

Analysis of growth And Plantbaby Kai-Lan(*Brassicaalboglabra L.*)The Use of Various Doses of Fertilizer Urea

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ABSTRACT

One important factor in cultivation that supports the success of plant life is the problem of fertilization. A common problem that occurs in fertilization is the low efficiency of nutrient uptake by plants. The efficiency of fertilizing nitrogen (N) and potassium (K) is relatively low, ranging from 30-40%. The efficiency of phosphorus (P) fertilization by plants is also low, around 15-20% (Rukmana, 2002). Efforts to improve the efficiency of fertilizer use can be pursued through the principle of the right type, the right dose, the right way, the right time of application and balanced according to the needs of plants (Syafuruddin et al, 2009). The purpose of this study was to determine the extent to which the effectiveness (appropriate) use of urea fertilizer (nitrogen sources) on plant growth and yield Baby Kailan (*Brassica alboglabra L.*). The study was conducted in the Experimental Garden of the Faculty of Agriculture, Merdeka University Surabaya, on Jalan Ketintang Madya VII-2 Surabaya, East Java with a height of ± 5 m above sea level, carried out from March to April 2019. This study used a Randomized Group Design (RBD) consisting six (6) treatments with three (3) replications and two (2) sample plants. As for the treatment given, namely the dose of urea fertilizer consisting of six (6) doses, namely: A = No Urea Fertilizer (Control); B = 75 kg / ha Urea Fertilizer (0.15 gram per plant); C = Urea fertilizer 150 kg / ha (0.30 gram per plant); D = Urea Fertilizer 225 kg / Ha (0.45 gram per plant); E = Urea fertilizer 300 kg / ha (0.60 gram per plant); F = Urea Fertilizer 375 kg / Ha (0.75 gram per plant) The results of the study show that the use of urea fertilizer has a very significant effect on the variable plant length, number of leaves and the wet weight of baby kailan plants. Effective (appropriate) dosage in the use of urea fertilizer during growth and yield of baby kailan plants tends to be achieved with urea fertilizer dosages of 300 kg per hectare (0.60 gram per plant), although the highest growth and yield tends to be indicated by urea fertilizer dosages 375 kg per hectares (0.75 grams per plant), because statistically (LSD 5%) between the two treatments the dose of urea fertilizer was not significantly different.

Keywords: Dosage, Urea Fertilizer, Baby Kailan

1. INTRODUCTION

Vegetables are one of the most important food ingredients in fulfilling community nutrition. The World Food and Agriculture Organization (FAO) recommends vegetable consumption of 75 kg / capita / year. That number higher than Indonesian people's vegetable consumption of 35 kg / capita / year. So there will be an increase in demand for vegetable consumption by 45 kg / capita / year. In addition, the demand for these commodities continues to increase with increasing population and vegetable consumption per capita in Indonesia. Thus vegetables become one of the commodities whose production must be increased.

Kailan (*Brassica oleracea* var. *Alboglabra*) is a type of vegetable from the cabbage family (*Brassicaceae*). These vegetables began to enter Indonesia in the 17th century and are thought to originate from China. The nutritional content and delicious taste, make kailan become one of the

agricultural products that are in demand by the community (Hariyadi, Ali, & Pratiwi, 2018). In addition, high demand from supermarkets, hotels and restaurants also increases the economic value of kailan. At present high demand cannot be balanced with a maximum and stable production (Lingga, 2010).

Kailan (*Brassica albolglabra* L.) is a type of leaf vegetable that contains many vitamins and minerals needed by the human body. Kailan is consumed in fresh form as well as in the form of cooking. The content of vitamins and minerals contained in 100 grams of material contains 7540 IU of vitamin A, 115 mg of vitamin C, and 62 mg of Ca, 2.2 mg of Fe. (Siemonsma and Piluek 1994). The need for kailan vegetables tends to continue to increase in line with the increasing public awareness of the importance of nutrition and the many restaurants that serve kailan as one of their menus. Baby kailan production in Indonesia can reach 500,000 - 600,000 kg per hectare (Sutanto, 2002). Although the price of kailan vegetables is relatively cheap, if it is cultivated intensively and oriented towards agribusiness, it will provide substantial benefits for farmers. Kailan marketing opportunities are increasingly widespread, because not only can be sold in local markets in the area, but also has been widely ordered by supermarkets (Pratiwi, Ali, Setiawan, Budiyanto, & Sucahyo, 2017). The entry of kailan vegetables into supermarkets will increase the selling price of these vegetables (Susila, 2006). The increasing demand for vegetables, of course needs to be balanced with increased production. One of the important production factors in intensive cultivation is the problem of fertilizer and fertilization. The low efficiency of nutrient uptake by plants on nitrogen and calcium fertilizers ranges from 30-40%, and 15-20% for phosphorus fertilizer (Sri Adiningsih, 1995).

