

# Utilization of Several Types of Fertilizer to Reduce the Percentage of Attack of the White Rice Stem Borer (*Scirpophaga innotata* Walk.) in 10 Inpari Varieties

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## ABSTRACT

This study aims to determine the effect of organic and inorganic fertilizers in suppressing the attack percentage of the white rice stem borer (*Scirpophaga innotata* Wlk.) and to determine the type of fertilizer that can increase rice production. The method in this study was using a randomized block design (RBD) with the following treatments: P0: control; P1: Organic Fertilizer (cow stable); P2: Compost Organic Fertilizer; P3: Single NPK Fertilizer (Urea, SP36 and KCl) P4: Compound NPK Fertilizer (16:16:16). The implementation of the research begins with the manufacture of organic fertilizer, then planting, application of treatments, data collection, and analysis of observational data so that the effect of applying fertilizer on the percentage of pest attacks and rice production will be obtained. The results showed that the application of organic and inorganic fertilizers increased the number of tillers, the number of panicles, the weight of 1000 grains, and the production per plot and was able to reduce the percentage of pest attacks. The application of 100 kg of manure per plot was the best treatment in increasing the number of tillers, the number of panicles, the weight of 1000 grains and the production per plot and the best in reducing the percentage of attack by the rice stem borer.

**Keywords:** *Scirpophaga innotata*; Variety; Fertilization.

## INTRODUCTION

The main problem in the food sector is not achieving national food self-sufficiency. The government is still carrying out import policies to ensure food security. Although, there was an increase in rice production in 2020 by 0.08%, there was a decrease in harvested area by 0.19% [1]. One of the factors for this decline is the attack of plant-disturbing organisms.

Rice stem borer is one of the important pests in reducing rice production in Indonesia. There are 21 species of rice stem borer in the world and 6 species in Indonesia, one of which is the white rice stem borer (*Scirpophaga innotata* Wlk.). This pest has a population distribution pattern that is clustered and the intensity of the attack spreads to all parts of the rice plant, causing higher yield losses than other rice stem borers [2].

Various control techniques have been carried out by farmers to reduce the population and intensity of attack by the white rice stem borer (*Scirpophaga innotata* Wlk.), but the results have not been satisfactory because the attack rate and population density are still high. The use of insecticides is also still a mainstay of farmers, but the continuous use of insecticides has an impact on the

sustainability of the agro-ecosystem, because it has a negative effect in the form of pest resistance to a pesticide.

The potential to increase rice production is highly dependent on the ability to integrate various components of good crop management, including a combination of varieties and fertilization [3]. The right blend is also able to increase plant resistance from attacks by plant-disturbing organisms, in this case the resistance of rice to attack by the white rice stem borer (*Scirpophaga innotata Wlk.*).

## MATERIALS AND METHOD

This research was conducted in Serdang Village, Beringin Sub-District, Deli Serdang District on paddy field. This study used a non-factor randomized block design (RBD) with five replications. The following treatments: P0: control; P1: Organic

Fertilizer (cow stable); P2: Compost Organic Fertilizer; P3: Single NPK Fertilizer (Urea, SP36 and KCl) P4: Compound NPK Fertilizer (16:16:16). Application of manure was carried out in a week before planting time using the treatment dosage, while application of inorganic fertilizer was carried out in the day 7 after planting (HST) and the day 42<sup>nd</sup> HST. The fertilizers used were in accordance with the Center for Rice Research (2016) recommendation.

## RESULTS AND DISCUSSION

### Number of Tillers

From the results of the analysis of variance, it was found that the treatment carried out had a significant effect on the number of tillers. The effect of treatment on the number of tillers of rice plants can be seen in Table 1.

