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Bio-Use Power of Insecticide *Metarizhium anisopliae* in Controlling *Oryctes rhinoceros* in Palm Oil

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ABSTRACT

Horn beetles (*Oryctes rhinoceros*) are among the pests in oil palm plantations. This study aims to find out the usefulness of Metarhizium anisopliae with a combination of various ways of application and dosage to suppress the development of *Oryctes rhinoceros* larvae in unproditioned plants (TM) in oil palm plantations. The experiment was conducted using a complete randomized design of two factors, namely eight treatments and three repeats, namely, the application of mushrooms *M. anisopliae* formulation of rice flour with a dose of 15 g / m2, 20 g / m2, 30 g / m2 and application of mushroom *M. anisopliae* dissolved in 1L water at doses of 15 g, 20 g, 25 g and 30 g. Observational data that the number of larvae infected and larval mortality were further analyzed by One Way Anova and further tested duncan with a real level of 5%. The observations showed differences in the number of infected larvae and the mortality of the larvae. The highest number of infected larvae and larval mortality occur in the treatment of *M. anisopliae* fungal application.

Keywords: fungal application, horn beetles, larvae, mortality, mushrooms

INTRODUCTION

Horn beetles (*Oryctes rhinoceros*) include pests in oil palm plantations [1], [2]. Common chemical insecticides are often used to control them. Chemical control has a rapid killing power, covers a large area, and immediate results are obtained. Side effects cause resistance, resurgence, second wave explosion, health problems in humans, and damage to the balance of nature [3][4]. Typical symptoms of *O. rhinoceros* attack are the hump and base of a young leaf that has not opened (young leaves) dismembered to form the letter "V" [5]. Adult beetles attack the janur at night, and migrate to the inside of the uppermost armpit leaves [6].

The bio-controllers Metarhizium anisopliae and Beuvaria bassiana are entomopathogen mushrooms that have a wide host range, but have host-specific and location-specific properties that correspond to the characteristics of biological control [7][8]. The application of this technology is effective and efficient to increase the productivity of palm oil while keeping in mind environmental factors. [9] In his study for one year, screening tests concluded that *M. anisopliae* isolate Jombang has the highest virulence with an *O. rhinoceros* mortality rate of 80% after infection at 144 hours. B. bassiana is

slower to kill beetles due to host-specific and location-specific.

MATERIALS AND METHODS

The research was conducted with the Complete Randomized Design method 2 factors, namely the way of application and application dose. The study was conducted with eight treatments and three repeats. The study was conducted at 07:00 WITA by observing the number of infected larvae and larval mortality at each treatment for 15 days i.e. on the seventh day after application until day 21 after application. The study was conducted at a 1x1m breeding site made from palm stems to become a place to live and eat larvae. The application of sowing is done with a flour formulation according to the dose and spray application is done by dissolving in 1 liter of water. The application is done at 17:00 WITA. This is done so that *M. anisopliae* mushrooms get optimal temperature and appropriate air humidity in order to be able to develop. Furthermore each breeding site is given 10 test larvae on each treatment.The observed parameters are the number of infected larvae and the mortality of larvae in each treatment which is further analyzed by One Way Anova and further tested by Duncan with a real level of 5%.

RESULTS AND DISCUSSION

Larvae of O. rhinoceros infected

Larvae of *O. rhinoceros* that die of *M. anisopliae* show symptoms of discoloration to blackish brown. This result is in accordance with the argument [10] The change in the color of the insect cuticle becomes brownish or black to be a sign of larvae and pupa infected with *M. anisopliae*. Subsequent infection occurs when the dead insect becomes hard and ends up covered with fungal hyphae. Hyphae becomes green when spores mature. In infected larvae are seen blackish-brown wounds such as burning on the body of *O. rhinoceros* larvae. Furthermore, the body of the larvae of *O. rhinoceros* will harden like a mummy. This reinforces the statement [11] that all body fluids and tissues of insects are used up by mushrooms, so that larvae die with bodies that harden like mummies. Larvae are infected at each breeding medium 21 days after the application of *M. anisopliae* fungus presented on the fig. 1.

