to control its population. One of the efforts to control rice bugs is to use the biological agent *Lecanicillium lecanii* because it does not cause resistance and is not harmful to human health. This study aims to determine the effect of the number of doses of *Lecanicillium lecanii* application in controlling the pest population of *walang sangit* (rice bugs) in rice cultivation. The research method used a completely randomized design (CRD) with four treatment doses of the biological agent *Lecanicillium lecanii* with a rank of  $9 \times 10^7$ . P0 without biological agent treatment, P1 = using a biological agent with a dose of  $10 \text{ mL.L}^{-1}$  of water, P2 = using biological agent with a doses of  $12.5 \text{ mL.L}^{-1}$  of water, P3 = using biological agent with a dose of  $15 \text{ mL.L}^{-1}$  of water, and. Each treatment was repeated 4 times. The results of the study The application dose of  $15 \text{ mL.L}^{-1}$  gave the best results, and this is in accordance with the recommendations of BBPOPT Jatisari that the application dose of *Lecanicillium lecanii* is  $15 \text{ mL.L}^{-1}$ .

**Keywords:** *Lecanicillium lecanii*; mortality; rice bug; *walang sangit*

### INTRODUCTION

Rice (*Oryza sativa* L.) is a rice-producing plant that is a source of carbohydrates for most of the world's population. The population of Indonesia, almost 95% consumes rice as a staple food, so every year the demand for rice needs increases along with the increase in population (Sankar & Rani, 2018).

Indonesia is a country with a large population concerned to increase food needs (Hariyadi et al., 2019). Rice plants are generally seasonal crops with four growth phases, namely the fast vegetative, slow vegetative, reproductive and ripening phases. Broadly speaking, the rice plant is divided into two parts, namely the vegetative part and the generative part, where the vegetative part consists of roots, stems, and leaves. The generative part consists of panicles consisting of grains and leaves and flowers (Sari et al., 2020).

Rice plants require nutrients, water and energy (Rozi et al., 2018). Nutrients are complementary elements of the composition of nucleic acids, hormones and enzymes that function as catalysts in overhauling photosynthesis or respiration into simpler compounds (Purwanti et al., 2021). Water is obtained by rice plants from the soil and

energy is obtained from photosynthesis with the help of sunlight (Arsyad, 2009).

Rice plants belong to the Gramineae plant group which are characterized by stems composed of several segments. The segments are empty ridges (Asikin & Thamrin, 2011). At both ends of the empty hood the hood is covered by the book. The length of 6 segments is not the same, and the shortest segment has the base of the stem, the second segment, the third segment, and so on are longer than the segment that preceded it. In the lower book of the segment, the midrib grows which wraps the segment to the upper book ((Ifriza & Djuniadi, 2015).

Rice bugs is one of the important pests that attack rice plants . This pest generally attacks rice plants in the milk ripening phase by sucking the liquid rice grains that are filling, causing the rice grains to become empty or filling imperfectly (Rozi et al., 2018).

In Indonesia, rice bug is a potential pest that under certain conditions becomes an important pest and can cause yield losses of up to 50% (Javandira et al., 2020). The results showed that the population of 5 tails of rice bugs per 9 clumps of rice would reduce yields by 15%. The relationship

between the population density of stink bugs and decreased yields showed that the attack of one stink bug per panicle in one week could reduce yields by 27% (Kusuma et al., 2019).

Walang sagit is one of the important pests of rice plants (Effendi, 2009). This insect can attack by sucking the fluid of rice plant tissue. There was a significant effect on the decline in the population of the pest in rice plants due to the application of various doses of *Lecanicillium lecanii*, therefore this study aimed to determine the effect of the number of doses of application of *Lecanicillium lecanii* in controlling the population of the pest in rice cultivation.

