THE EFFECT OF COW MANURE AND UREA FERTILIZER APPLICATION ON THE GROWTH

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ABSTRACT

This study aims to assess how the application of cow manure and urea fertilizer affects the increase in production yields and maximum plant growth. This study was conducted at the Medan City Food Security Office, Jl. Kramat Indah / Selambo Ujung, from May to August 2023. This research method applied an experimental design with a randomized block factorial (RBD) involving two treatment factors. The first factor, denoted as "S," had three different levels: (S1) 1 kg/plot, (S2) 2 kg/plot, and (S3) 3 kg/plot. The second factor was urea fertilizer, denoted as "U," with three different levels: (U1) 30 g/plot, (U2) 40 g/plot, and (U3) 50 g/plot. This resulted in a total of nine treatment combinations, each of which was replicated three times. The observational data were then analyzed using analysis of variance with the F test at a significance level of 5%. If there were significant differences, further testing was carried out using the Duncan test. The results of the research and analysis concluded several main points: 1. Application of cow manure did not have a significant impact on plant height, number of leaves, number of flowers, number of pods, and pod weight of green bean plants (Phaseolus vulgaris L.). 2. Application of urea fertilizer had a significant impact on plant height, but did not significantly affect the number of leaves. Application of urea fertilizer had a significant impact on the number of flowers, number of pods, and pod weight of green bean plants (Phaseolus vulgaris L.). In addition, when cow manure was used together with urea fertilizer, it also significantly affected plant height, number of flowers, number of pods, and pod weight. However, it is important to note that there was no significant effect of this interaction on the number of leaves in green bean plants (Phaseolus vulgaris L.).

Say key : *Cow Manure, Urea Fertilizer and Green Beans*

1. INTRODUCTION

Green beans (Phaseolus vulgaris L.) are a popular legume vegetable in Indonesia and offer promising market opportunities for both sellers and consumers. Green beans are a rich source of vegetable protein, rich in vitamins A, B, and C. The protein content in green beans ranges from 20-28%, and has a caloric value of around 31 kcal/100 grams, as reported in a 2013 study by Handayani. According to a study by Duaja and colleagues in the same year, green beans are known to contain more than 35.1% vegetable protein (Ristianah et al., 2024).

The production of green beans in North Sumatra has increased starting from 2017 reaching 29,434 tons. In 2018, production reached 24,832 tons, followed by 28,674 tons in 2019, then increased to 36,597 tons in 2020, and reached 49,856 tons in 2021. However, in 2022, there was a decrease in production to 46,858 tons. with unknown problems, therefore researchers conducted research, so that the value of green bean vegetable production in North Sumatra could increase again and the community's needs could be met (BPS, 2022).

One way to increase bean yields is to ensure adequate nutrient supply throughout their growth through proper fertilization. Organic farming, also known as Organic Farming, is a farming method

that aims to maintain soil fertility and plant growth by managing soil and plants using natural or organic materials as sources of information, and avoiding the use of artificial fertilizers and pesticides, unless recommended or necessary (Munir et al., 2025).

In developing and implementing organic farming systems, farmers face a number of challenges and issues. One of these is the relatively low productivity of organic farming. This discourages farmers from switching to organic farming, especially in the absence of attractive pricing incentives for natural products. Furthermore, the supplement content of natural ingredients is generally very low, necessitating the use of larger quantities to meet plant nutritional needs.

The application of natural compost is an act of adding supplements and improving the actual properties of manure. Utilizing natural compost can help soil processing using animal waste or cow manure. An adult cow can produce approximately 23.59 kg of compost per day containing the elements N, P, and K. In addition to these large-scale elements, manure from cow compost can also produce various mini nutrients such as Fe, Zn, Bo, Mn, Cu, and Mo. Therefore, this manure can be considered an alternative fertilizer choice that supports crop productivity per hectare, as mentioned in research by Djazuli and Ismunadji in 1983.

The use of organic materials is one of the techniques applied in organic farming. As stated by Novizan in 2004, this organic material refers to compost derived from a combination of animal waste, food waste, and urine containing nutrients such as N, P, and K, which are useful for increasing soil fertility. Furthermore, Winarso in 2005 stated that the use of natural materials can further improve soil structure, water retention limits, and organic movement within the soil. The determination of the type of natural material can be based on its nutritional content. Cow manure prioritizes supplement content over chicken manure, making it a more profitable choice. Furthermore, cow manure waste is available in abundant quantities, so in this study, organic material from locally available cow manure will be used, in accordance with the principle emphasized by Sutanto in 2002, that organic farming always utilizes available local resources.

Urea fertilizer is a favorite among Indonesian farmers due to its affordability and its immediate visible impact on plant growth after application. Urea fertilizer offers several benefits in enhancing bean plant growth, including the following:

1. Giving urea fertilizer causes plant leaves to become greener and fresher, and increases the content of green leaf granules (chlorophyll) which has a key role in the photosynthesis process.
2. Urea fertilizer contains protein which is useful for plant growth.
3. Urea manure can be used in various types of plants, including food crops, green plants, plantation crops, livestock organizations, and fisheries organizations.

