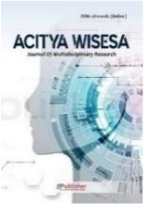

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Damage Intensity Pests and Pathogens in Manure Dosage Treatment on White Glutinous Rice Plant

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ABSTRACT

This research aims to assess the use of various doses of manure affect the intensity level of pests and pathogens on white glutinous rice plants. This research was conducted from February 2020 to June 2020, in Dibal Village, Ngemplak District, Boyolali Regency with an altitude place 200 meters above sea level with the type of soil Grumosol. This research method uses a single factor randomized complete block design (RCBD) consisting of 10 kinds of experiments and each was repeated 3 times in order to obtain 30 kinds trial. The results showed that bug pest attacks in 70 days after planting with lowest intensity of pest damage, namely 34.02%. While the symptoms of narrow brown spot disease (Cercospora oryzae) were evenly distributed at 40 days after planting with lowest disease intensity, namely 71.43%. The treatment of goat manure at a dose of 1.35 kg / plot (K3) on white glutinous rice (Oryza sativa L glutinosa) can reduce the intensity of damage to stink bug pests. The treatment of chicken manure at a dose of 4.5 kg / plot on glutinous white rice can reduce the intensity of narrow brown spot disease (Cercospora oryzae) on leaves and stems. Then, the treatment of chicken manure at a dose of 4.5 kg / plot on white glutinous rice plants gave the highest yield on grain weight per plot, namely 1820.90 grams (8.67 tons/ha).

Keywords: *Pathogens, Pests, Symptoms, White Glutinous Rice*

INTRODUCTION

The average productivity of glutinous rice in Indonesia is around 42,000 tons per year. Generally, glutinous rice used as a processed material for food industry, however, the supply is still limited. Thus, Indonesia needs to import glutinous rice from Thailand. in 2013, the data showed that imports of glutinous rice reach 120,000 tons, glutinous rice was imported from Thailand and Vietnam, while glutinous rice production centers in Indonesia were in three regions such as Subang, East Java and Central Java (Fathnoer, 2014). The importance of glutinous rice as a staple food and industrial processed material, it is necessary to pay attention to the cultivation process. Therefore, the productivity of glutinous rice will increase. One of the efforts to increase the productivity of plant and fulfill the nutrients of plants. By sufficient nutrients for plant needs, the growth of plants can be optimal and the plants become healthy (cannot be attacked by pests and diseases).

In general, the application of organic matter into the soil will maintain and improve physical, chemical and biological properties of a soil. Soil organic matter (SOM) is the component of soil, consisting of plant and animal detritus at various stages of decomposition, cells and tissues of soil microbes, and substances that soil microbes synthesize. Research works show that organic amendments can be beneficial in supporting soil organisms and due to slow release of nutrients this will slow down the rate at which they are leached. Organic soil management can sustain coffee growth when water supply is low by improving soil moisture conservation and water use efficiency (Yvette, 2017).

Glutinous rice plants are very susceptible to pests and pathogens. it called as pests because organisms that live in form of animals are harmful and their presence is not desirable. Insects comprise a hugely diverse group of organisms and constitute a key component in the ecosystem. Some insects are harmful to human, for example, causing damages to agriculture, forestry, stored products or human health and considered pest species (Gurung et al., 2019). One of the most harmful pests is *walang sangit*. While pathogens are disease-causing organisms, one of which is Cercospora which causes narrow brown spot disease.

Research on the intensity of damage to pests and pathogens on the use doses of manure on white glutinous rice plants needs to be carried out in order to understand the use on the right dose of manure in suppressing pests and pathogens. This study aims to examine the use of various doses of manure that can affect the intensity of pest and pathogen attacks on white glutinous rice plants. The reduction in rice yield due to insect, pests and diseases is recorded to be about 21% in North and Central America and about 31.5% in Asia (excluding mainland China). Harvest loss varies within production conditions. In utter terms, yield losses of about 1.2 to 2.2 tons/ha have been recorded due to weed, insects, pest and disease injuries in Asia. More than 800 rice insects' species have been reported in the worldwide ecosystem (Iqbal, 2020). It is suspected that the application of chicken manure at a dose of 3 kg/plot has lowest intensity of pest and pathogen attacks, therefore it can provide optimal white glutinous rice yields.