Table 1. The effect of treatment on the number of tillers

Treatment	Number of Tillers			
	2 WAP	4 WAP	6 WAP	8 WAP
P0 (Control)	13,52a	19,28a	20,98a	20,68a
P1 (Cow Manure)	18,6e	23,58d	29,64e	31,34e
P2 (Compost)	17,94d	21,82c	28,36d	28,78d
P3 (Single NPK Fertilizer)	17,38c	20,02b	26,42c	27,08c
P4 (Compound NPK Fertilizer)	15,28b	20,06b	23,46b	23,28b

Table 1 shows that in the observation of 2 WAP the highest number of tillers was in treatment P1 with an average number of 18.6 clumps which were significantly different from treatments P0, P2, P3 and P4. In the observation of 4 WAPs, the highest number of tillers was in treatment P1 with an average number of 23.58 clumps which were significantly different from treatments P0, P2, P3 and P4, but treatment P3 was not significantly different from treatment P4. In the observation of 6 WAPs the highest number of tillers was in treatment P1 with an average number of 29.64 families which were significantly different from treatments P0, P2, P3 and P4. Whereas the 8 WAP observations were not much different from the 6 WAP observations where the highest number of tillers was still found in treatment P1 with an average number of 31.34 clumps which were significantly different from

treatments P0, P2, P3 and P4. From Table 1 it can be seen that the application of manure can increase the growth of tillers. This is in accordance with the statement of Notohadoprawiro (2006) which states that the addition of organic matter can add nutrients to plants. Cow manure functions as an ameliorant that can improve the amount and activity of microbes and sources of nutrients in the soil so that it can improve soil quality (Benauli, 2019).

### Number of panicles

From the results of the analysis of variance, it was found that the treatments carried out had a significant effect on the number of panicles. The effect of treatment on the number of panicles of rice plants can be seen in Table 2.

**Table 2. The effect of treatment on the number of panicles**

Treatment	Number of panicles
P0 (Control)	15,58e
P1 (Cow Manure)	22,44a
P2 (Compost)	20,64b
P3 (Single NPK Fertilizer)	18,62c
P4 (Compound NPK Fertilizer)	16,62d

From Table 2. it can be seen that P1 produced the best average number of panicles and was significantly different from the other treatments. Applying manure can increase the number of rice panicles. Fertilizer application makes plants develop properly as a result of the nutrients contained in fertilizer can help the growth of rice, especially panicles. Nyanjang (2003)

**Table 3. The Effect of Organic and Inorganic Fertilizers on the Percentage of Rice Stem Borer Attack at Age 2, 4, 6 and 8 WAP**

Treatment	Percentage of the <i>Scirpophaga innotata</i> Wlk. (%)			
	2 WAP	4 WAP	6 WAP	8 WAP
P0 (Control)	10,59a	11,78a	14,87a	19,73a
P1 (Cow Manure)	4,22c	6,09e	8,40d	10,15c
P2 (Compost)	5,32b	7,01d	9,60b	11,45b
P3 (Single NPK Fertilizer)	5,50b	8,48c	9,52b	12,35b
P4 (Compound NPK Fertilizer)	6,14b	9,72b	11,12c	14,35b

Based on Table 3, it can be seen that at ages 2, 4, 6 and 8 WAP the highest percentage of rice stem borer attack was in treatment P0 (Control), which was significantly different from other treatments. Cow manure treatment was able to reduce the attack percentage of the rice stem borer (*Scirpophaga innotata*). This is in accordance with the statement of Benauli (2019) which states that the application of organic fertilizers, in this case cow manure, can increase the resistance of rice plants to pest attacks.

### 1000 Grain Weight (g)

From the analysis of variance data, it is known that the doses of organic and inorganic fertilizers have a significant effect on the weight of 1000 grains of rice. The effect of treatment on the weight of 1000 grains of rice can be seen in Table 4.

**Table 4. The effect of treatment on the weight of 1000 grains of rice can be seen in Table 4.**

Treatment	Weight of 1000 grains (g)
P0 (Control)	22,956a
P1 (Cow Manure)	26,686e
P2 (Compost)	25,19d
P3 (Single NPK Fertilizer)	24,156c
P4 (Compound NPK Fertilizer)	23,996b

that complete and balanced fertilization greatly affects the growth and yield of rice plants because it can add and restore nutrients that have been lost, both washed and carried by plants during harvest.