Plants are not enough just to rely on nutrients from the soil. Therefore, plants need to be given additional nutrients from the outside, namely in the form of fertilizer (Prihantoro, 2001). Efforts to increase the efficiency of fertilizer use can be pursued through the principle of the right dose, the right way, the right time of application and balanced according to the needs of plants (Syafuruddin et al, 2009). Furthermore according to Wahyono (2012) emphasized, that fertilizer is an ingredient and food substance that is given or added to plants with the intention of increasing food nutrients for the soil. There are two kinds of fertilizers, namely artificial fertilizers and natural fertilizers. Lack of knowledge of farmers about the type and amount of fertilizer doses needed by plants, is also a problem, which results in a low increase in production of large unity plants (Lingga and Marsono, 2007).

Vegetable cultivation, especially kailan, requires a good and regular fertilization program. Urea fertilizer is a chemical fertilizer that contains high levels of Nitrogen (N). Urea fertilizer in the form of white crystal grains is a fertilizer that dissolves easily in water and is very easy to suck

water. Urea fertilizer which is sold in the market usually contains nutrients Nitrogen (N) of 46% with the understanding that every 100 kg of Urea contains 46 kg of Nitrogen (Rukmana, 2005).

Leaf vegetable crops such as mustard greens, kailan, spinach, kale, broccoli, cabbage etc. are quite easy to cultivate and are responsive to environmental changes and fertilizer application. This is in accordance with the opinion of Mahajoeno (2010) which states, that mustard plants need a sufficient intake of nutrients N, P and K to support its growth.

The results of Harin Eki Prमितasari, Tatik Wardiyati and Mochammad Nawawi (2016) research showed that there was no real interaction between the treatment of nitrogen fertilizer doses with the level of plant density on the growth and yield of baby kailan plants. For all growth variables and yield components except the number of leaves, stem diameter, leaf area, and harvest index. The treatment dose of nitrogen fertilizer N5 (126.5 kg N per hectare) gave the highest yield compared to all treatments of nitrogen fertilizer dosage. At the time of harvest, the treatment of plant density level P2 (30 plants per m²) gives a yield of fresh total plant weight and the consumption weight of baby kailan plants is higher than P1 (25 plants per m²).

Giving urea fertilizer at a dose of 300 kg per hectare (approximately 1.5 grams of urea fertilizer per plant) is able to increase the yield of mustard plants (*Brassica Juncea L.*) the highest and as the best results obtained plant weight 8.22 kg per plot equivalent to 6, 85 tons per hectare (Daud Saribun, 2008).

Furthermore, the results of research by Pristianingsih Sarif, Abdul Hadid and Imam Wahyudi (2015) stated that urea fertilizer application with a dose of 200 kg / ha had a very significant effect on plant height growth, number of leaves and yield of mustard plants fresh weight and dry weight and the best dose of urea fertilizer for mustard (plant *Brassica Juncea L.*) is at a dose of 200 kg / ha. Based on the description and explanation, the basic fertilization researches, especially on the type, time, method and dosage of fertilizer use need to be done in the hope that appropriate (effective) and profitable (efficient) fertilization will be achieved, especially in vegetable crops.

2. RESEARCH METHODS

The study was conducted in the Experimental Garden of the Faculty of Agriculture, Merdeka University Surabaya, on Jalan Ketintang Madya VII-2 Surabaya, East Java with a height of ± 5 meters above sea level. The research was carried out in March-April 2019. The materials used in this study include: planting soil, urea prill fertilizer, Baby Kailan seeds. While the tools used include hoes, poppers, knives, polybags (5 kg media size), labels, ruler gauges, stationery, weight gauges (house scales and electric scales) and other laboratory equipment.