RESEARCH METHODOLOGY

This study used a single factor Completely Randomized Block Design that is a standard design for bio statistic experiments in which similar experimental units are grouped into blocks or replicates. It is used to control variation in an experiment by, for example, accounting for spatial effects in field or greenhouse (Alkutubi, 2021). It consists of 10 kinds of experiments and each repeated 3 times; thus, 30 kinds of experiments were obtained, such as:

1. without manure
2. Chicken manure with a dose of 1.5 kg / plot
3. Chicken manure with a dose of 3.0 kg/plot
4. Chicken manure with a dose of 4.5 kg / plot
5. Cow manure with a dose of 1.5 kg/plot
6. Cow manure at a dose of 3.0 kg/plot
7. Cow manure with a dose of 4.5 kg/plot
8. Goat manure with a dose of 0.45 kg/plot
9. Goat manure with a dose of 0.90 kg/plot
10. Goat manure with a dose of 1.35 kg/plot

The data obtained were analysed by fingerprint variance, if there are treatments that show significant differences, it will be proceed by Honest Significant Difference Test (BNJ) at significant level of 5% to determine the treatments that have an effect.

The variables consist of pests and pathogens, the intensity of damage, agronomic observation include the number of tillers per clump, grain weight per clump (g), grain weight per plot (gr), weight of 1000 grain (gr). pests play a key role in the potential impacts of long-term climate change on crop productivity (JUROSZEK & von TIEDEMANN, 2013). This research was conducted from February 2020 to June 2020, which located in Donohudan Village, Ngemplak, Boyolali with an altitude of ± 150 meters above sea level grumusol soil type.

RESULTS AND DISCUSSION

The Damage Intensity of Pests and Pathogen

Table 1. The Damage Intensity of Pests and Pathogen

Treatment	The Damage Intensity to Pests and Pathogens (%)		
	Walang Sangit	*C.oryzae* on the leaves	*C.oryzae* on the stem
D0	37,33 b	77,10 bcd	33,34 abc
A1	37,67 b	78,92 bcd	33,34 abc
A2	39,00 b	74,34 ab	33,97 bc
A3	39,33 bc	71,43 a	31,09 a
K1	35,00 ab	77,48 bcd	32,85 ab
K2	35,33 b	80,63 cd	33,34 abc
K3	31,33 a	76,56 bc	32,29 ab
S1	41,00 cd	78,86 bcd	34,25 bc
S2	38,33 b	81,44 d	35,64 c
S3	43,00 d	77,24 bcd	34,25 bc

Source: Processed Data by Researchers

The Damage Intensity of Walang Sangit Pest

The results of variance analysis indicated that the dose of manure had significant effect on the damage intensity of pest. The results of 5% level BNJ test contains in table 1 indicated that the treatment of cow manure at a dose of 4.5 kg/plot (S3) caused the highest damage intensity of 43.00, however it was not significantly different from the treatment of cattle manure at a dose of 1.5 kg. /plot (S1) by an average of 41.00, The results of manure chemical analysis showed that cow manure had the lowest K content of 1.02%, it caused the high pest attack of the stink bug. Meanwhile, the treatment of goat manure at 1.35 kg/plot makes the lowest intensity of pest damage, which was 31.33, however it was not significantly different from the treatment of goat manure at a dose of 0.45 kg/plot with the intensity of pest damage at 35,00.

The Damage Intensity of C. oryzae on Leaf

The analysis results of variance indicated that the treatment of chicken manure at a dose of 4.5 kg/plot (A3) could suppress the intensity of narrow brown spot disease (Cercospora oryzae) with an average of 71.43. However, it is not significantly different compared to the treatment of chicken manure with a dose of 3. 0.0 kg/plot (A2) within an average of 74.34, and significantly different when compared to cow manure treatment at a dose of 3.0 kg/plot (S2) with an average of 81.44.