### Percentage of the *Scirpophaga innotata* Wlk.

From the analysis of variance data, it was found that the doses of organic and inorganic fertilizers had a significant effect on the percentage of rice stem borer attack at the age of 2, 4, 6 and 8 WAP. The effect of treatment on the percentage of rice stem borer attack can be seen in Table 3.

Table 4. shows that the application of cow manure (P1) was heavier and significantly different from other treatments. This is due to the application of fertilizers can increase plant growth. Kasim (2004) states that maximizing growth by providing adequate food, water and oxygen supply to rice plants will provide a large number of seeds in panicles and can increase the weight of rice grain. Plant growth is largely determined by the available nutrients in optimal and balanced conditions. A plant will thrive if all the nutrients needed are sufficiently available and, in a form, suitable for plant absorption (Dwidjoseputro, 1983).

### Production per Plot

From the analysis of variance data, it is known that the doses of organic and inorganic fertilizers have a significant effect on the production per rice plot. The effect of treatment on production per rice plot can be seen in Table 5.

**Table 5. Effect of Treatment on Production per Plot of Rice Plants**

Treatment	Production per Plot (g)
P0 (Control)	2014,20a
P1 (Cow Manure)	2280,40e
P2 (Compost)	2137,80d
P3 (Single NPK Fertilizer)	2163,80c
P4 (Compound NPK Fertilizer)	2143,00b

Table 5. shows that the application of cow manure (P1) is heavier and significantly different from other treatments. This is caused by the provision of organic fertilizer is able to maintain the soil's ability to support nutrients. According to Pramono (2004) organic fertilizers can increase nutrient availability because they can support N nutrients so they are not easily lost through washing or leaching processes into soil particles.

### The N Nutrient content in Plants

From the analysis of variance data, it is known that the doses of organic and inorganic fertilizers have a significant effect on N nutrient levels. The effect of treatment on N nutrient levels can be seen in Table 6.

Table 6. The effect of treatment on N nutrient levels

Treatment	The N Nutrient content (%)
P0 (Control)	1,25d
P1 (Cow Manure)	1,55b
P2 (Compost)	1,41c
P3 (Single NPK Fertilizer)	1,71a
P4 (Compound NPK Fertilizer)	1,43c

From Table 6. it can be seen that P1 which is 1.71% is the highest N nutrient content and is significantly different from other treatments. Fertilizer application can increase nutrient levels in rice plants. This is in accordance with Notohadiprawiro (2006) that the addition of organic matter can accelerate nutrient cycling in the soil-plant system. Adding organic matter to the soil can add nutrients to plants.

### The K Nutrient content in Plants

From the analysis of variance data, it is known that the doses of organic and inorganic fertilizers have a significant effect on K nutrient levels. The effect of treatment on K nutrient levels can be seen in Table 7.

Table 7. The effect of treatment on K nutrient levels

Treatment	The K Nutrient content in Plants (%)
P0	1,14d
P1	2,32a
P2	2,19b
P3	2,15b
P4	1,81c

From Table 7. it can be seen that P1, which is 2.32%, is the highest K nutrient content and is significantly different from other treatments. Giving manure 100 kg/plot can increase nutrient levels in rice plants. The increase of nutrient content was caused by application of manure which could increase the total K nutrient content (Benauli, 2019). The addition of organic matter into paddy fields had several benefits for physical, chemical and biological fertility of soil [11].

### CONCLUSION

The application of organic and inorganic fertilizers can increase the number of tillers, the number of panicles, the weight of 1000 grains, and the production per plot.

Provision of organic and inorganic fertilizers can reduce the percentage of pest attacks.

Applying 100 kg of manure per plot is the best treatment in increasing the number of tillers, the number of panicles, the weight of 1000 grains and the production per plot and the best in reducing the percentage of attack by the rice stem borer.

### Declaration by Authors

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