Vol. 6 No. 1 September 2022
ISSN : 2597 - 8713 (ONLINE)
ISSN : 2598 - 5167 (PRINT)
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

The Effectiveness of Using NPK Compound Fertilizer on the Growth and Yield of Mustard Plants (Brassica juncea L.)

Budi Utomo

Faculty of Agriculture,Mayjen Sungkono University Mojokerto, Indonesia

Correspondence E-mail: budi.utomo@unimas.ac.id

Article History: Received: Agustus 28, 2022; Accepted: September 27, 2022

ABSTRACT

This study aims to determine the extent to which the effectiveness of using NPK compound fertilizer on the growth and yield of mustard plants. This study used a simple randomized block design (RBD) consisting of eight treatments with three replications and for observation, each treatment was represented by two sample plants. The placement of the treatments in the experimental plots was carried out randomly, the growth and yield variables of the mustard plants observed in this study were the length of the plants, observed at the age of 10 days, 20 days and 30 days after transplanting, the number of leaves were observed at the ages of 10 days, 20 days and 30 days after transplanting and plant wet weight. This was done when the plants were 30 days after transplanting. While the results of the study showed a significant effect on the observation variables of plant length, number of leaves and fresh weight of mustard plants due to the use of NPK compound fertilizer and effective (effective) doses in the use of NPK compound fertilizer during growth and yield of mustard plants tended to be achieved by treatment with doses of NPK compound fertilizer. 250 kg per hectare, although the highest growth and yield tended to be shown in the treatment of 350 kg of NPK compound fertilizer per hectare, followed by the treatment of 300 kg of NPK compound fertilizer per hectare.

Keywords: Fertilizers, Plants, Mustard Greens, Vegetables, NPK

1. INTRODUCTION

Sawi is a type of vegetable that is favored by the people of Indonesia. The consumers range from the lower class of society to the upper class of society. Another advantage, mustard is able to grow both in the lowlands and highlands. Mustard greens have high economic value after crop cabbage, cauliflower and broccoli. Mustard greens are thought to have originated from China (China), this plant has been cultivated since 2500 years ago, then spread to the Philippines and Taiwan (Anggraeni et al., 2022).

From a climatological perspective, it is timely for Indonesia to develop a vegetable business. The growth rate of vegetable production in Indonesia ranges from 7.7–24.2% per year. Several types of vegetables such as shallots, Chinese cabbage or mustard greens, kale and cucumbers increased production as a result of the application of cultivation technology (Ngantung et al., 2018).

Mustard greens when viewed from the economic and business aspects are feasible to be developed or endeavored to meet consumer demand and the existence of market opportunities. The feasibility of developing mustard cultivation is shown, among other things, by the comparative

Vol. 6 No. 1 September 2022
ISSN : 2597 - 8713 (ONLINE)
ISSN : 2598 - 5167 (PRINT)
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

advantage of the conditions in the tropical region of Indonesia which are very suitable for this commodity, besides that the harvesting age of mustard greens is relatively short, namely 40-50 days after planting and the results provide adequate profits (Rizka, 2022).

In addition, the technical, economic and social aspects are also very supportive of vegetable cultivation in our country. Judging from the technical aspect, the cultivation of mustard greens is not too difficult. Mustard greens, we often encounter in our daily diet. Mustard greens are usually processed into stir-fried vegetables or a complement to eating meatballs. This green vegetable has many benefits. Mustard greens contain lots of antioxidants and have lots of vitamins. According to experts, mustard greens, like other green vegetables, function as cancer prevention. For women, mustard has many benefitsat time menopause, because it can protect women from heart disease and breast cancer. The content of nutrients such as calcium, folic acid and magnesium can also support bone health. For those of you who don't like to eat vegetables, you don't need to worrylose all these healthy benefits, because it turns out, mustard greens can not only be eaten as a vegetable, but also mixed into a refreshing healthy drink (Situmorang & Alamsyah, 2015).