A mixture of inorganic fertilizer and natural compost significantly impacts the growth and yield of legume plants. This is because regular compost application can improve the soil's ability to utilize nutrients, increase its water retention capacity, and activate microorganisms within the soil. By considering the physical, compound, and organic properties of the soil, soil fertility can be improved (as Susanto stated in 2006 in research led by Lestari in 2013).

Plants require adequate nitrogen. Providing the right amount of nitrogen can enhance plant growth, increase protein synthesis, produce chlorophyll, resulting in greener leaves, and optimize root development. Therefore, proper nitrogen measurements can increase plant growth rates, according to research led by Nur and Thohari in 2005.

Based on the context that has been presented, the researcher attempted to

combine the effect of providing organic fertilizer in the form of cow dung with inorganic fertilizer, namely urea fertilizer, on the development and yield of bean plants.

2. REVIEW LIBRARY

The bean (Phaseolus vulgaris L.) is a member of the Leguminosae family and is an annual plant with a shrub-like growth pattern. Bean plants have two distinct growth variants: climbing and upright. These two types require different management practices, requiring staking and non-staking. Upright bean plants generally grow no more than 60 cm tall. This contrasts with climbing bean plants, which grow 2-3 m and require trellises for cultivation. (Amin, 2014) .

Bean plants consist of roots, stems, flowers, leaves, fruit, and seeds . To ensure high productivity, bean plants must consider climatic conditions, including sunlight, air temperature, humidity, rainfall, and wind. The recommended fertilizer dosage is 15 tons of cow manure per hectare, 250 kg of TSP (Triple Super Phosphate) per hectare, and 250 kg of KCL (Potassium Chloride) per hectare as base fertilizer. Additional compost can be given by adding manure to a 10 cm deep hole around the plant, and then covering the hole with soil .

Natural compost has several benefits, including its ability to develop soil structure, increase the soil's ability to retain water, increase the presence of microorganisms in the soil, and can be a food source for plants (as stated by Lingga and Marsono in 2002). . The element nitrogen, which is often taken from chemical fertilizers in the form of urea, or from organic fertilizers derived from animal waste such as cows, goats, and chickens, is the main source of this nutrient. Urea pollution is hygroscopic, making it a powerful absorber of water waste. Urea's advantages include its high nitrogen content, at 46%, its rapid decomposition in water, its easy uptake by plants, and its relatively affordable price compared to other types of nitrogen fertilizers (according to research by Supriyadi and Kardawati in 2017).

3. IMPLEMENTATION METHOD

In this study, a research approach was used using a factorial Randomized Block Design (RAK) involving two factors. The first is the treatment of cow manure fertilizer dosage (S) consisting of 3 levels . The second factor is inorganic UREA (U) consisting of 3 levels of dosage . The research was conducted on the land of the Medan City Food Crops and Fisheries Service. Jln. Keramat Indah No. 4, Medan Denai District, from May to August 2023. The materials used in this study were export quality bean seeds (upright beans), organic fertilizer (cow dung), inorganic fertilizer (urea) and soil. The tools used in this research were hoes, scales, buckets, meters, bamboo, rope, plywood, nails, rulers, stationery or books. After collecting data from this study, data analysis will be conducted using a factorial Randomized Block Design (RBD) Experimental Design . If the treatment results in this study show a significant effect in the analysis of variance, the next step is to conduct a mean comparison test and evaluate the response curve .

4. RESEARCH RESULT

Plant Height (cm)

Information regarding the height of green bean plants one and a half months after planting and the results of the differences are recorded in Appendix 4-9. Based on the change test, it was found that the use of cow compost and urea fertilizer did not significantly affect plant quality one month after planting. However, in the fifth week after planting, the use of urea fertilizer significantly affected plant quality. Meanwhile, approximately one and a half months after planting, the application of cow manure significantly affected plant growth.

The effect of cow manure and urea fertilizer on the height of bean plants (in

centimeters) from one week after planting (WAP) to six weeks after planting can be found in Table 3.

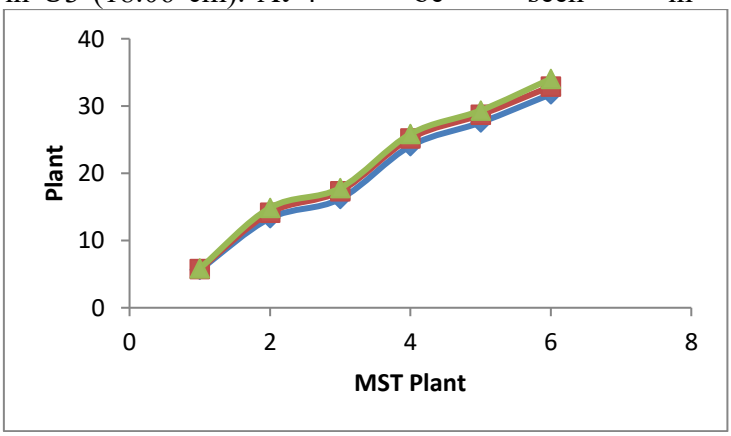
Table 1. Results of the Difference Test for Average Plant Height (cm) for Cow Manure (S) and Urea Fertilizer (U) Treatments at Plant Ages 1 to 6 MST.