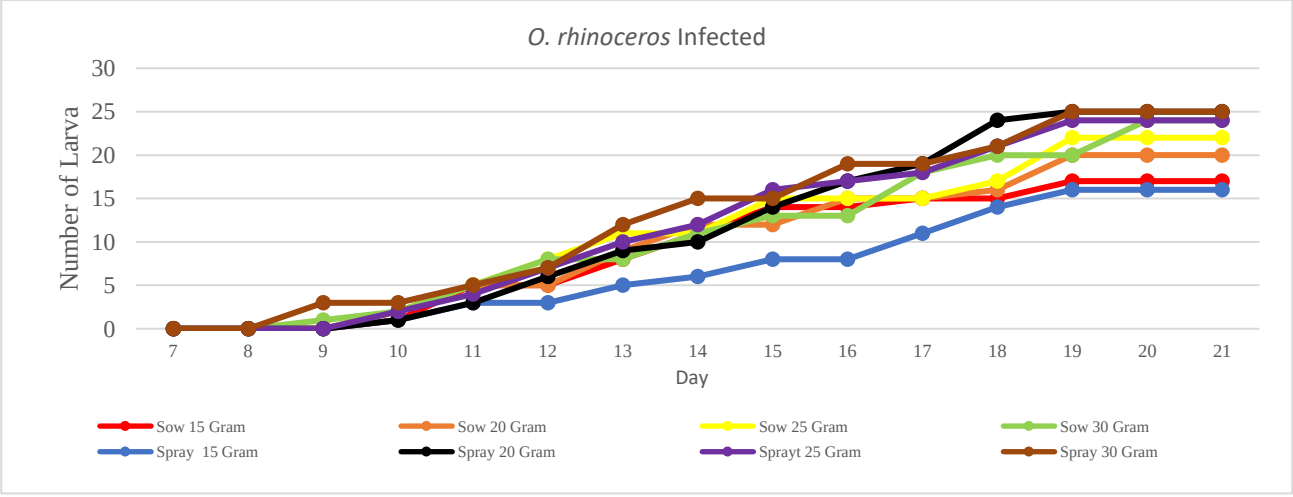

Fig 1. *O. rhinoceros* attack

Observations on the different ways of sowing application with various doses of rice flour formulations and spray applications of various doses dissolved on a liter of water demonstrated *M.*

anisopliae's ability to infect *O. rhinoceros* larvae. This suggests that *M. anisopliae* is capable of infecting the larvae of *O. rhinoceros* regardless of its application. The most important thing to note is that *O. rhinoceros* larvae must make contact with the fungus M. anispoliae. This condition is in accordance with research [11] that when fungi come into contact with larvae, *M. anisopliae* can infect *O. rhinoceros* larvae.

Observations in the second week after application showed that *M. anisopliae* began to affect the movement of *O. rhinoceros* larvae due to the injuries caused. Larvae of *O. rhinoceros* affected by *M. anisopliae* begin to show symptoms of an attack in the form of black spots such as burning on the body part of the larva. Symptoms of the attack began to appear on the 9th day after application on the breeding site spray treatment with a dose of 30 grams / liter of water and on breeding site treatment 30 grams formulation of rice flour. This condition can be interpreted that the larger the dose used, the faster the effectiveness obtained. There are three larvae of *O. rhinoceros* that are attacked at the breeding site spray treatment with a dose of 30 grams / liter of water and one attack on the breeding site treatment of 30 grams of rice flour formulation. In the third step after the application of *O. rhinoceros* larvae infected with *M. anisopliae* begins to die. The larval body begins to coil into a circle and hardens like a mummy. Larvae of *O. rhinoceros* are no longer moving, the color of the body begins to darken and on the buttocks there is a tightening.

Mortality of O. rhinoceros larvae at Each Breeding Site

Mortality of *O. rhinoceros* larvae infected with *M. anisopliae* presented in table 1. Table 1 above shows that breeding sites with different doses of *M. anisopliae* show real differences between treatments. This suggests that various doses of *M. anisopliae* have been shown to increase infection and cause death for *O. rhinoceros* larvae. The use of *M. anisopliae* mushrooms presented in the table above shows a difference in each breeding media. In this study the percentage of larval mortlity on day 21 after application ranged from 56% to 83%.

Table 1. Mortality of *O. rhinoceros* larvae at 21 days after application (%)

Treatment	Larvae Mortality
Sow 15 Gram	56.67 ab
Sow 20 Gram	66.67 bc
Sow 25 Gram	73.33 cd
Sow 30 Gram	80.00 d
Spray 15 Gram	53.33 a
Spray 20 Gram	83.33 d
Spray 25 Gram	80.00 d
Spray 30 Gram	83.33 d

*) The numbers in the same column for each process followed by the same letter indicate that there is no significant DMRT difference at the significance level of 5%.