Mustard production during the period 2005 to 2008 decreased minus 1.44% per year. This happened due to reduced land area, in 2008, the largest mustard production was 77,147 tons, an increase of 2,036 tons. When compared to the production of mustard greens in 2007 amounting to 75,111 tons, there were almost mustardin the whole regions in Indonesia (Susila, 2005).

One important factor in cultivation that supports the success of plant life is the problem of fertilization. A common problem in fertilization is the low efficiency of nutrient uptake by plants (Sari et al., 2020). The efficiency of N and K fertilization is low, ranging from 30-40%. The efficiency of P fertilization by plants is also low, ranging from 15-20% (Gunawan et al., 2015).

Plants are not enough just to rely on nutrients from the soil alone. Therefore, plants need to be given additional nutrients from outside, namely in the form of fertilizer. Efforts to increase the efficiency of fertilizer use can be achieved through the principles of the right type, right dose, right method, timely application and balanced according to plant needs (Tando, 2019).

To be able to grow and produce optimally, vegetable plants need essential nutrients in addition to solar or solar radiation, water and CO2. Essential nutrients are nutrients that play an important role as a source of nutrients for plants. Availability of each of these elementsinside soil differs between plants (Hartati et al., 2012).

Increasing mustard production can be done by fertilizing. Fertilization through the soil can be done with artificial fertilizers and natural fertilizers. Fertilization can also be given according to its type, including single fertilizer, compound fertilizer, macro element fertilizer and micro element fertilizer. The lack of farmer knowledge regarding the amount and type of nutrients needed by

Vol. 6 No. 1 September 2022
ISSN : 2597 - 8713 (ONLINE)
ISSN : 2598 - 5167 (PRINT)
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

plants is also a problem which results in a low increase in production per unit area (Sari et al., 2020).

The use of NPK fertilizer can be a solution and alternative in increasing plant growth, especially mustard greens. The use of NPK fertilizer is expected to increase the nutrient content needed in the soil so that it can be used directly by plants, and is intended to provide ease of application.in the field (Son, 2012). This study aims to determine how effective (effective) the use of NPK compound fertilizer is on the growth and yield of mustard greens (Brassica juncea L.)

2. RESEARCH METHOD

This study used a simple randomized block design (RBD) consisting of eight treatments with three replications and for observation, each treatment was represented by two sample plants. The placement of the treatments in the experimental plots was done randomly.

The treatment given was NPK compound fertilizer consisting of eight doses, including:

A = Without fertilizer (control)
B = NPK Fertilizer 100 kg/Ha (1.11 grams per plant)
C = NPK Fertilizer 200 kg/Ha (2.22 grams per plant)
D = NPK Fertilizer 300 kg/Ha (3.33 grams per plant)
E = NPK Fertilizer 400 kg/Ha (4.44 grams per plant)
F = NPK Fertilizer 500 kg/Ha (5.55 grams per plant)
G = NPK Fertilizer 600 kg/Ha (6.67 grams per plant)
H = NPK fertilizer 700 kg/Ha (7.78 grams per plant)

To determine the effect of NPK compound fertilizer application on the growth and yield of Mustard Greens, the F test was used with a level of 5%, namely the Sidik Analysis Test (ASR). If from the results of the 5% F Test there is a significant effect, then proceed with the T Test (Smallest Significant Difference Test) with a level of 5% in order to determine the difference between the treatment doses of NPK compound fertilizer, so that the appropriate treatment dose (effective dose) can be determined.

Variable types of growth and yield of mustard plants observed in this study include:

a. Plant Length: that is by measuring the length of the plant that starts from the base of the existing pseudo stemOn surface soil to plant parts the longest. Observed on plants aged 10 days, 20 days and 30 days after transplanting.
b. Number of Leaves: that is by counting all the leaves that have opened perfect. Observed on plants aged 10 days, 20 days and 30 days after transplanting.
c. Plant Wet Weight: that is by weighing all parts of the plant after being harvested and previously washed with water and cleaned of soil or dirt, and air-dried so that there is no

Vol. 6 No. 1 September 2022
ISSN : 2597 - 8713 (ONLINE)
ISSN : 2598 - 5167 (PRINT)
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

residue water on plant parts. This is done when the plants are 30 days old after transplanting.

d.