## METHODS

The research was conducted in the working area of the Station Protection of Food Crops and Horticulture in Mojokerto which is located at Jabon Village, Mojoanyar District, Mojoanyar Regency number 146. This research method used a Completely Randomized Design (CRD) with 4 treatments of doses of the biological agent *Lecanicillium lecanii* with the rank of  $9 \times 10^9$ . P0 without biological agent treatment, P1 = using biological agent with a doses of 10 ml / liter of water, P2 = using biological agent with a doses of 12.5 ml / liter of water, P3 = using biological agent

with a doses of 15 ml / liter of water, and. Each treatment was repeated 4 times so that 16 treatment combinations were obtained.

The tools used in this study were as follows: Insect nets, Insect containers used for netted bug containers, Plastic pots used for media containers for planting rice, Masks used to limit the movement of bugs, Mini sprayer used for spraying the biological agent to be tested against the bug and the measuring cup used to measure the biological agent to be tested.

The tools used in this study were insect nets used to catch rice bugs from the field, container insects used for netted rice bugs containers, plastic pots used for media containers for planting rice, hoods used to limit the space for rice bugs to move, Mini sprayer used to spray the biological agent to be tested on rice bugs and measuring cup used to measure the biological agent to be tested. The data obtained is processed using an excel data processing program.

## RESULTS AND DISCUSSION

### Mortality of Rice Bugs

After testing the biological agent *Lecanicillium lecanii* using doses of 10 ml / liter, 12.5 ml / liter and 15 ml / liter with 2 applications with an interval of 7 days, the mean mortality is obtained in table 1.

**Table 1.** The rice bugs mortality due to *Lecanicillium lecanii* application

Treatment	Days to								
	1	2	3	4	5	6	7	8	9
P0	10	10	10	10	10	10	10	10	10
P1	10	10	10	10	10	7,5	3,25	0,75	0
P2	10	10	10	10	6,75	4	1,25	0	0
P3	10	10	10	10	6,5	2,75	0,75	0	0

### Grain production yield (Tons ha<sup>-1</sup>)

After the plants are 110 days old, harvesting and tiling are carried out from each treatment and replication and the results can be seen in table 2.

Based on the results of application of *Lecanicillium lecanii* in 4 different

treatments showed different mortality rates in different rice bugs. At 1- days after planting, there was no mortality because the fungus *Lecanicillium lecanii* needed time to infect the insect's body but the infected stink bugs were no longer actively moving.

Mortality began to occur in 5 days after planting (DAP), namely in P2 and P3 treatments, while mortality in P1 treatment occurred in 6 DAP.

**Table 2.** Grain production results (tons ha<sup>-1</sup>)

Treatment	Rice product due to <i>L.lecanii</i> application				Average	BNT
	1	2	3	4		
P0	4.99	5.15	20.72	5.29	5.18	a
P1	7.26	7.6	29.09	6.87	6.87	b
P2	7.14	7.8	29.57	7.4	7.4	c
P3	7.49	7.65	30.26	7.92	7.57	d

The fastest mortality occurred in P3 and P2 after that in P1 treatment, while in P0 there was no mortality, because P0 was not treated. Rice bugs infected with the fungus *Lecanicillium lecanii* became hard and stiff, then after a few days it was covered with white fungal mycelia so that it looked white. like a mummy according to the theory of (Prabaningrum *et al.*, 2019), the fungus *Lecanicillium lecanii* infects all body tissues of the insect so that it becomes dead, with a hardened body like a mummy and when environmental conditions support the fungus will grow out through the body of the insect and the hyphae in the colony looks white (Ardi *et al.*, 2017).

So that the results of grain production showed that the application of the natural agent *Lecanicillium lecanii* gave a significant difference. Where the average production at P0 is 5.18 tons/ha, P1 is 7.28 tons/ha, P2 is 7.4 tons/ha, while P3 is 7.57 tons/ha, so it can be recommended that P3 treatment is very effectively used in an effort to secure rice production from the pest attack of rice bugs.