Control of *O. rhinoceros* with *M. anisopliae* in the laboratory can produce 100% mummification of larvae. This is slightly different from the survey conducted in this area, with the highest percentage at 83.33% [12]. This may be due to the limitation of the larval space in the laboratory so that all larvae can come into contact with *M. anisopliae*. But in contrast to the conditions in the field, not all larvae come into contact with *M. anisopliae* because the larval space is very large on the land.

The graph above shows the death of *O. rhinoceros* larvae from 3 repeats for each treatment of *M. anisopliae* applications. The death of *O. rhinoceros* larvae begins to be seen 12 days after application, with signs of hardening and curling of

the body. Fourteen days after spraying the body of the larvae of *O. rhinoceros* begin to change color to dark brown. Fungi take time to develop and kill insects. Larvae and pupa infected with *M. anisopliae* are characterized by insect cuticles turning brown or black [10]. Another infection occurs when insects die, until finally covered with fungal hyphae. Hyphae becomes green when the spores mature. *M. anisopliae* mushrooms are also referred to as green muscardins.

Graph 2 shows that all treatments are capable of causing death in *O. rhinoceros* larvae. Sowing applications had a mortality of 68.33% at 21 days after application while spray applications had a mortality of 75% at 21 days after application. Spray application has a higher mortality the possibility of spraying the solution makes higher humidity so that it can help the development of *M. anispoliae* mushroom conidia more effectively. Konidia germinates at humidity above 90%, but konidia germinate well when humidity is very high up to 100%. When humidity is less than 86%, the pathogenicity of *M. anisopliae* fungus is reduced [11].

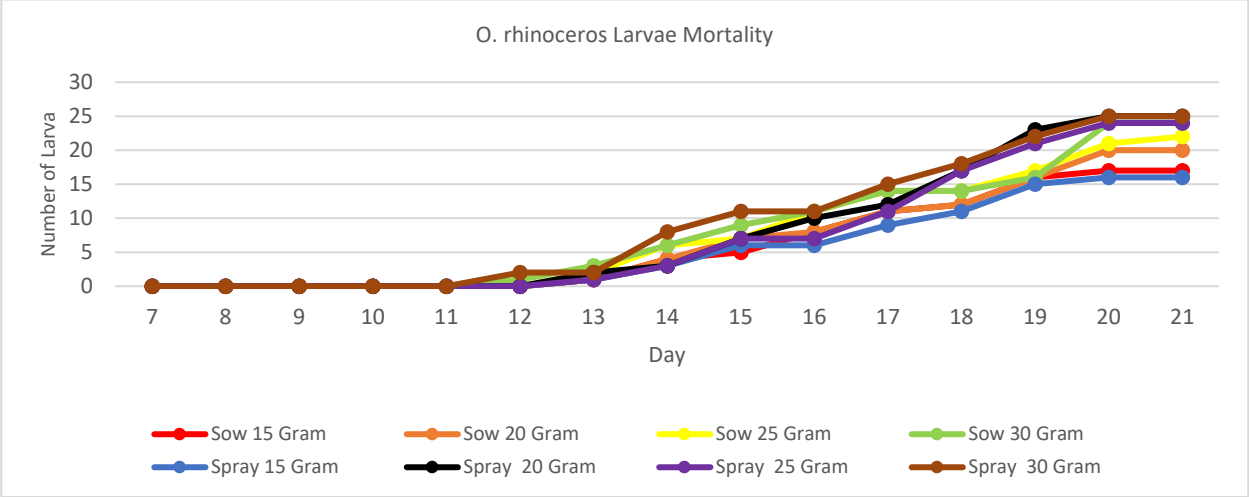

Fig 2. Mortality of *O. rhinoceros* larvae

CONCLUSION

Based on the results of analysis and discussion on the effectiveness of the use of bioinsectiside *M. anisopliae* to control horn beetle pests (*O. rhinoceros*), it can be concluded that the application of *M. anisopliae* fungus plays a good role in suppressing *O. rhinoceros* larvae. Larvae of *O. rhinoceros* are infected 9 days after application and die 12 days after application. The highest mortality of *O. rhinoceros* larvae occurs during the application treatment of spray doses of 20 Grams / L of water and spray application doses of 30 Grams / L of water with mortality of 83.33%.

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