Treatment	Plant Height (cm)					
	1 MST	2 MST	3MST	4 MST	5 MST	6 MST
S1	5.65	13.31 a	16.20 a	24.05 a	27.55 a	31.75 a
S2	5.76	14.14 b	17.35 b	25.20 b	28.70 b	32.90 b
S3	5.84	14.86 b	17.80 b	25.84 b	29.34 b	34.04 b
U1	5.69	12.89 a	16.03 a	23.08 a	26.58 a	30.78 a
U2	5.67	14.64 b	17.26 b	25.64 b	29.14 b	33.34 b
U3	5.89	14.79 c	18.06 b	26.37 c	29.87 b	34.57 c

Description: Numbers followed by the same letter in the same column mean no difference with the DMRT test at the 5% level.

From the table above, it can be seen that at the age of 1 year of planting (WAP), the most significant plant growth occurred in the treatment of cow manure (S), especially in S3 (plant height reached 5.84 cm), while in the treatment of urea fertilizer (U), the highest average plant height was recorded at U3 (5.89 cm). At the age of 2 years WAP, the most striking plant growth was also seen in the treatment of cow manure (S), especially in S3 (14.86 cm), while in the treatment of urea fertilizer (U), the highest average plant height was found in U3 (14.79 cm). At the age of 3 WAP, the largest average plant height was recorded in the treatment of cow manure (S), especially in S3 (17.80 cm), while in the treatment of urea fertilizer (U), the highest average plant height was found in U3 (18.06 cm). At 4 WAP, the highest plant height was achieved in the cow manure (S) treatment, especially in S3 (25.84 cm), while in the urea (U) treatment, the highest average plant height was recorded in U3 (26.37 cm). At 5 WAP, the highest plant height was also found in the cow manure (S) treatment, especially in S3 (29.34 cm), while in the urea (U) treatment, the highest average plant height was found in U3 (29.87 cm). At 6 WAP, the highest plant height was achieved in the cow manure (S) treatment, especially in S3 (34.04 cm), while in the urea (U) treatment, the largest average plant height was recorded in U3 (34.57 cm).

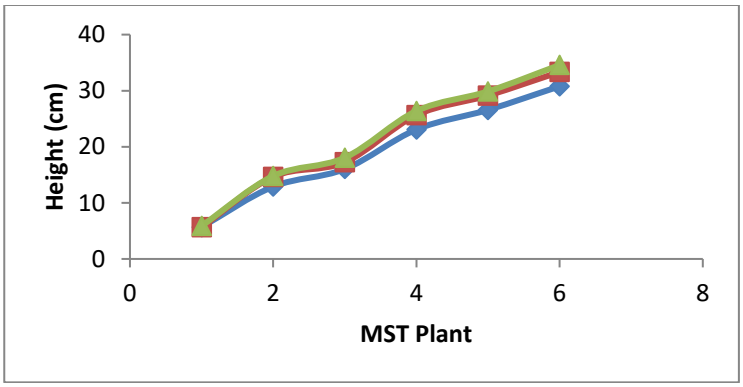
The development of plant height (cm) at the age of 1 to 6 MST in the treatment of providing cow manure (S) can be seen in Figure 1.



Gambar 1 Plant Height Development (cm) in Cow Manure Fertilizer Treatment (S) at 1 – 6 WAP

Figure 1 shows that plant height growth in the cow manure treatment increased simultaneously from 1 to 3 weeks after planting, with less pronounced growth. At 3-6 weeks after planting, the plants experienced very rapid growth. The cow manure treatment (S) achieved the highest growth rate at 6 weeks after planting, namely treatment S3 (34.04 cm), with the lowest growth rate being obtained in treatment S1 (31.75 cm).

The development of plant height (cm) at the age of 1 to 6 MST in the treatment of urea (U) fertilizer can be seen in Figure 2.



Gambar 2 Plant Height Development (cm) in Urea Fertilizer Treatment (U) at 1 – 6 WAP

Figure 2 shows that plant height growth in the Urea fertilizer treatment increased simultaneously from 1 to 3 weeks after planting, with less pronounced growth. At 3-6 weeks after planting, the plants experienced very rapid growth. The highest value was obtained in the U3 treatment (34.57 cm) at 6 weeks after planting, with the lowest value being in the U1 treatment (30.78 cm).

Number of leaves (blades)

Data on the number of leaves in green bean plants at 2 and 4 weeks after planting (WAP), along with the results of the difference analysis, can be found in appendices 4-9. The results of the fluctuation test showed that the use of cow compost and urea fertilizer did not significantly impact the number of leaves in green bean plants.