3. RESULTS AND DISCUSSION

Plant Length

The results of the analysis of variance showed that the treatment using NPK compound fertilizer had a significant effect on the observation of plant length during the growth of mustard plants, both at the age of 10 days, 20 days and 30 days after transplanting.

Table 1. Average Plant Length (cm) Due to Influence Use of NPK Compound Fertilizer in Various Age of Observation

NPK Compound Fertilizer Treatment	Average Plant Length (cm)		
	10 days	20 days	30 days
No fertilizer	10,50 a	21,17 a	32,17 a
NPK Fertilizer 50 kg/Ha	11,17 a	23,50 a	36,50 b
NPK Fertilizer 100 kg/Ha	13,00 b	26,67 b	37,50 b
NPK Fertilizer 150 kg/Ha	13,50 bc	28,17 bc	41,33 c
NPK Fertilizer 200 kg/Ha	15,17 c	29,50 c	45,67 d
NPK Fertilizer 250 kg/Ha	17,67 d	32,67 d	48.00 from
NPK Fertilizer 300 kg/Ha	18,17 d	33,00 d	49.33 and
NPK Fertilizer 350 kg/Ha	19,17 d	35,17 d	49.83 and
BNT 5%	1,85	2,37	3,45

Note: Numbers accompanied by the same letter in the same column is not significantly different in the 5% BNT Test

In Table 1. shows, that with increasing the use of compound fertilizer doses will also be followed by an increase in plant length during the growth of mustard plants. The shortest plant length tended to be shown in the treatment without fertilizer (32.17 cm) and was statistically different from the treatment with other NPK compound fertilizers. The longest plants tended to be achieved by using NPK compound fertilizer 350 kg/ha (49.83 cm), although

Vol. 6 No. 1 September 2022
AGRICULTURAL SCIENCE
ISSN : 2597 - 8713 (ONLINE)
ISSN : 2598 - 5167 (PRINT)
Agricultural Science
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

statistically not significantly different from the treatment using NPK compound fertilizer 300 kg/Ha (49.33 cm) and the treatment using NPK compound fertilizer 250 kg/Ha (48.00 cm).

Number of Leaves

The results of the analysis of variance showed that the treatment using NPK compound fertilizer had a significant effect on the observation of the number of leaves during the growth of mustard plants, both at the age of 10 days, 20 days and 30 days after transplanting (Appendix 2).

Table 2. Average Number of Leaves Due to the Effect of Use NPK Compound Fertilizer at Various Ages Observation

NPK Compound Fertilizer Treatment	Average Number of Leaves		
	10 days	20 days	30 days
No fertilizer	3,50 a	10,33 a	16,67 a
NPK Fertilizer 50 kg/Ha	4,33 b	13,00 b	19,00 b
NPK Fertilizer 100 kg/Ha	4,50 b	14,33 b	20,33 b
NPK Fertilizer 150 kg/Ha	5,83 c	16,67 c	22,87 c
NPK Fertilizer 200 kg/Ha	5,83 c	18,67 d	23,67 c
NPK Fertilizer 250 kg/Ha	6,00 c	19.33 from	25,87 d
NPK Fertilizer 300 kg/Ha	6,67 d	20.00 from	26,33 d
NPK Fertilizer 350 kg/Ha	6,83 d	20.67 and	27,00 d
BNT 5%	0,53	1,86	2,12

Note: Numbers accompanied by the same letter in the same column is not significantly different in the 5% BNT Test

In Table 2. shows, that with increasing the use of compound fertilizer doses will also be followed by an increase in the number of leaves during the growth of mustard plants. The smallest number of leaves tended to be shown in the treatment without fertilizer (16.67 leaves) and was statistically different from the use treatment other NPK compound fertilizers. The highest number of leaves tended to be achieved by the treatment using NPK compound fertilizer 350 kg/Ha (27.00 strands), although statistically this was not significantly different from the treatment using NPK compound fertilizer 300 kg/Ha (26.33 strands) and the treatment using NPK compound fertilizer 250 kg/Ha (25.87 strands).

