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Organic Fertilizer Types at Different Interval Comparison to Butterfly Pea Flower Growth and Yields

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ABSTRACT

The butterfly pea (*Clictoria ternatea*) is one of the horticulture plants. It is part of the ornamental plant group. This plant has many uses, such as food colouring and herbal remedies. Butterfly peas are cultivated organically. However, there needs to be more research regarding adding varieties of organic fertilizers and different fertilization intervals to the plant. The research was executed in Sukalaksana Village, Samarang Subdistrict, Garut Regency, whereas the quality analysis was completed in the Horticulture Cultivation Department of UNPAD Agriculture Faculty. Experimental design of factorial Rancangan Acak Kelompok / Randomized Block Design (RAK) was used. The main factor is the liquid organic fertilizer, made from three different materials: banana stems LOF, chicken manure LOF, and Nasa LOF. The second factor is the fertilization intervals, which were scheduled in three different intervals: once a week, once every two weeks, and once every three weeks. Each interval was repeated three times. Results showed interaction between organic fertilizer types and fertilization intervals on leaf numbers, shoot and roots ratio, number of flowers and flower weight. The best interaction was LOF chicken manure types with fertilization intervals of 3 weeks, which gave higher results in the number of leaves, shoot and root ratio, number of flowers per plant, flower weight per plant and antioxidant content.

1. Introduction

The butterfly Pea (*Clictoria ternatea*) is a horticulture plant. It is part of a decorative plant group. The colours of the butterfly pea flowers are blue, white, and purple, so they are widely used as natural dyes. The main component of butterfly pea flowers that cause blue flowers is the anthocyanin content (Handito *et al*., 2022). People's interest in planting butterfly pea flowers is increasing because they contain many health benefits. The content of chemical compounds in butterfly pea flowers has the potential as an antioxidant (Zahara, 2022).

In Indonesia, the butterfly pea flower has yet to be widely cultivated. Currently, butterfly pea flowers are widely cultivated in the house's yard or the garden on a small scale. Much research has been done on the content of the butterfly pea flower. Some research has been carried out in Samarang District but has not yielded satisfactory results. Based on the survey results of one of the butterfly pea flower farmers in Samarang District, Garut Regency, the cultivation practice is not adding fertilizer after planting, so flower production decreases.

The butterfly pea flower is a food ingredient, so it is widely cultivated organically. The use of organic fertilizers can be a great solution to increase production of the plant. Organic fertilizers are safer to use because they do not cause residues, either in the soil or in the crops (Susantidiana & Aguzaen, 2015). Organic fertilizers can be obtained from livestock waste and plant residues. One type of organic fertilizer from livestock wastes often used is chicken manure, while one of the plant residues often used is banana stems. Organic fertilizer application can be either solid or liquid. However, liquid organic fertilizer (LOF) as an addition to fertilizer for plants is more widely used because it is easier for plants to absorb. Utilization of chicken manure and plant residues as liquid organic fertilizer can be done quickly if the source of these materials is in the surrounding environment. Making LOF on a large scale requires more time, space, and effort, so farmers prefer to use commercial LOF to make it easier. One of the commercial LOF that is often used is Nasa's LOF.

Fertilization is one of the essential factors for good production. Besides fertilizer type, another factor that needs to be considered in fertilizing is the fertilization interval. Fertilization intervals can affect the availability of nutrients in the soil. Appropriate fertilization intervals can increase the efficiency of nutrient uptake by plants. Based on those factors, the purpose of this research is to find out what is the result of adding varieties of organic fertilizers and applying different fertilization intervals to the plant regarding these parameters: plant height, number of leaves, shoot and root ratio, number of flowers, flower size and flowers weight per plant.