The effect of providing cow manure and urea fertilizer on the number of bean leaves (strands) at 2 and 4 weeks post-planting can be seen in Table 1.

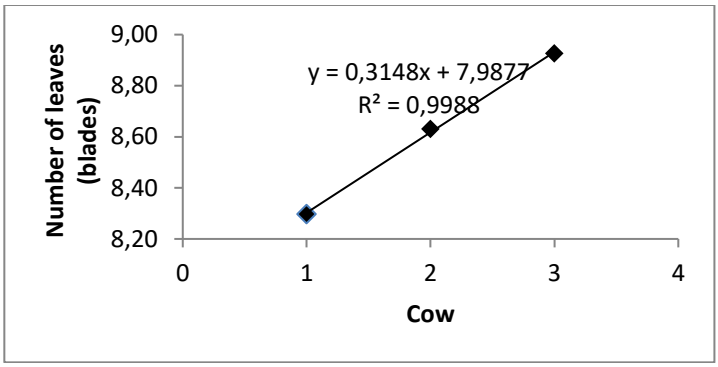
Table 2. Results of the Difference Test for the Average Number of Leaves (strands) for the Treatment of Cow Manure (S) and Urea Fertilizer (U) at Plant Ages 2 and 4 Weeks After Planting

Treatment	Number of leaves (blades)	
	2 MST	4 MST
S1	4.11	8.30
S2	4.33	8.63
S3	4.33	8.93
U1	4.19	8.52
U2	4.26	8.56
U3	4.33	8.78

Description: Numbers followed by the same letter in the same column mean no difference with the DMRT test at the 5% level.

From the table above, it can be seen that the number of normal plant leaves at the age of 2 years MST obtained the largest value in the treatment of giving cow compost (S), namely S3 (4.33 pieces), and S2 (4.33 pieces). pieces) while for the treatment of giving urea manure (U) The highest average plant content was obtained in the U3 treatment (4.33 pieces). At the age of 4 years MST, the largest value obtained in the treatment of giving cow compost (S) was S3 (8.93 pieces), while for the treatment of giving urea fertilizer (U), the highest average plant content was obtained in U3. treatment (8.78 pieces).

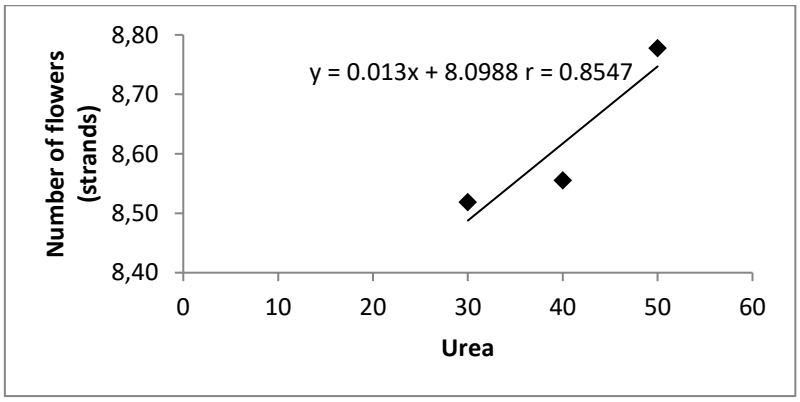
The number of leaves at the age of 4 weeks after planting in the treatment of cow manure (S) can be seen in Figure 3.



Gambar 3 Response Curve of Number of Leaves (strands) in Cow Manure Fertilizer Treatment (S) at 4 MST

Figure 3 shows that cow manure utilization significantly affects the number of leaves (leaflets) in legume plants. The higher the proportion of cow manure, the higher the number of leaves on the bean plants. In the cow manure compost treatment (S), the highest increase in leaves was found in treatment S3 (8.93 leaves), while the lowest score was achieved in treatment S1 (8.30 leaves).

The number of leaves at 4 MST in the urea(U) fertilizer treatment can be seen in Figure 4 .



Gambar 4 Response Curve of Number of Leaves (strands) in Urea Fertilizer Treatment (U) at 4 WAP

Figure 4 shows that urea fertilizer application significantly impacts the number of leaves in legume plants. The higher the proportion of urea compost applied, the greater the number of leaves in the bean plants. The highest value for urea fertilizer (U) was achieved in treatment U3 (8.78 leaves), while the lowest value was achieved in treatment U1 (8.52 leaves).

Number of Flowers (strands)

Information regarding the number of flowers on mature green beans at 2 and 4 weeks after planting, as well as an overview of the differences, can be found in References sections 4-9. The fluctuations indicate that the application of cow dung and urea fertilizer had little effect on the treatment mixture. For the treatment, cow dung significantly affected the number of flowers. However, the urea fertilizer treatment significantly affected the number of flowers.

The effect of providing cow manure and urea fertilizer on the number of bean flowers at 4 weeks after planting can be seen in Table 1.

