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Effect of NPK Mestibiru Fertilizer and Mamigro Fertilizer on the Growth and Yield of Mustard (Brassica rapa L.), Chia Tai Variety

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Abstract: *The objectives of the study were: to determine the effect of NPK Mestibiru fertilizer and Mamigro leaf fertilizer and their interaction on the yield of mustard greens; and to determine the proper dose of NPK Mestibiru fertilizer and Mamigro fertilizer concentration for mustard greens (Brassica rapa L), Chia Tai variety. The research was carried out for two months, starting from March 2021 to April 2021. It was located in Melak village, Melak sub District, West Kutai Regency, East Kalimantan Province, Indonesia. The study used a factorial experiment in a completely randomized design (CRD) 3 x 3, with 4 replications. Factor I was the dose of NPK Mestibiru fertilizer (B), consisting of 3 levels, namely: bo = no NPK Mestibiru fertilizer application or control; b1 = 200 kg/ha (5 g/polybag), and b2 = 400 kg/ha (10 g/polybag). Factor II was the concentration of Mamigro fertilizer (M), consisting of 3 levels, namely: mo = no Mamigro fertilizer; m1 = 2 g/l.water, and m2 = 4 g/l.water. Data analysis was counted by analysis of variance and continued with the BNT test at 5% level. The results indicated that: (1) Treatment of NPK Mestibiru fertilizer (B) had a significant to very significant effect on the plant height and number of leaves at aged 10, 20 and 30 days after planting, and fresh weight per plant; (2) Mamigro (M) fertilizer treatment had a significant to very significant effect on the plant height and number of leaves at aged 10, 20, and 30 days after planting, and fresh weight per plant; and (3) The interaction between NPK Mestibiru fertilizer and Mamigro fertilizer had no significant effect on the plant height and number of leaves at aged 10, 20, and 30 days after planting, but it had a very significant effect on the fresh weight per plant. The highest plant fresh weight was produced in the combination of b2m2, which was 247.25 g, while the lowest one was produced in the treatment no NPK Mestibiru fertilizer and no Mamigro fertilizer (b0m0), which was only 98.50 g.*
Keywords: *NPK mestibiru fertilizer; mamigro leaf fertilizer; mustard*

I. Introduction

Horticultural crops are agricultural commodities that are prospective to be developed because they have high economic value. Judging from the suitability of the climate, in Indonesia it is possible to develop vegetable commodities that are beneficial for improving the economy and human health. Among the vegetable crops that are easily cultivated and commonly consumed by the public are mustard.

Green mustard (Brassica rapa L.) is a type of annual plant that is popular with the community. Mustard plants have a short lifespan and contain the nutrients the body needs. The content of beta-carotene in mustard can prevent cataracts. Other content is protein, vegetable fat, carbohydrates, fiber, Ca, Mg, Fe, Na, vitamin A, and vitamin C (Samadi, 2017). The community's high demand for mustard must be balanced with sufficient production capacity. Fulfillment of these needs can be done by increasing production in terms of both quality and quantity. One of the efforts that can be done is through optimizing the provision of nutrients that trigger the growth and productivity of mustard, namely fertilization. Fertilizer can be applied through the soil and/or plant body, two types of fertilizers that can be

used for mustard plants are NPK Mestibiru fertilizer and Mamigro leaf fertilizer. NPK Mestibiru fertilizer has several advantages, namely it contains macro and micro nutrients, nutrients are quickly absorbed, and has little residue (PT Mest Indonesia, 2020). While the use of Mamigro leaf fertilizer is that it also contains macro and micro nutrients, and other elements needed by plants, making it a leaf fertilizer that is able to provide more value for farmers and provide the best quality for plants (Mansur, 2019). The objectives of the study were: (1) to determine the effect of NPK Mestibiru fertilizer and Mamigro leaf fertilizer and their interaction on the yield of mustard greens; and (2) to determine the proper dose of NPK Mestibiru fertilizer and Mamigro fertilizer concentration for mustard greens, Chia Tai variety.

II. Research Methods

2.1 Time and Place

The research was carried out for 2 months, starting from March 2021 to April 2021. It is located in Melak village, Melak sub District, West Kutai Regency.