This study used a Randomized Block Design (RCBD) consisting of six (6) treatments with three (3) replications and two (2) sample plants. As for the treatment given, namely the dose of urea fertilizer consisting of six (6) doses, namely: A = No Urea Fertilizer (Control); B = 75 kg / ha Urea Fertilizer (0.15 gram per plant); C = Urea fertilizer 150 kg / ha (0.30 gram per plant); D = Urea Fertilizer 225 kg / Ha (0.45 gram per plant); E = Urea fertilizer 300 kg / ha (0.60 gram per plant); F = Urea Fertilizer 375 kg / Ha (0.75 gram per plant).

According to Adji Sastrosupadi (1999) and Bambang Wicaksono Hariyadi (2017) to find out the effect of urea fertilizer on the growth and yield of baby kailan plants, the F test with a level of 5% is used, the Variance Analysis Test (ASR). If from the results of the F% Test there is a significant effect, then proceed with the T Test (The Smallest Significant Difference Test) with a level of 5% to determine the difference between the treatment of urea fertilizer doses, so that it can be known treatment the appropriate dosage (effective dose) and beneficial (efficient dosage).

3. RESULTS AND DISCUSSION

3.1 Research result

1. Plant Length The

Results of the analysis of variance show that the treatment of urea fertilizer use has a very significant effect on the observation of plant length during the growth of Baby Kailan plants, both 10 days, 20 days and 30 days after transplanting (Appendix Table 1).

Table 1. Average Length of Baby Kailan Plants Due to Use Various Doses of Urea Fertilizer at Different Age Observation

Treatment of Dose Urea Fertilizer	Average Plant Length (cm)		
	10 days	20 days	30 days
Without Urea Fertilizer	7.67 a	11.17 a	18.50 a
Urea Fertilizer 75 kg / Ha	8.00 a	13.50 b 13.50	b
Fertilizer Urea 150 kg / Ha	9.17 b	15.50 c	26.00 c
Urea Fertilizer 225 kg / Ha	9.50 b	16.17 c	27.17 c
Urea Fertilizer 300 kg / Ha	10.17 c	18.00 d	29 , 67 d
Urea Fertilizer 375 kg / Ha	10.50 c	18.67 d	30.00 d
BNT 5%	0.53	1.05	2.31

Description: Numbers accompanied by the same letter in

the same column was not significantly different in the BNT Test of 5%.

In Table 1. it shows that the increasing use of urea fertilizer will be followed by an increase in plant length during the growth of baby kailan plants. The shortest plant length tends to be shown treatment without urea fertilizer (18.50 cm) and statistically significantly different from the treatment using other doses of urea fertilizer. The longest baby kailan plants tended to be produced using 375 kg / ha (30.00 cm) urea fertilizer dosage, although statistically was not significantly different from the treatment using urea 300 kg / ha (29.67 cm). Then followed by the use of urea Urea fertilizer 225 kg / ha (27.17 cm) and 150 kg / ha (26.00 cm).

2. Number of Leaves

The results of the analysis of variance showed that the treatment of urea fertilizer use significantly affected the observation of the number of leaves during the growth of baby kailan plants, both at the age of 10 days, 20 days and 30 days after transplanting (Appendix Table 2).

Table 2. Average Number of Leaves Due to the Use of Various Doses Urea Fertilizer at Various Observations

Treatment of Dose Urea Fertilizer	Average Number of Leaves		
	10 days	20 days	30 days
Without Urea Fertilizer	3.10	a	9,13 a 15.87 a
Urea Fertilizer 75 kg / Ha	4.33 b	12.00 b	18.90 b
Urea Fertilizer 150 kg / Ha	4,50 b	13.33 b	19.33 b
225 kg Urea Fertilizer / Ha	5.83 c	15.67 c	21.44 c
300 kg Urea Fertilizer / Ha	5.94 c	17.67 d	23.67 d
Urea fertilizer 375 kg / ha	6.00 c	18.73 d	24.00 d
BNT 5%	0.47	1.73	2.30

Note: The numbers accompanied by the same letter in the same column was not significantly different in the 5% LSD Test

Table 2. shows that the increased use of urea fertilizer will be followed by an increase in the number of leaves during the growth of baby kailan plants. The smallest number of leaves tends to be shown treatment without urea fertilizer (15.87 strands) and statistically (BNT 5%) different from the treatment of other urea fertilizer doses, while the highest number of leaves tends to be achieved urea 375 kg / ha (24.00 strands) treatment), although not statistically significantly different from the treatment dose of urea fertilizer 300 kg / ha (23.67 strands).