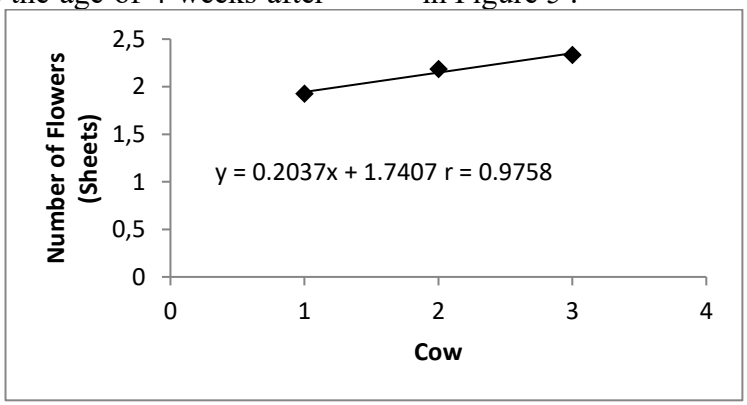
Tabel.3 Results of the Difference Test for the Average Number of Flowers (strands) for the Treatment of Cow Manure (S) and Urea Fertilizer (U) at Plant Age 4 Weeks After Planting

Treatment	Number of Flowers (strands)
	4 HSTP
Cow Manure Fertilizer (S)	
S1	1.93 a
S2	2.19 b
S3	2.33 b
Urea Fertilizer (U)	
U1	2.00 a
U2	2.04 ab
U3	2.41 c

Description: Numbers followed by the same letter in the same column mean no difference with the DMRT test at the 5% level.

From the table above, it can be seen that the average number of plant flowers at the age of 4 weeks after planting that obtained the largest value in the treatment of cow manure (S) was S3 (2.33 strands) , followed by the value of treatment S2 (2.19 strands) and the one that obtained the smallest value in the treatment of cow manure was treatment S1 (1.93 strands). At the age of 4 weeks after planting, the one that obtained the largest value in the treatment of Urea fertilizer (U) was U3 (2.41 strands) , followed by the value of treatment U2 (2.04 strands) and the one that obtained the smallest value in the treatment of urea fertilizer was treatment U1 (2.00 strands).

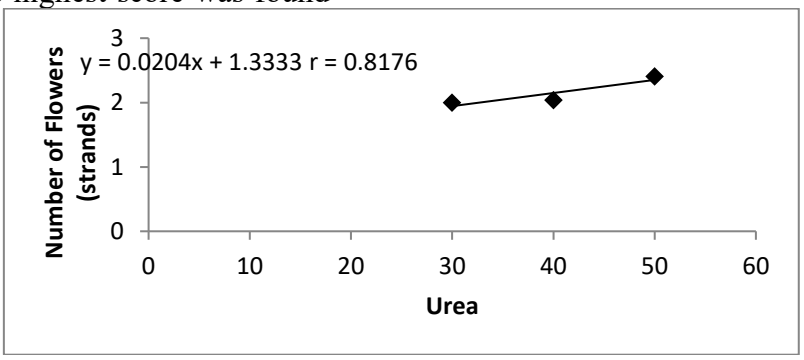
The number of flowers at 4 MST in the cow manure (S) treatment can be seen in Figure 5 .



Gambar 5 Response Curve of Number of Flowers (strands) in Cow Manure Fertilizer Treatment (S) at 4 MST

Figure 5 shows that the use of cow manure significantly affected the number of flowers (flowers) on vegetable plants. The higher the cow manure content, the higher the number of flowers on the legume plants. In the cow manure compost treatment (S), the highest score was found in treatment S3 (2.33 flowers), while the lowest score was in treatment S1 (1.93 flowers).

The number of flowers at 4 MST in the Urea (S) fertilizer treatment can be seen in Figure 6 .



Gambar 6 Response Curve of Number of Flowers (strands) in Urea Fertilizer Treatment (U) at 4 WAP

Figure 6 shows that the use of urea compost significantly affects the number of flowers (flowers) on legume plants. The higher the urea fertilizer dose, the higher the number of flowers on legume plants. The highest value for urea fertilizer (U) was achieved in the U3 treatment (2.41 flowers), while the lowest value was achieved in the U1 treatment (2.00 flowers).

Number of Pods Per Plant (fruit)

Information regarding the number of bean units at 6 WAP and an overview of the change testing can be found in Appendix 4-9. The fluctuations indicate that the application of cow manure and urea fertilizer had little effect on the treatment mixture. For treatment, the application of cow manure significantly affected the number of cases. However, the urea fertilizer treatment significantly affected the number of cases.