2.2 Materials and Tools

The research materials were: topsoil, seed of mustard greens Chia Tai variety, compost, NPK Mestibiru fertilizer, Mamigro leaf fertilizer, Basudin 50 EC, Dithane M-45, and Furadan 3G. While the research tools are: hoe, machete, rake, wire filter, analytical scale, polybag size 40 cm x 40 cm, plastic rope, hand sprayer, stationery and camera, plant watering bucket.

2.3 Experimental Design

The study used a factorial experiment in a completely randomized design (CRD) 3 x 3, with 4 replications.
Factor I is the dose of NPK Mestibiru Fertilizer (B), consisting of levels, namely:
bo = no Mestibiru NPK fertilizer
b1 = 200 kg/ha (5 g/polybag),
b2 = 400 kg/ha (10 g/polybag).
Factor II is the concentration of Mamigro Fertilizer (M), consisting of 3 levels, namely:
mo = no Mamigro fertilizer
m1 = 2 g/l.water
m2 = 4 g/l.water

2.4 Research Implementation

Research activities include: preparation of planting media, seed sowing, composting, planting, fertilizing (Mestibiru and Mamigro), plant upkeep, and harvesting,

2.5 Observation and Data Collection

Observable data: plant height and number of leaves aged 10, 20 and 30 days after planting, as well as fresh weight per plant.

2.6 Data Analysis

To determine the effect of the treatment of NPK Mestibiru fertilizer and Mamigro leaf fertilizer and their interactions, an analysis was carried out with Variety Test (F Test). If the results of the variance have no significant effect (F. Count F Table 5%) no further test is carried out, but if the results of the variance have a significant effect (F. Count F-Table 5%) or have a very significant effect (F-Calculate F -Table 1%), then to compare the two treatment averages, further tests were carried out using the Least Significant Difference Test (BNT) at the 5% level.

III. Discussion

The results of the analysis indicated that the effect of NPK Mestibiru fertilizer was significantly to very significant on the plant height at the aged of 10, 20 and 30 days after planting, number of leaves at 20 and 30 days after planting, fresh weight per plant, but not significantly different on the number of leaves at 10 days after planting.

The results of the analysis showed that the effect of Mamigror foliar fertilizer was significantly to very significant on plant height and number of leaves at the age of 10, 20 and 30 days after planting, as well as fresh weight per plant.

The results of the analysis showed that the interaction between the Mestibiru NPK fertilizer factor and the Mamigro leaf fertilizer factor was not significantly different on plant height and number at 10, 20 and 30 days after planting, but the fruit weight per plant was significantly different.

3.1 The Effect of NPK Mestibiru Fertilizer

The results (Table 1) showed that the application of NPK Mestibiru fertilizer significantly affected on the plant height and number of leaves aged 10, 20, and 30 days after planting, except for the number of leaves aged 10 days after planting.

Table 1. Effect of NPK Mestibiru Fertilizer on the Growth and Yield of Mustard (*Brassica rapa* L.), Chia Tai Variety

Treatment Factor	Plant height (cm)			Leaf number			Fresh weight/ crop (g) 30 DAP
	10 DAP	20 DAP	30 DAP	10 HST	10 DAP	20 DAP	
No Mestibiru (b_0)	7,96 b	16,83 b	25,42 b	5,33	6,58 b	8,75 b	103,17 b
5 g g/polybag (b_1)	9,29 a	21,08 a	32,67 a	5,58	7,83 a	11,58 a	141,83 b
10 g/polybag (b_2)	9,42 a	21,42 a	34,33 a	5,42	8,08 a	12,92 a	193,42 a

Note:
- DAP: Days after planting
- Numbers followed by the same letter in the same column show no significant difference in the LSD test at 5% level

Application of 5 and 10 g/polybag resulted in higher mustard plants and more leaves than treatment without NPK Mestibiru fertilizer. This situation shows that the application of NPK Mestibiru fertilizer in mustard cultivation can significantly stimulate the growth of plant height and number of leaves. As stated by Hardjowigeno (2010) that in the cultivation of plants that are taken or cultivated for their leaves, it is necessary to give fertilizers that contain lots of nitrogen (N) in order to grow and develop properly.

There was no significant effect of the application of NPK Mestibiru fertilizer on the number of leaves at the age of 10 days after planting, because the plants were still in the early stages of growth (just transferred from the nursery) and the fertilizer given had not been fully absorbed by the plant roots, which had a small number of roots. In addition, at the beginning of its growth, mustard plants are more dominant for high growth, while leaf growth is slow. As stated by Mulyani and Sutejo (2013) that during plant growth and development there are processes with different intensities, requiring different times and not the same amount of nutrients.