3. Wet Wet Weight The

Results of the various analyzes showed that the treatment of urea fertilizer had a very significant effect on the observation of the wet weight of the baby kailan plant (Appendix Table 3).

Table 3. Average Wet Weight of Baby Kailan Plants Due to Use Various Dosages of Urea Fertilizers

Treatment Doses of Urea Fertilizer	Average Wet Crop Weight (grams)
Without Urea Fertilizer	143.55 a
Urea Fertilizer 75 kg / Ha	200.85 b
Urea Fertilizer 150 kg / Ha	223.95 b
Urea Fertilizer 225 kg / Ha	276.37 c
Urea fertilizer 300 kg / ha	338.07 d
Urea fertilizer 375 kg / ha	344.33 d
BNT 5%	38.59

Note: The numbers accompanied by the same letter in the same column was not significantly different in the 5% LSD Tes

Table 3. shows that the increased use of urea fertilizer tended to be followed by an increase in the wet weight of baby kailan plants. The smallest wet weight of plants tends to be shown treatment without urea fertilizer (143.55 grams) and statistically significantly different from other urea fertilizer use treatments. The highest wet weight of baby kailan plants tended to be achieved with the treatment of urea fertilizer use of 375 kg / ha (344.33 grams), although it was not statistically significantly different from the treatment using urea fertilizer dosage of 300 kg / ha (338.07 grams).

3. DISCUSSION

The results of measurement and statistical analysis on all observational variables, namely plant length, number of leaves and plant wet weight showed a very significant effect with the F Test (5%) due to the use of urea fertilizer doses. This proves that urea fertilizer (nitrogen element) has enormous benefits and its role for the growth and yield of baby kailan plants. The use of urea fertilizer will increase the availability of nitrogen which is quite large into the soil, so that the need for growth and development can be fulfilled as well. The function of nitrogen as fertilizer is to

improve vegetative growth of plants and assist the process of protein formation, as well as play a role in the growth of meristem tissue, thereby increasing plant resistance to disease and improving yield quality (Hardjowigeno, 2003 and Sutanto, 2006).

This is in accordance with the statement of Napitupulu and Winarto (2010) which states that nitrogen fertilizer is needed by plants to stimulate plant growth, especially stems, branches and leaves. Nitrogen fertilizer spurs leaves which acts as an indicator of plant growth in the process of photosynthesis. Even spread of light that can be received by the leaves causes an increase in the assimilation process that occurs, so that the accumulated assimilation results will be more, where the assimilation will be used as plant growth energy to form vegetative organs such as leaves and plant height.

Furthermore, Novik Kurnianti (2013) explained that **urea** fertilizer is a single inorganic fertilizer with a high N (nitrogen) element. Inorganic fertilizers are factory-made fertilizers, made from high levels of nutrient chemicals. So urea fertilizer is a synthetic fertilizer from inorganic compounds produced by factories using chemicals containing high levels of nitrogen (N).

In the smallest significant difference test (LSD 5%) the difference between treatments using urea fertilizer dosages tends to show statistically significant differences. The lowest growth and yield of baby kailan plants, always shown treatment without urea fertilizer and statistically it is always significantly different from the treatment using other doses of urea fertilizer. Increasing the use of urea fertilizer tends to always be followed by an increase in the value of all plant observation variables, but the effective (effective) dose of using urea fertilizer tends to always be shown to be treated with urea fertilizer dosages of 300 kg per hectare (0.60 gram per plant). It is suspected, that the dose of urea fertilizer has been able to meet the optimum needs for growth and yield of baby kailan plants and statistically the dose of urea fertilizer of 300 kg per hectare (0.60 gram per plant) is not significantly different from the dose of urea fertilizer 375 kg per hectare (0.75 grams per plant).