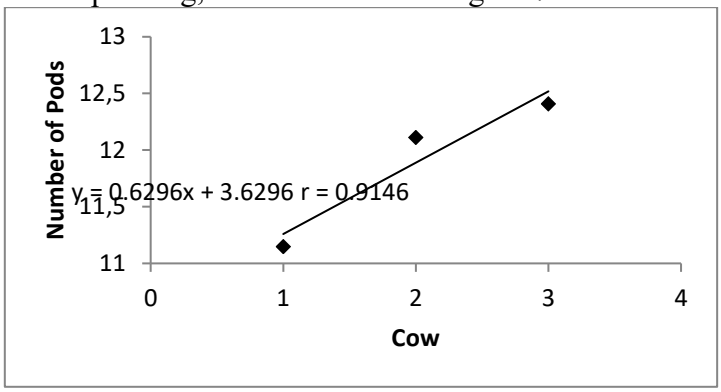
The impact of the application of cow manure and urea fertilizer on the number of bean pods at 6 weeks after planting (WAP) is shown in Table 4.

Tabel.6 Results of the Difference Test for the Average Number of Pods (Fruits) in the Treatment of Cow Manure (S) and Urea Fertilizer (U) at Plant Age 6 Weeks After Planting

Treatment	Number of pods
	6 HST
Cow Manure Fertilizer (S)	
S1	11.15 a
S2	12.11 b
S3	12.41 b
Urea Fertilizer (U)	
U1	9.52 a
U2	12.70 b
U3	13.44 c

From the table above, it can be seen that the average number of plant pods at the age of 6 weeks after planting that obtained the highest value in the treatment of cow manure (S) was S3 (12.41 pods) , followed by the value of treatment S2 (12.11 pods) and the one that obtained the smallest value in the treatment of cow manure was treatment S1 (11.15 pods). At the age of 6 weeks after planting, the one that obtained the largest value in the treatment of Urea fertilizer (U) was U3 (13.44 pods) , followed by the value of treatment U2 (12.70 pods) and the one that obtained the smallest value in the treatment of urea fertilizer was treatment U1 (9.52 pods).

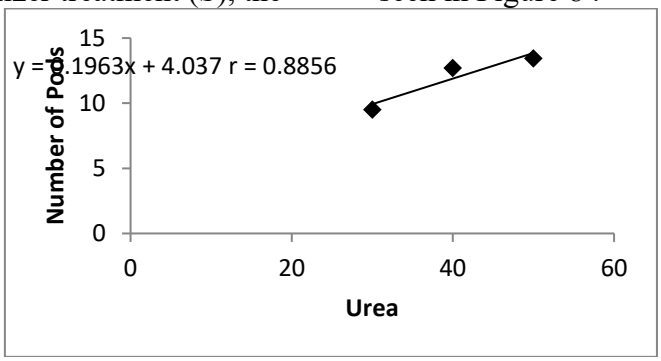
The number of pods at 6 MST in the cow manure (S) treatment can be seen in Figure 7 .



Gambar 7 Response Curve of the Number of Pods (pods) in the Treatment of Cow Manure (S) at 6 MST

Figure 7 shows that the use of cow compost affects the number of cases (units) of legume plants. The higher the proportion of cow compost, the higher the number of units in the legume plants. In the cow manure fertilizer treatment (S), the highest score was found in treatment S3 (12.41 cases), while the lowest score was obtained in treatment S1 (11.15 pods).

The number of pods at 6 MST in the Urea (S) fertilizer treatment can be seen in Figure 8 .



Gambar 8 Response Curve of the Number of Pods (pods) in the Treatment of Urea Fertilizer (U) at 6 WAP

Figure 8 shows that the use of urea compost affects the number of legume plants. The higher the urea fertilizer portion, the higher the number of cases in legume plants. The highest value was obtained in the U3 treatment (13.44 pods), while the lowest value was obtained in the U1 treatment (9.52 pods).

Pod Weight Per Plant (g)

Information on unit weight of legume plants at 6 weeks after planting and an examination of changes are

provided in References sections 4-9. Investigation of these changes revealed that the use of cow manure and urea fertilizer did not significantly affect unit weight of beans. However, urea fertilizer did significantly affect pod weight of bean plants.

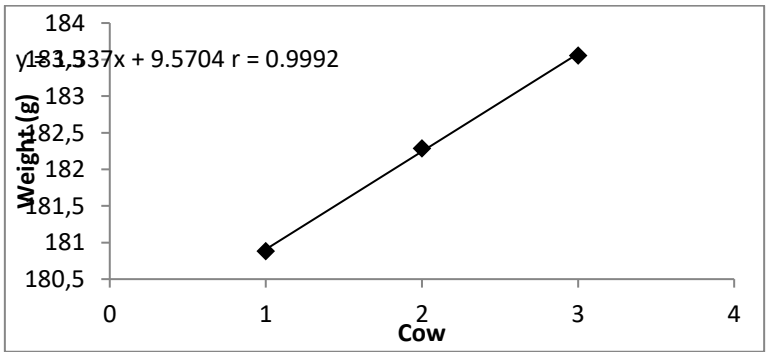
The effect of providing cow manure and urea fertilizer on the number of bean pods (pods) at 6 weeks after planting can be seen in table 7 .

