



POTENTIAL OF BEAUVERIA BASSIANA ON THE INTENSITY OF THE BEMESIA TABACI PEST IN HORTICULTURAL PESTS

By

Betty Kadir Lahati¹, Helda Sabban²

^{1,2}Universitas Khairun, Fakultas Pertanian Program Studi Agroteknologi

Email: ¹bettylahati@gmail.com

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ABSTRACT

This study aims to analyze the potency of *Beauveria bassiana* (Bb) and the best concentration on the population of whitefly *Bemisia tabaci* on horticultural crops. The method used was a Randomized Block Design (RAK) on eggplant and chili plants with 4 treatments, namely control, Bb 100g/10ltr water, 150g/10ltr water and 200g/10ltr water. Each treatment was repeated 5 times. Data analysis used analysis of variance and continued with the BNT test. The results of the potency test of *Beauveria bassiana* have the best concentration at 200g/10ltr of water. The average whitefly population on eggplant plants was 65.57%, the population decreased to 6.37% and chili with an average population of 39.37% chili, the population decreased to 15.87%. This is also influenced by agricultural systems in eggplant fields which often rely on synthetic pesticides which cause pests to become resistant and also destroy natural enemies. compared to whitefly pest populations in chili fields which often use organic materials that are far from pest resistance and anti-natural enemies. In addition, the leaves of the eggplant plant are larger than the chili leaves which allow them to lay more eggs and also have a number of trichomes as a shelter for whitefly from natural enemies (predators). The conclusion of the study was that *Beauveria Bassiana* had good potency at a concentration of 200g/10ltrair against the whitefly *Bemisia tabaci* on horticultural crops, both eggplant and chili plants. It is suggested to analyze the relationship between leaf structure and preference level of whitefly on horticultural crops.

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Corresponding Author:

Betty Kadir Lahati,
Fakultas Pertanian Program Studi Agroteknologi,
Universitas Khairun,
Email: bettylahati@gmail.com

1. INTRODUCTION

The decline in production and productivity of horticultural crops mostly comes from solanaceae plants. One of the obstacles faced in cultivation is the disturbance of plant pest organisms (OPT), namely pests and diseases. Among the pests and diseases that cause a lot of damage to Solanaceae plants, one of them is caused by viruses (Ardiansyah, 2013). One of the insects that become pests on solanaceae plants is the whitefly (*Bemisia tabaci*). Direct damage occurs due to feeding activities, namely stomata closure, formation of chlorotic spots on leaves, formation of anthocyanin pigments, and leaf fall. According to data from the Central Statistics Agency (2017), the production of horticultural crops, especially chili plants, tomatoes, eggplants and cucumbers, has decreased both in production and in the area of land used for cultivation. The most significant decline in horticultural crop production occurred in 2015 from 11,918,571 tons to 11,629,414 tons. Eggplant (*Solanum melongena* L.) is a herbaceous plant that can grow to a height of 60-90 cm. This plant has ear-shaped leaves.

The flowers are white to purple and are perfect flowers, usually separated and formed in clusters of flowers. The leaves are 10-20 cm long and 5-10 cm wide (Elba, D. S. 2014). Whitefly can also attack eggplant, the presence of

whitefly (*Bemisia tabaci*) on vegetable commodities can act as pests that damage directly and as vectors of yellow virus disease. If the population of this pest is high, you will see powdery mildew that comes from insect secretions. Powdery mildew is a good place for the development of sooty mold on plant leaves so that it will reduce the photosynthetic efficiency of plants (Hasyim *et al.* 2016). Red chili (*Capsicum annum* L.) can grow well in areas that have an altitude of up to 900 m above sea level, the soil is rich in organic matter with a pH of 6-7 and the soil texture is crumbly. This plant is in the form of a shrub that reaches 1.5 – 2 m in height and the width of the plant canopy can reach 1.2 m. Chili leaves are supported by leaf stalks that have pinnate bones. Leaf shape is generally ovoid, oval and oval with a pointed tip (Regita, 2013).

Pest control is one of the factors that determine the success of farming. So far, farmers tend to use chemical pesticides because they are considered the most effective and efficient. On the other hand, excessive use of chemical pesticides causes several environmental problems. Thus, it is increasingly clear that in an integrated pest control effort, it is necessary to develop compatible control measures, one of which is the use of entomopathogenic nematodes. Utilization of entomopathogenic nematodes can suppress pest populations but does not cause residues for the environment. Therefore, the use of entomopathogenic nematodes needs to be developed in integrated pest control.