Vol. 6 No. 1 September 2022
ISSN : 2597 - 8713 (ONLINE)
ISSN : 2598 - 5167 (PRINT)
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

Plant Wet Weight

The results of the analysis of variance showed that the treatment using NPK compound fertilizer had a significant effect on the observed fresh weight of the mustard plants.

Table 3. Average Wet Weight of Mustard Plants (grams) As a result Effect of Using NPK Compound Fertilizer

NPK Compound Fertilizer Treatment	Average Wet Weight of Plants (gram)
No fertilizer	125,90 a
NPK Fertilizer 50 kg/Ha	179,07 b
NPK Fertilizer 100 kg/Ha	209,95 b
NPK Fertilizer 150 kg/Ha	256,23 c
NPK Fertilizer 200 kg/Ha	298,77 d
NPK Fertilizer 250 kg/Ha	351.43 and
NPK Fertilizer 300 kg/Ha	364.22 and
NPK Fertilizer 350 kg/Ha	372.03 and
BNT 5%	40,52

Note: Numbers accompanied by the same letter in the same column is not significantly different in the 5% BNT Test

Table 3 shows that increasing the use of compound fertilizer doses tends to be followed by an increase in the wet weight of mustard plants. The smallest plant wet weight tends to be shown without fertilizer treatment (125.90 gram) and statistically different from the treatment of other NPK compound fertilizers. The highest plant wet weight tended to be achieved by the treatment using NPK compound fertilizer 350 kg/Ha (372.03 grams), although statistically it was not significantly different from the treatment using NPK compound fertilizer 300 kg/Ha (364.22 grams) and the treatment using NPK compound fertilizer. 250 kg/Ha (351.43 grams).

From the results of measurements and statistical analysis on all observed variables, including: length, plant length, number of leaves and fresh weight of plants showed a significant effect with the F test (5%) due to the use of NPK compound fertilizer doses. This proves that there are enormous benefits and the importance of macro elements (NPK) for the growth and yield of mustard greens. The use of NPK compound fertilizer will increase the availability of nitrogen, phosphorus and potassium which is quite large in the soil, so that the needs of plants for growth and development can also be fulfilled. The function of nitrogen as fertilizer is to improve

Vol. 6 No. 1 September 2022
ISSN : 2597 - 8713 (ONLINE)
ISSN : 2598 - 5167 (PRINT)
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

vegetative growth of plants and help the process of protein formation. deficiencyphosphorus causing plant growthslow, weak and stunted. The nutrient element potassium, functions in the formation of sugar and starch, protein synthesis, a catalyst for enzymatic reactions and plays a role in the growth of meristem tissue, thereby increasing plant resistance to disease and improving yield quality (Ali, 2015)

In the smallest significant difference test (5% BNT).between the treatment of using NPK compound fertilizer doses tended to show statistically significant differences. Lowest growth and yields always tend to show treatment without NPK compound fertilizer and this was significantly different from the treatment using NPK compound fertilizer. An increase in the use of NPK compound fertilizer doses tends to always be followed by an increase in all plant observation variables, although effective (effective) doses of NPK compound fertilizer use tend to be shown in the treatment of NPK compound fertilizer doses of 250 kg per hectare. It is presumed that the dose of NPK compound fertilizer used has met the optimum requirement for plant growth and yield. The results of this study are in accordance with the research of Daud Saribun (2008) which showed that the application of NPK compound fertilizer at a dose of 300 grams per plot or300 kg per hectare (4 grams of NPK per plant) was able to increase the highest yields of mustard greens (Brassica Juncea L.) and as the best result obtained a plant weight of 8.22 kg per plot equivalent to 6.85 tonnes per hectare.