Tabel.7 Results of the Difference Test for Average Pod Weight (g) of Cow Manure (S) and Urea Fertilizer (U) Treatments at 6 Weeks After Planting

Treatment	Pod weight (g)
	6 HSTP
Cow Manure Fertilizer (S)	
S1	180.89 a
S2	182.29 b
S3	183.56 c
Urea Fertilizer (U)	
U1	179.13 a
U2	182.41 b
U3	185.19 c

From the table above, it can be seen that the average plant weight at the age of 6 weeks after planting that obtained the largest value in the treatment of cow manure (S) was S3 (183.56 g) , followed by the value of treatment S2 (182.29 g pods) and the one that obtained the smallest value in the treatment of cow manure was treatment S1 (180.89 g pods). At the age of 6 weeks after planting, the largest value was obtained in the treatment of Urea fertilizer (U) was U3 (185.19 g) , followed by the value of treatment U2 (182.41 g) and the one that obtained the smallest value in the treatment of urea fertilizer was treatment U1 (179.13 g).

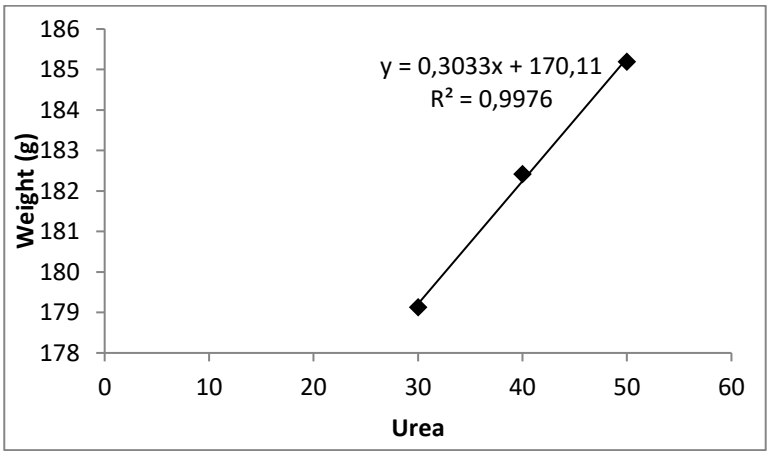
The weight of the pods at 6 weeks after planting in the cow manure (S) treatment can be seen in Figure 9 .



Gambar 9 Response Curve of Pod Weight (g) in Cow Manure Fertilizer Treatment (S) at 6 WAP

Figure 9 shows that the use of cow manure affects the unit weight of grains. The higher the portion of cow manure, the more prominent the weight of cases in legume plants. In the cow manure treatment (S), the highest value of pod weight was obtained in treatment S3, which was 183.56 grams, while the lowest value was obtained in treatment S1 (180.89 g).

The weight of the pods at 6 WAP in the Urea (S) fertilizer treatment can be seen in Figure 10 .



Gambar 10 Response Curve of Pod Weight (g) in Urea Fertilizer Treatment (U) at 6 WAP

Figure 10 shows that the use of cow manure affects the weight of bean units. The higher the portion of cow manure, the more pronounced the weight of the case in legume plants. In the cow manure (S) treatment, the highest value of pod weight was obtained in the S3 treatment, which was 183.56 grams. In the urea fertilizer (U) treatment, the highest value was obtained in the U3 treatment (185.19 g), while the lowest value was obtained in the U1 treatment (179.13 g).

5. DISCUSSION

The Effect of Cow Manure Application on the Growth and Production of Bean Plants (*Phaseolus vulgaris* L.)

Through observations of the changes made, it was apparent that the addition of cow manure had a significant impact on plant growth. This was due to the manure's ability to act as compost, which increases water retention in the soil and facilitates nutrient absorption. This is in line with the view expressed by Chairani (2006), who explained that although cow manure may not have a very high supplement content, it has other advantages in further developing soil properties, such as water penetration, soil porosity, soil structure, water retention limits, and soil cation trade. Cow manure fertilizer also contains various nutrients such as NPK which impacts the rate of photosynthesis in roots and all plant tissues, and is used for flower and fruit development.

This is consistent with the assertion of Setiawati et al. (2018) who stated that accumulating high concentrations of phosphorus in storage will produce new, stronger photosynthates and can transfer most of them to the roots to maintain high nutrient retention levels. The abundant photosynthesis process results from well-managed nutrient absorption, which is then distributed through the plant's vegetative organs such as stems and leaves. These organs function as food storage sites that are key to flower development and the resulting natural products.

The results of the study showed fluctuations indicating that the use of cow manure significantly affected the number of leaves, number of flowers, number of pods, and weight of plant pods. Although the effects of cow manure processing may not be clearly visible, there is a trend that the more compost used, the more plant growth tends to increase, both in vegetative and generative aspects. As conveyed by Sigit and Marsono (2008), the advantage of using cow manure or other organic fertilizers is its ability to improve soil structure, facilitate root development, and increase water retention capacity in the soil. cultivate the presence

of organic entities. in the soil and add supplements in the manure.

The Effect of Urea Fertilizer Application on the Growth and Production of Bean Plants (*Phaseolus vulgaris* L.)