2. RESEARCH METHOD

RESEARCH METHODOLOGY Research Time and Place This research will be carried out in April - September 2021. The first stage of research is carried out in the Laboratory for the development of *Beauveria bassiana*. The second stage will be carried out on Horticultural (eggplant and chili) plantations in 2 urban villages in the District of South Ternate City. Research Tools and Materials The tools and materials to be used in this research are treatment/retest boards, raffia rope, loops, jars, block millimeters, PDA media, Aquades, Alcohol. Isolate of *Beauveria bassiana*, etc Research methods This study will use a randomized block design method on land affected by whitefly pests, with a diagonal sampling technique. There are 4 treatments that will be carried out and each treatment is repeated 5 times, namely as follows:

- A. Control (without *Beauveria bassiana*)
- B. *Beauveria bassiana* 100g/ 10 liters water
- C. *Beauveria bassiana* 150g/ 10 liters of water
- D. *Beauveria bassiana* 200g/10 liters water

Research work procedures Activities in the Laboratory Preparation of materials and tools: Rice for propagation media is rice media for propagation of *Beauveria bassiana*. Parent (starter) *Beauveria bassiana*. This broodstock was obtained at the Agrotechnology laboratory, Faculty of Agriculture, Unkhair Propagation of *Beauveria bassiana*: Preparation of planting media: Wash the rice, then soak it for about 15 minutes Drain and air out overnight. Ready-to-use rice is rice that feels moist but doesn't stick to your hands. Put it in a small plastic bag, about 100 grams. Steam for 2 hours Turn off the stove, and let it cool on its own overnight. Mushroom Seed Planting (Inoculation) Prior to inoculation, sterilize all equipment to be used so that no microorganisms other than *Beauveria bassiana* grow in the media. Spoon sterilization: Place the spoon in the alcohol solution for a few seconds, then remove it. A spoon that has been wet with alcohol is then burned with fire, while shaking it until the fire goes out. Take a little starter *Beauveria bassiana* using a sterile spoon. Mix into the media with a ratio of 5 grams of starter: 100 grams of media Plastic cap and stapler. Ripening (incubation) Store media that has been planted by *Beauveria bassiana* in a closed and humid room Within 10-15 days, the media will be covered with white fibers like cotton. This indicates the breeding of *Beauveria* sp is successful and ready to be applied in the field. Activities on land infested with whitefly (*Bemisia tabaci*) The land that will be applied to Bb is in the block according to the zigzag sampling technique using raffia to represent all plants and assigning control areas to each treatment. Plants that will be used are horticultural crops, namely eggplant. And chili Application of Bb testing according to treatment and repeated every week Spraying of Bb on the affected plants was carried out in the afternoon. Observations of whitefly pests infected with Bb were counted and analyzed for each horticultural crop commodity. Observation Parameter The parameters observed in this study were: the number and population as well as the intensity of the insecticide treatment attack on each. How to calculate the percentage or intensity of damage (CI) infected with Bb can be calculated using the following formula.

The parameters observed in this study were :

1. The potential of *Beauveria bassiana* on the number of whitefly pest *Bemisia tabaci* populations on several horticultural crops.
2. The best concentration of the fungus *Beauveria bassiana* which can reduce the population of whitefly pests *Bemisia tabaci* on several horticultural crops