The results (Table 1) showed that the application of NPK Mestibiru fertilizer had a very significant effect on the fresh weight of the plant. The highest plant fresh weight was found in the NPK Mestibiru fertilizer treatment of 10 g/polybag (b_2), which was 193.42 g, followed by the 5 g/polybag (b1) treatment which was 141.83 g and the lowest was in the treatment without NPK Mestibiru fertilizer (b_0), which is 103.17 g. This situation is due to the application of NPK Mestibiru fertilizer can increase the availability of nutrients, especially N, P, and K which are needed by plants. Thus there are many nutrients in the soil, which can be absorbed by plant roots, to increase photosynthetic activity to produce carbohydrates for the formation of leaves, which in turn will increase the wet weight of the plant. In line with the results of research reported by Karim, et al (2020) that giving a dose of NPK 16:16:16 fertilizer of 1000 kg/ha gave the best effect on the growth and yield of mustard plants on the parameters of plant height, number of leaves, leaf length and fresh weight. plant.

3.2 Effect of Mamigro Fertilizer

The results (Table 2) showed that the application of Mamigro foliar fertilizer had a significant to very significant effect on the plant height and number of leaves aged at 10, 20, and 30 days after planting.

Table 2. Effect of Mestibiru Mamigro Fertilizer on the Growth and Yield of Mustard (*Brassica rapa* L.), Chia Tai Variety

Treatment Factor	Plant height (cm)			Leaf number			Fresh weight/ crop (g)
	10 DAP	20 DAP	30 DAP	10 DAP	20 DAP	30 DAP	
No Mamigro (m_0)	7,58 b	16,50 c	27,33 b	4,83 b	6,50 c	9,92 b	127,33 c
2 g/liter water (m_1)	8,63 b	19,42 b	31,83 a	5,42 b	7,42 b	10,92 ab	142,25 b
4 g/liter water (m_2)	10,46 a	23,42 a	33,25 a	6,08 a	8,58 a	12,42 a	168,83 a

Note:
- DAP: Days after planting
- Numbers followed by the same letter in the same column show no significant difference in the LSD test at 5% level

The application of various concentrations of Mamigro foliar fertilizer (2 and 4 g/l water) resulted in higher mustard plants and more leaves than the treatment without Mamigro foliar fertilizer. This is because the application of Mamigro fertilizer can increase the availability of nutrients, especially N which is very necessary for plant vegetative growth. As stated by Winarso (2005), nitrogen fertilizer is an essential fertilizer for plant growth and development, and is closely related to the formation of amino acids and proteins which are very important in the formation of plant vegetative organs. Furthermore, the results of research reported by Djarwatiningsih, et al (2018) that the application of Mamigro leaf fertilizer has a significant effect on observations plant height at the age of 21 and 56 days after planting.

The results of the variance analysis (Table 2) showed that the Mamigro fertilizer treatment had a very significant effect on the wet weight of the plant. Mamigro fertilizer treatment with a concentration of 2 g/liter of water and a concentration of 4 g/liter of water gave higher plant wet weight yields than the treatment without Mamigro fertilizer. The highest plant wet weight was produced in the treatment of 4 g/liter of water (m_2), which was 168.83 g, while the lowest was in the treatment without Mamigro fertilizer, which was only 127.33 g. This situation shows that with increasing concentration of Mamigro fertilizer applied, the wet weight of the resulting plant will also increase. This happens because of the

role of nutrients contained in Mamigro fertilizer, which stimulates plant growth by increasing the height and number of plant leaves, thereby increasing the wet weight of the plant. This is in accordance with the opinion of Lingga and Marsono (2013) that nitrogen is very important in the formation of green leaves for the photosynthesis process to form proteins, fats and various other organic compounds, thereby increasing the weight of plant biomass. The results of the study reported by Maharani, Guniarti and Sulistyono (2021) that treatment with a concentration of 5 g/l Mamigro with time intervals of application of Mamigro leaf fertilizer every 10 days gave the best results on the number of flowers, total fruit harvested and total fruit weight harvested for tomato plants.