The treatment of chicken manure at a dose of 4.5 kg/plot (A3) had lower intensity of leaf brown spot disease (Cercospora oryzae) compared to other treatments. at 85 DAP observations there was a significant increase in the intensity of narrow brown spot disease (Cercospora oryzae) compared to 40 DAP, 55 DAP, and 70 DAP observations. Data analysis indicated that chicken manure had a significant effect on the number of leaves, initial leaf width, canopy diameter, stem diameter, and head diameter (Herliana & Ahadiyat, 2020). The severity of disease, dramatically increased due to the increase of air humidity. therefore, plants became susceptible to pathogens because their metabolic activity was too high and lowered the plant's immune system

The Damage Intensity of C. oryzae on Stem

The variance analysis result indicated that the treatment of chicken manure at a dose of 4.5 kg/plot (A3) could suppress the intensity of narrow brown spot disease (Cercospora oryzae) with an average of 31.09, it is not significantly different compared to the treatment without application of manure (D0) within an average of 33.34, the treatment of chicken manure with a dose of 1.5 kg/plot (A1) with an average of 33.34 with the standard of 31.09, but it is not significantly different when compared with the treatment without manure application (D0) with an average of 33.34, the behaviour towards of chicken manure with a dose of 1.5 kg/plot (A1) with an average of 33.34 goat manure treatment with a dose of 0.45 kg/plot (K1) with an average value of 32.85, goat manure treatment with 0.90 kg/plot (K2) dose with an average of 33.34, goat manure treatment with 1, 35 kg/plot (K3) dose with an average of 32.29 are significantly different when compared to cow manure treatment at a dose of 3.0 kg/plot (S2) with an average of 35.64.

Apart from treatment, the environmental factors also have an influence on susceptible rice plants growth and create suitable conditions for the type of pathogen life that causes narrow brown spot disease. The microclimate (rainfall, soil, water, light and nutrients) and host plants are prone to cause the development of pathogens to infect rice plants in the early vegetative phase, characterized by the presence of narrow brown patches of disease (Simanjuntak et al., 2020). Many environmental conditions affect plant disease development, including temperature, light and water availability, soil fertility, wind speeds, and atmospheric ozone, methane and CO_2 concentration. Among these, three are predicted to most likely change and affect the climate in this century, namely CO_2 concentration, temperature, and water availability (Velásquez et al., 2018).

The Harvest

Table 2. The Harvest of White Glutinous Rice

Treatment	The Observation of White Glutinous Rice Harvest			
	Number of Tillers per Clump	Grain Weight per Clump (gr)	Grain Weight per Plot (gr)	Weight per 1000 Seeds (gr)
D0	22,625 ab	39,86 a	1115,58 a	31,40 a
A1	26,542 abc	54,69 a	1420,87 ab	36,57 ab
A2	30,458 bc	49,56 a	1536,50 ab	36,67 ab
A3	31,833 c	48,03 a	1820,90 b	34,60 ab
K1	19,042 a	44,09 a	1356,08 ab	36,57 ab
K2	21,583 a	46,57 a	1372,54 ab	36,53 ab
K3	21,625 a	49,15 a	1476,56 ab	36,87 b
S1	20,250 a	42,33 a	1328,62 ab	36,83 b
S2	21,000 a	45,74 a	1345,93 ab	33,73 ab
S3	22,583 ab	52,81 a	1432,44 ab	35,97 ab

Source: Processed Data by Researchers

The growth of tillers during chicken manure treatment with a dose of 4.5 kg/plot (A3) resulting many leaves that cover each other due to the large number of tillers that reducing the light intensity and increasing the humidity around the plant. The high humidity causes the increase number of tillers and the plants become fertile, causing it to be susceptible to the intensity of narrow brown spot disease.

The highest grain weight per plot is caused through chicken manure treatment with a dose of 4.5 kg/plot (A3) with an average of 1820.90. The chicken manure is classified as having high N, P and K nutrients that can be absorbed by plants in sufficient quantities. Nitrogen plays a most important role in various physiological processes. It imparts dark-green color in plants, promotes leaves, stem and other vegetative part's growth and development. Moreover, it also stimulates root growth (Wahocho, 2016).Apart from N element, the chicken manure also contains high P as an important factor in flower growth, grain filling and making the grain pithier that tends to increase the grain harvest.

The highest weight of 1000 grain in goat manure treatment with a dose of 1.35 kg/plot (K3) with an average of 36.87 are not significantly different when compared to chicken manure treatment at a dose of 1.5 kg/plot (A1) with an average of 36 ,57. This result is different from the research conducted by Mahendra (2020) that stated the treatment of chicken compost gave the highest yield of fresh fruit weight, namely 1499.56 g which increased 46.46% compared to without compost of 1023.85 g. Treatment of chicken biochar with a dose of 15 tonnes ha-1 gave the highest fruit fresh weight 1395.37 g which increased 23.69% compared to without biochar 1128.10 g. This is presumably because the percentage of pithy grain is influenced by environmental factors which in this case are the type and dosage of N, P and K fertilizers contained in chicken, goat and mature cow manure that can improve the physical, chemical and biological properties of the soil. In addition, the weight of pithy grain is more dominantly influenced by planting environment than plant genetic factors.