This research reinforces the statement, that nitrogen functions as a chlorophyll maker that plays an important role in the process of photosynthesis. The higher the administration of nitrogen (up to its optimum limit), the amount of chlorophyll formed will increase (Adil *et al*, 2005). The increasing amount of chlorophyll causes the rate of photosynthesis to increase so that plant growth is faster and maximum. The result of these photosynthesis is used for plant organs, where the greater the plant organs formed, the more water content that can be bound by plants (Koryati, 2004). Besides that, the higher plant height and leaf area, the fresh weight of the kailan plant also increases. This agrees with Prasetya (2009) which states, that the fresh weight of a plant is influenced by plant height and leaf area, the higher and greater the leaf area, the higher the fresh weight of the plant.

Likewise, according to Gardner *et.al.*(1991), that nitrogen fertilizer significantly affected leaf expansion, especially on the width and width of the leaves, this affected the fresh weight and total dry weight per plant.

This study is also in accordance with the research of Daud Saribun (2008) which shows that the administration of urea fertilizer 300 kg per hectare (approximately 1.5 grams of urea fertilizer per plant) is able to increase theyield of mustard (*Brassica Juncea L.*highest) and as a result the best plant weight obtained 8.22 kg per plot equivalent to 6.85 tons per hectare. Furthermore, the results of Harin Eki Pramitasari, Tatik Wardiyati and Mochammad Nawawi (2016) research showed that there was no real interaction between the treatment of nitrogen fertilizer doses with the level of plant density on the growth and yield of baby kailan plants. For all growth variables and yield components except the number of leaves, stem diameter, leaf area, and harvest index(Purwanti, Hidayati, & Nurlina, 2017). The treatment dose of nitrogen fertilizer N5 (126.5 kg N per hectare) gave the highest yield compared to all treatments of nitrogen fertilizer dosage. At the time of harvest, the treatment of plant density level P2 (30 plants per m²) gives a yield of fresh total plant weight and the consumption weight of baby kailan plants is higher than P1 (25 plants per m²).

The application of 110 kg urea / ha urea inorganic fertilizer and 5 tons / ha organic fertilizer produced 16.49 tons / ha total fresh baby kailan and could increase 32.13% fresh weight, compared to 10 tons / ha of organic fertilizer treatment. produce fresh weights of 12.48 tons / ha. In this treatment prove, that there is a reduction in urea fertilizer by 50% (inorganic fertilizer) with the addition of 5.0 tons / ha of organic fertilizer in the form of cow manure (Putri Bella Puspita, Sitawati and Mudji Santoso, 2014). While the results of research by Rukmana (1986) *in* Mira (2004) stated that to obtain high mustard yields, nitrogen fertilizer 125 kg per hectare is equivalent to 250 kg urea per hectare, in addition to TSP and KCL.

Roesmarkan and Yuwono (2002) explained that urea is one type of nitrogen fertilizer. The benefits of nitrogen fertilizer for plants are huge, because the nitrogen element plays an important role in plant growth. Nitrogen-deficient plants cannot grow optimally so that the growth process will be hampered. If plant growth is inhibited it will certainly inhibit the flowering process and fruiting as well (the process of reproduction). Suboptimal flower production will result in fruit production as well, eventually the agricultural products produced are very low or even unable to produce fruit at all. In this case the level of urgency of nitrogen fertilizer for plants is very high. Besides the growth phase (vegetative phase), the nitrogen element is also needed during the generative phase (flowering and fruiting) along with other elements, such as the macro elements P (phosphorus) and K (potassium), even though the requirements are not as much as in the vegetative

phase. So the element nitrogen (N) is absolutely necessary during the process of plant growth. Plants with nitrogen deficiency growth require the addition of high nitrogen content fertilizer, so the addition of urea can be used to meet these deficiencies. Furthermore Hardjowigeno (2003) explains, that the main function of urea fertilizer is to meet the needs of plant nitrogen, because the benefits of nitrogen are very large to carry out the process of plant growth, in this case the nitrogen contained in urea.

4. CONCLUSION

The use of urea fertilizer has a very significant effect on the variable length of plants, number of leaves and wet weight of baby kailan plants. Effective (appropriate) dosage in the use of urea fertilizer during growth and yield of baby kailan plants tends to be achieved with urea fertilizer dosages of 300 kg per hectare (0.60 gram per plant), although the highest growth and yield tends to be indicated by urea fertilizer dosages 375 kg per hectares (0.75 grams per plant), because statistically (LSD 5%) between the two treatments the dose of urea fertilizer was not significantly different.

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