Based on the results of the analysis of variance, it was found that the effect of urea fertilizer application had no significant effect on plant height at the ages of 1, 2, 3, 4, and 6 WAP. However, at the age of 5 WAP, the effect of urea fertilizer application had a significant effect on plant height. In observations regarding the number of leaves, the use of urea fertilizer did not have a significant impact, while in observations regarding the number of flowers, the application of urea fertilizer had a significant positive effect on bean plants. Considering the number of units and the severity of the case, the use of urea fertilizer made a clear difference. Urea compost is a compound fertilizer containing high concentrations of nitrogen (N), which is an important supplement for plant development. Urea manure is in the form of white, translucent granules, is effectively soluble in water, and has hygroscopic properties, meaning it can absorb water easily. Urea fertilizer contains about 46% nitrogen, which means that every 100 kg of fertilizer contains about 46 kg of nitrogen. The moisture content in this fertilizer is about 0.5%, with a biuret content of 1%, and the grain size ranges from 1 to 3.35 mm. The most crucial nutrient is nitrogen in urea fertilizer, because plants require nitrogen in larger quantities than other nutrients.

This aligns with an evaluation conducted by Dwdjosaputro in 1990, as mentioned in the 2013 study by Erawan and colleagues, which showed that nitrogen (N) plays a crucial role in plant vegetative growth. Nitrogen is an essential component in cell division and expansion, thus acting as a cell-building material found in many plant tissues. Excess nitrogen in plants is beneficial because nitrogen is the primary raw material for the formation of chlorophyll, proteins, and amino acids. Therefore, the presence of nitrogen is essential, especially during vegetative growth.

Besides phosphorus (P), nitrogen also plays a role in regulating overall plant health. Conversely, calcium (Ca) plays a dominant role, especially at plant growth points such as young shoots and root tips. This finding aligns with research by Lingga and Marsono in 2008, which stated that during the vegetative stage, plants will continue to grow before their development stops at a certain stage. The use of urea fertilizer containing nitrogen plays a crucial role in stimulating overall plant growth, particularly the growth of stems, branches, and leaves. Furthermore, nitrogen also plays a significant role in the health of green leaves, which are crucial in the photosynthesis cycle. It also has the potential to increase the production of protein, fat, and other natural compounds in plants.

Interaction of Treatment Effect of Cow Manure and Urea Fertilizer on the Growth and Production of Bean Plants (*Phaseolus vulgaris* L.)

The results of the change study indicate that the collaboration between the use of cow compost and urea fertilizer essentially impacts the plant level around one and a half months after planting (MBS). Considering the number of leaves, the impact is not too significant. Judging from the number of flowers, the impact of cow compost and urea fertilizer on meetings and medicines provides a very large difference and the impact of the mixture of cow manure and urea compost is not too significant. From the exploration results, the mixture of cow compost and urea fertilizer received the highest value of the two mixtures, namely in the S3U3 treatment, namely 3 kg/plot of cow manure and 50 g/plot of urea fertilizer. From the communication of the two manures, the nutrients from the two composts

complement the needs of legume plants, so that when combined can affect the development and yield of legume plants. The availability of sufficient nitrogen causes a healthy level between leaves and roots, so that vegetative development runs well and without problems. Conditions like this will affect plants entering the generative improvement stage. Fachruddin (2002) in Idham (2004) stated that the fairness between vegetative and generative improvements before the start of the generative stage can handle the overall organ initiation. Because there are no supplements in the soil, ordinary fertilizers are combined with other manure so that the supplements can be filled. Tawakkal, (2009) stated that natural compost generally contains nutrients in fairly limited quantities in the soil and is usually delayed in opening in the soil so that the most common way of delivering nutrients is hampered. The slow supply of nutrients makes the availability of additional materials in the soil unable to help increase growth. At the beginning of planting, inorganic fertilizers are not used, so improvements are not entirely ideal because biofertilizers only contain very low nutrients, so adding inorganic fertilizers at the beginning of planting as a starter is very important. This is in accordance with the opinion of Suwahyono (2011) who stated that the use of animal manure will be beneficial if its use is combined or combined with inorganic fertilizers, especially on dry land or land that is poor in nutrients. This is because the solid content of animal waste is generally low. During the test, rainfall was generally low and sunlight was sufficient so that the growth of vegetable plants was disturbed and the use of manure had no effect and the absorption of excess materials in the soil was hampered.

6. CONCLUSION

a) The use of cow manure did not have a significant impact on plant height, number of leaves, number of flowers, number of pods, and pod weight in bean plants (Phaseolus vulgaris L.).
b) The application of urea fertilizer had a very significant impact on plant height, had an insignificant impact on the number of leaves, significantly affected the number of flowers, and had a very significant impact on the number of pods and pod weight in bean plants (Phaseolus vulgaris L.).
c) The collaboration between the use of cow manure and urea fertilizer significantly affected plant height, number of flowers, number of pods, and pod weight in bean plants (Phaseolus vulgaris L.), but did not indicate a significant difference in the number of plant leaves.

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