4. CONCLUSIONS

Based on the results of observations and discussion of research on the effectiveness of using NPK compound fertilizer on the growth and yield of mustard greens (Brassica juncea L), it can be concluded as follows, There was a significant effect on the observed variable plant length, number of leaves and fresh weight of Mustard plants due to the use of NPK compound fertilizer and Effective (effective) doses in the use of NPK compound fertilizer during growth and yield of Mustard plants tended to be achieved in the NPK fertilizer dose of 250 kg per hectare, although the highest growth and yield tended to be shown in the NPK compound fertilizer dose treatment of 350 kg per hectare followed by the NPK fertilizer dose treatment 300 kg per hectare.

REFERENCES

Ali, M. (2015). EFFECT OF NPK FERTILIZER DOSAGE ON CAPSAICIN PRODUCTION AND CONTENT IN FRUITS OF CHILLI PLANTS (Capsicum frutescens L.).*JOURNAL OF AGROSAINS: CREATIVE AND INNOVATIVE WORKS*, *2*(2), 171–178.

Anggraeni , A. Y. , Raksun , A. , & Mertha , I. G. (2022).The Effect of Vermicompost and NPK Fertilizer on the Growth of Green Mustard (Brassica Juncea L.). *Journal of Tropical Biology*, *22*(2), 525–533.

ISSN : 2597 - 8713 (ONLINE)
ISSN : 2598 - 5167 (PRINT)

Gunawan, R., Kusmiadi, R., & Prasetiyono, E. (2015). Study on the utilization of mustard greens organic waste (Brassica juncea L.) and blue swimming crab waste (Portunus pelagicus) for the manufacture of liquid organic compost.*Enviagro: Journal of Agriculture and the Environment*, *8*(1), 37–47.

Hartati, S., Winarno, J., & Novarizki, G. (2012). Status of Ca, Mg, and S Nutrients as Basis for Fertilizing Peanut Plants (Arachis Hypogaea L.) in Punung District, Pacitan Regency.*Sains Tanah-Journal of Soil Science and Agroclimatology*, *9*(2), 108–121.

Ngantung, J. A. B., Rondonuwu, J. J., & Kawulusan, R. I. (2018). The response of green mustard plants (Brassica juncea L.) to the application of organic and inorganic fertilizers in Rurukan Village, East Tomohon District.*Eugenia*, *24*(1).

Putra, S. (2012). Effect of single, compound and foliar NPK fertilizers on increasing production of Situ Patenggang upland rice variety.*Agrotrope. West Java Agricultural Technology Study Center*, *2*(1), 55–61.

Rizka, S. (2022). Analysis of the Feasibility Analysis of Hydroponic Mustard Greens Business in Kambu District, Kendari City.*Agribusiness Management: Journal of Agribusiness*, *22*(2), 123–132.

Sari, R. P., Chaniago, I., & Syarif, Z. (2020). Banana Peel Liquid Organic Fertilizer to Increase Growth and Yield of Strawberry (Fragaria vesca L.).*Gem Agro*, *25*(1), 38–43.

Situmorang, T. S., & Alamsyah, Z. (2015). Analysis of marketing efficiency of sweet mustard greens using the structure, conduct, and performance (SCP) approach in South Jambi District, Jambi City.*Scientific Journal of Socio-Economics of Business*, *18*(2).

Susila, W. R. (2005). Opportunities for oil palm development in Indonesia: Long-term perspective 2025.*SOCA: Agricultural Socioeconomic Journal*, *6*(3), 44004.

Sari, I. P., Hidayati, S., Ali, M., & Purwanti, S. (2020). Application of Urban Waste Organic Fertilizer on the Growth of Mustard Plants (Brassica Juncea L.). *Agricultural Science*, *4*(1), 74–84.

Tando, E. (2019). Efforts to increase efficiency and increase the availability of nitrogen in the soil and nitrogen uptake in lowland rice (Oryza sativa L.).*Continent of Science*, *18*(2), 171–180.