Data analysis

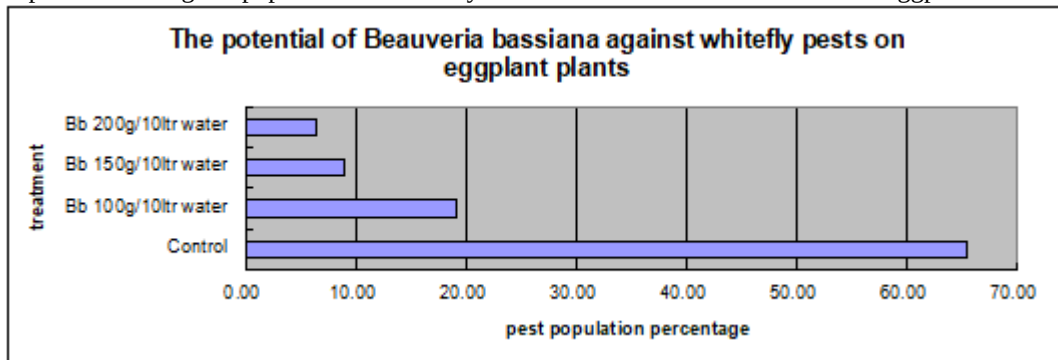
Observational data were analyzed using Analysis of Variance (ANOVA) with a significance level of 5%, if there is a significant difference, then proceed with the Least Significant Difference Test (BNT).at 5% level.

RESULTS AND ANALYSIS

A. eggplant plant

Based on the results of the potential test of *Beauveria bassiana* on the population of whitefly pests on eggplants where the application of the biological agent *Beauveria bassiana* can suppress the population of the whitefly pest *Bemesia tabaci*. This can be seen in graph 1 below:

Graph 1: Percentage of population of whitefly *Bemesia tabaci* in each treatment on Eggplant



The population level of whitefly pests on eggplant plantations in Rua Village on control (without Bb) was very high, reaching 65.57%. After spraying *Beauveria bassiana* (Bb) at a concentration of 100g/10ltr it can suppress the whitefly pest population 19.13%, followed by spraying Bb 150g/10ltr suppressing the whitefly population 8.93% and the lowest population at a concentration of 200g/10ltr with 6.37%. In the test results, a good concentration of *Beauveria bassiana* against whitefly in this study was 200g/10ltr of water, where the higher the concentration of *Beauveria bassiana*, the better the effect on suppressing the whitefly pest population. Zaki (2011) reported that the application of the fungus *B. bassiana* with low doses did not have a negative impact on predator survival. The population level of whitefly pests on eggplant in Rua sub-district is very high where the farming system often relies on synthetic pesticides which causes resistance to whitefly pests and causes natural enemies to die too. The unwise use of synthetic insecticides can cause resistance, resurgence, and the destruction of natural enemies that are useful for pest control in the field (Prayogo et al., 2005). The way *B. bassiana* works is in the larval body, the fungus will release the *beauvericin* toxin and according to Soetopo & Indrayani (2007) that the *beauvericin* toxin can cause damage to the body tissues of infected insects as a whole and can result in the death of insects. Utilization of entomopathogenic fungi to control pests is one component of Integrated Pest Management (Prayogo et al., 2005).

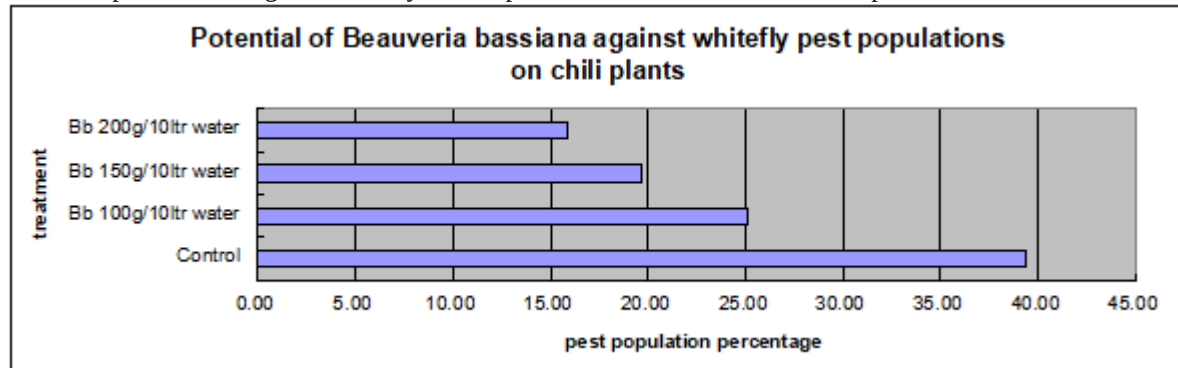
Resistance occurs because most of the insect pests that are able to survive will form increasing immunity, then the generation of insects produced is increasingly resistant to synthetic insecticides. Meanwhile, resurgence occurs due to the entire population of natural enemies, generally generalist predators from the Order *Coleoptera*, Family *Coccinellidae* and egg parasitoids from the Order Hymenoptera, Family *Trichogrammatidae*. killed, useful insects are generally more susceptible to synthetic pesticides so that pest populations develop more freely (Tsuji et al., 2011). The results of the efficacy of the fungus *B. bassiana* on the whitefly nymph stage on soybeans were lower than the results of a study conducted by Jahel et al.(2017) which reached 94% mortality in tomato plants.