Based on observation result, the damage caused by pest was the lowest intensity during the treatment of goat manure with 1.35 kg/plot (K3) dose, it was suspected that a low attack of walang sangit resulted in optimal filling of rice grains in goat manure treatment with a dose of 1.35 kg/plot, because the liquid in rice grains is resulting larger and fuller rice grains. The treatment without manure (D0) is a treatment without manure that is suspected in a lack of nutrients that causes the non-optimal filling of rice grains and producing smaller grains of rice compared to other treatments. In fact, this treatment resulted in lowest weight of 1000 grains, which was 31.40 grams. In addition, the attack of walang sangit in treatment (D0) was high that caused the decrease of rice grains quality and its weight.

CONCLUSION

The results showed that the pest attack of walang sangit appeared at 70 days after planting with lowest intensity of pest damage, namely 34.02 %. While the symptoms of narrow brown spot disease (Cercospora oryzae) were evenly distributed at 40 days after planting with lowest disease intensity of 71.43%. the treatment of goat manure with a dose of 1.35 kg/plot (K3) on white glutinous rice (Oryza sativa L glutinosa) was able to reduce the damage intensity due to walang sangit. Meanwhile, the chicken manure treatment with a dose of 4.5 kg/plot on white glutinous rice can suppress the intensity of narrow brown spot disease (Cercospora oryzae) on leaves and stems. The chicken manure treatment with a dose of 4.5 kg/plot on White glutinous rice plants resulting in the highest yield on grain weight per plot with 1820.90 grams (8.67 tons/ha).

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REFERENCES

Alkutubi, H. (2021). On Randomized Complete Block Design. *International Journal of Sciences: Basic and Applied Research (IJSBAR)*, *53*(2), 230–243.

Fathnoer, V. (2014). *Pengaruh Tingkat Kematangan Benih Terhadap Vigor dan Viabilitas pada Dua Genotipe Padi Ketan (Oryza sativa glutinous).* Universitas Andalas.

Gurung, K., Wertheim, B., & Falcao Salles, J. (2019). The microbiome of pest insects: it is not just bacteria. *Entomologia Experimentalis et Applicata*, *167*(3), 156–170. https://doi.org/10.1111/eea.12768

Herliana, O., & Ahadiyat, Y. R. (2020). Branch prunning and chicken manure application to improve growth and yield of brocolli in lowland area. *Ilmu Pertanian (Agricultural Science)*, *5*(3), 166. https://doi.org/10.22146/ipas.43101

Iqbal, S. (2020). *Insect, Pest and Disease Management in Rice*. Austin Publishing Group.

JUROSZEK, P., & von TIEDEMANN, A. (2013). Plant pathogens, insect pests and weeds in a changing global climate: a review of approaches, challenges, research gaps, key studies and concepts. *The Journal of Agricultural Science*, *151*(2), 163–188. https://doi.org/10.1017/S0021859612000500

Mahendra, K. A., Yohanes Parlindungan Situmeang, & Made Suarta. (2020). Effect of Biochar and Compost from Chicken, Goat, and Cow Manure on Cultivation of Red Chili (Capsicum annuum L). *SEAS (Sustainable Environment Agricultural Science)*, *4*(2), 95–101. https://doi.org/10.22225/seas.4.2.2291.95-101

Simanjuntak, F. A. S., Safni, I., & Bakti, D. (2020). Distribution of narrow brown leaf spot disease of rice (Cercospora oryzae Miyake) in North Sumatra. *IOP Conference Series: Earth and Environmental Science*, *454*(1), 012163. https://doi.org/10.1088/1755-1315/454/1/012163

Velásquez, A. C., Castroverde, C. D. M., & He, S. Y. (2018). Plant–Pathogen Warfare under Changing Climate Conditions. *Current Biology*, *28*(10), R619–R634. https://doi.org/10.1016/j.cub.2018.03.054

Wahocho, N. (2016). Role of Nitrogen for Plant Growth and Development: A review. *Advances in Environmental Biology*, *10*(9), 209–218.

Yvette, M. (2017). *Effects of Different Organic Fertiliser Levels on The Growth of Coffee Seedlings in The Nursery*. Midlands State University.