So that the quality of the grain will be harvested as expected by the farmers, the application of the biological agent *Lecanicillium lecanii* is one product that can be used by farmers to eradicate pest attacks on rice. From the results of this study, farmers can take advantage of the biological *Lecanicillium lecanii* according to the dose carried out in this study in order to get good

results and also reduce pesticide use for farmers (Rozi *et al.*, 2018).

*Lecanicillium lecanii* a type of entomopathogenic fungus that is ovicidal, so it is able to prevent the hatching of insect pests . The percentage of brown ladybug eggs that do not hatch after being infected with *Lecanicillium lecanii* reaches 80%. Eggs that hatch to form nymph I eventually die and cannot develop into nymph II because they fail to molt (S. Prayogo, 2016).

The efficacy of *Lecanicillium lecanii* is not only limited to eggs because the fungus is also capable of infecting the nymph and imago stages of the brown ladybug. Therefore, the fungus *Lecanicillium lecanii* has a great opportunity to be used as a biological agent for the control of brown ladybugs. species *Lecanicillium* found in Indonesia can be ascertained to be *Lecanicillium lecanii*, which is cosmopolitan, so that many isolates were found in tropical and subtropical areas which are genetically diverse with very varied levels of fungal virulence. Meanwhile, the virulence of the isolate *Lecanicillium lecanii* was strongly influenced by the physiological character of the fungus, indicating that the physiological character of the fungus was related to colony growth rate, size and production of conidia, conidia germination, sensitivity of conidia to temperature, and mortality of host insects. the source of the fungal isolates, the density of the applied conidia suspension, and the age of the host stadia, isolates obtained from

one location and different hosts will have different physiological and virulence characters of each isolate. Likewise, isolates obtained from different locations from the same host source also have different physiological and virulence characteristics, and the physiological character of the fungus can be used as a benchmark to identify virulent isolates from the field.

According to research results (Ardi et al., 2017). Each experimental unit was replicated thrice. Each treatment of the dilutions was 1 ml drew up using a pipette and allowed to drop directly on the ear bug body. The bugs then were released into the house screen within which grown plant rice had reached a milky grain phase. The mortality of the bugs infected with *V. lecanii* was observed seven days after the applications. The highest imago mortality of the earhead rice bugs was found in the 10-5 dilution of Palolo *V. lecanii* isolates.

According to research results (Y. Prayogo, 2011). *Lecanicillium lecanii* (*Verticillium lecanii*) (Zimm.) (Viegas) Zare and Gams are an effective entomopathogenic fungus to control the brown ladybug *Riptortus linearis* on soybeans. Excess of the fungus *Lecanicillium lecanii* can infect all stages of brown ladybugs, including egg, nymph and imago stages. The eggs of the brown ladybug infected with the fungus *Lecanicillium Lecanii* eventually fail to hatch because the fungus is ovicidal. *Lecanicillium lecanii* is cosmopolitan, easy to find in various tropical and subtropical areas so that it has very diverse virulence.

The effect of the number of doses of *Lecanicillium lecanii* on the Control of Rice Insects in Rice Plants, the application dose of 15 ml / lt gives the best results, it is proven that pests in walang sagit can be handled properly with the application of *Lecanicillium lecanii* in controlling the pest population of rice bugs in rice plantations.

## CONCLUSION

The results of grain production showed that the application of the biological agent

*Lecanicillium lecanii* gave a significant difference. Where the average production at P0 is 5.18 tons/ha, P1 is 7.28 tons/ha, P2 is 7.4 tons/ha, while P3 is 7.57 tons/ha, so it can be recommended that P3 treatment is very effectively used in an effort to secure rice production from the pest attack of rice bugs. So that the results for grain production will be very good, because there is a pest control treatment of rice bugs, so that the results of grain production are very good. So that the results for the production of grain will be very good, because there is a pest control treatment of rice bugs, so that the results of grain production are very good. Further research is needed in the field to test the effectiveness of the biological agent *Lecanicillium lecanii* in suppressing the population of rice bugs in rice fields.

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