The difference in the percentage of insect mortality was caused by the virulence of the fungus as a result of the influence of genetic diversity of the *B. bassiana* isolates applied (Petlamul and Prasertsan 2012). Therefore, to increase the control efficacy of *B. tabaci*, it is recommended to apply repeatedly three times because the insect population structure generally varies, consisting of eggs, nymphs and imago (Wari et al. 2020; Ghongade & Sangha 2021). The results of the efficacy of the fungus *B. bassiana* on the whitefly stadianymph on soybean plants were lower than the results of research conducted by Jahel et al.(2017) which reached 94% mortality in tomato plants. *B. tabaci* control is recommended to apply repeatedly three times because the insect population structure generally varies, consisting of eggs, nymphs and imago (Wari et al. 2020; Ghongade & Sangha 2021)

B. Chili Plant

Based on the results of the potential test of *Beauveria bassiana* on the population of whitefly pests *Bemesia tabaci* on chili plants, spraying the biological agent *Beauveria bassiana* can also suppress the population of the whitefly *Bemesia tabaci*. This can be seen in graph 2 below:

Graph 2: Percentage of Whitefly Pest Population in each treatment in chili plantations.



The population development of whitefly pests in chili plantations was low compared to the population of whitefly pests in eggplant plantations (graph 1) in the control treatment without *beauveria bassiana* which had 39.37%. This happens because the chili farming system in Fitu Village relies more on organic agriculture such as the use of vegetable pesticides. Vegetable pesticides are pesticides that use natural ingredients from plants that have the same toxic power as synthetic pesticides. Therefore there is no chance for pest resistance to occur, besides that natural enemies are still there to maintain the balance of the ecosystem. After spraying *Beauveria bassiana* there was a decrease in the whitefly population, with a Bb concentration of 100g/10ltr of water it could suppress the whitefly pest population by 25.06%, followed by a concentration of 150g/10ltr of water which could suppress the whitefly pest population by 19.70% and the lowest was at a concentration of 200g/10ltr of water. suppressing the population of whitefly pests by 15.87%. The best treatment with a concentration of 200g/10ltr of water. *Beauveria bassiana* with a concentration of 200g/ltr of water can control insect pests that attack chili plants.

The use of biological insecticides using the entomopathogen *Beauveria bassiana* is very effective in reducing pest populations and reducing the intensity of chili damage (BK. Lahati & Haryanto.S. 2019).. The use of *B. bassiana* fungal biological agents is effective for suppressing plant pests and has no danger or side effects on the environment and human health (Ikawati, 2016). Another statement was also put forward (Gargita et al, 2017) which stated that the thicker the concentration of the *Beauveria bassiana* formulation, the higher the density of spores in it, so that the more likely insects will be infected. This is in accordance with the opinion (Tantawizal et al, 2015) that the higher the concentration applied, the higher the density of the fungal conidia, so that the possibility of conidia attached to the insect's body increased which resulted in faster penetration into the insect's body and damaged the insect's body tissue. According to the report of Zafar et al. (2016) that *B.bassiana* effectively kills whitefly (*Bemisia tabaci*) (Homoptera: Aleyrodidae), both egg stage, nymphs and imago. Meanwhile, Popola et al. (2015) stated that *B. bassiana* is also effective kills the corn seed borer *Prostephanustruncates* (Horn) (Coleoptera: Bostrichidae)

3. CONCLUSION

Potency test of *Beauveria bassiana* against whitefly pest population *Bemesia tabaci* on horticultural crops (eggplant and chili) which has a very good effect in suppressing whitefly pest populations than without *Beauveria bassiana* application and gives a good effect when applied repeatedly. The best concentration of *Beauveria bassiana* is 200g/10ltr of water on the development of whitefly pest *Bemesia tabaci* populations on horticultural crops.

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