3.3 Effect of Treatment Interaction on Mustard Plants

The results (Table 3) showed that the interaction treatment of the NPK Mestibiru fertilizer dose factor and the Mamigro fertilizer concentration factor had no significant effect on plant height and number of leaves aged at 10, 20 and 30 days after planting, but significantly affected fruit fresh weight per plant.

Table 3. Effect of NPK Mestibiru Fertilizer and Mamigro Fertilizer Interaction on the Growth and Yield of Mustard (*Brassica rapa* L.), Chia Tai Variety

Treatment Factor	Plant height (cm)			Leaf number (helai)			Fresh weight/ crop (g) 30 DAP
	10 DAP	20 DAP	30 DAP	10 HST	10 DAP	20 DAP	
b_0m_0	6,75	14,00	22,50	4,75	6,00	8,00	98,50 e
b_0m_1	7,63	16,00	26,00	5,50	6,25	8,25	99,00 e
b_0m_2	9,50	20,50	27,75	5,75	7,50	10,00	112,00 de
b_1m_0	7,75	17,25	27,00	5,00	6,50	9,50	138,25 cd
b_1m_1	9,00	21,50	36,25	5,25	7,75	11,75	140,00 cd
b_1m_2	11,13	24,50	34,75	6,50	9,25	13,50	147,25 c
b_2m_0	8,25	18,25	32,50	4,75	7,00	12,25	145,25 c
b_2m_1	9,25	20,75	33,25	5,50	8,25	12,75	187,75 b
b_2m_2	10,75	25,25	37,25	6,00	9,00	13,75	247,25 a

Note:

- DAP : Days after planting
- Numbers followed by the same letter in the same column show no significant difference in the LSD test at 5% level

This situation indicates that the NPK Mestibiru fertilizer factor and the Mamigro leaf fertilizer factor are not mutually exclusive in influencing the growth and yield of mustard plants. In the condition that the different interactions is not significant, it could be said that the treatment factors act independently of one another. Gomez and Gomez (1995) stated that two treatment factors are said to interact if the influence of a treatment factor changes when the level of another treatment factor changes. Added by Hanafiah (2010) that if the first factor and the second factor have a significant effect, while the interaction has no significant effect, the recommendation from the experimental results suggests that the application of the two factors separately or only one of them.

The results showed that the combination of various doses of NPK Mestibiru fertilizer and the concentration of Mestibiru foliar fertilizer resulted in better growth in plant height, number of leaves and wet weight per plant than the combination without NPK Mestibiru fertilizer and without Mamigro foliar fertilizer. The highest plant fresh weight was produced in the combination of b_2m_2, which was 247.25 g, while the lowest was produced in the treatment without Mestibiru NPK fertilizer and without Mamigro fertilizer (b_0m_0), which was only 98.50 g. This situation shows that the application of NPK Mestibiru fertilizer combined

with Mamigro fertilizer can increase the availability of both macro and micro nutrients for plant growth, so as to increase plant yields, in the form of fresh weight of mustard plants. As stated by Dwidjoseputro (2001) that plants will thrive if the nutrients they need are available in sufficient and balanced quantities.

IV. Conclusion

4.1 Conclusion

Based on the results of research and discussion, several conclusions can be drawn as follows:

1. Treatment of NPK Mestibiru fertilizer (B) had a significant to very significant effect on the plant height and number of leaves aged 10, 20 and 30 days after planting, and fresh weight per plant.
2. Treatment of Mamigro (M) fertilizer had a significant to very significant effect on plant height and number of leaves aged 10, 20, and 30 days after planting, and fresh weight per plant.
3. The interaction of NPK Mestibiru fertilizer and Mamigro fertilizer had no significant effect on plant height and number of leaves aged 10, 20, and 30 days after planting, but had a very significant effect on fresh weight per plant. The highest plant wet weight was produced in the combination of b2m2, which was 247.25g, while the lowest was produced in the treatment without Mestibiru NPK fertilizer and without Mamigro fertilizer (b0m0), which was only 98.50g.

4.2 Suggestion

Some suggestions from the research results are:

1. It is recommended to use NPK Mestibiru fertilizer at a dose of 10 g/polybag and a concentration of Mamigro fertilizer at 4 g/liter of water.
2. It is necessary to carry out further research with a more varied dose of fertilizer to determine the maximum yield of mustard plants.

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