2. Methodology

The materials used in this study included soil as a planting medium (soil mixed with chicken manure), local purple butterfly pea seeds, organic chicken manure, LOF from banana stems, LOF from chicken manure and NASA LOF. This study used a factorial randomized block design (RBD) using two factors and three replications. First factor: Type of organic fertilizer (P), which consisted of 3 levels, namely: P 1 = LOF Banana Stem; P 2 = LOF Chicken Manure; P 3 = LOF Nasa. The second factor: LOF application interval (I), which consists of 4 levels, namely: I 1 = once a week (6 applications); I 2 = once every 2 weeks (3 times the application); I 3 = 3 weeks (2 times the application). The dose of fertilizer applied was 600 mL/plant; how to apply fertilizer for treatment once a week was done 6 times with a volume of 100 mL for one flush. Treatment every 2 weeks was done 3 times with a volume of 200 mL for one flush. Treatment every 3 weeks was carried out 2 times with a volume of 300 mL for one flush.

3. Results and Discussion

3.1 Plant Height

Plant height is a growth indicator that shows the level of cell division in plants. Increased plant height indicates increased cell division due to increased assimilation (Harjanti *et al*., 2014). The observation results showed no interaction between the type of organic fertilizer treatment and the fertilization interval. The independent effect of the type of organic fertilizer showed no significant difference in plant height at 6 WAP but significantly different in plant height at 7 WAP and 8 WAP (Table 1).

Table 1. Height of the butterfly pea plant is 6 WAP, 7 WAP and 8 WAP

Treatment	Plant Height (cm)		
	6 WAP	7 WAP	8 WAP
Types of Organic Fertilizers			
LOF Banana Stem	34.96 a	55.48 b	78.00 b
LOF Chicken Manure	43.44 a	65.87 a	90.30 ab
LOF Nasa	35.67 a	54.31 b	74.96 b
Fertilization Intervals			
Fertilization once a week	36.18 a	54.94 a	75.70 a
Fertilize once every 2 weeks	41.74 a	60.93 a	82.11 a
Fertilization every 3 weeks	36.15 a	59.79 a	85.44 a

Note: The average number followed by different letters in the same column shows a significant difference according to Duncan's Multiple Range test at 5% significance level.

Based on the average tree height analysis of butterfly pea plants, the LOF type of chicken manure gave significantly higher yields at 7 WAP and 8 WAP compared to the LOF treatment of banana stems and LOF Nasa. This is presumably because the LOF of banana stems contains high levels of N-fixing microbes and phosphate-solubilizing microbes. The high content of N-fixing bacteria can increase the amount of nitrogen in the soil and make it more available to plants. Nitrogen is a nutrient that is very important in plant growth (Sudirja *et al*., 2019). LOF banana stems with LOF chicken manure and LOF Nasa at a plant height of 6411 cm were obtained over 8 weeks without biofertilizer plants. This shows that adding organic fertilizers can increase plant height.

Chicken manure is an organic fertilizer with a low C/N ratio, so it breaks down quickly into plant nutrients. Nutrients in the soil are available to plants to stimulate plant growth (Ishak *et al*., 2013). Nutrients in the soil can affect plant growth. If plants lack nutrients in the soil, it can cause stress so that plant physiological processes are disrupted (Arnawa *et al*., 2017) Plant height growth occurs due to cell division and elongation, which requires sufficient nutrients (Kastono, 2005).

The fertilization interval treatment had no significant effect on plant height. Fertilization intervals once every 3 weeks tend to produce taller plants at 8 WAP. This shows that with a fertilization interval of once every 3 weeks, plant height growth is faster in the final vegetative phase. In the vegetative phase, plants need sufficient nutrients so that the photosynthesis process can run well (Zabarti *et al*., 2012).

3.2 Number of Leaves

The number of leaves is one of the indicators of plant growth, and it affects the photosynthesis process. Analysis results show interactions between adding additional organic fertilizers and fertilization intervals with the number of butterfly pea leaves. The best number of leaves is shown on the butterfly pea, which was treated with the banana stems LOF with fertilization interval once every three weeks, compared to the others, which were fertilized once a week. There is no difference compared to the one fertilized once every two weeks. It happened because the LOF volume given once every three weeks is higher; it is available longer for the plant. However, no significant difference exists in the number of leaves on butterfly peas treated with chicken manure LOF, no matter the fertilization intervals (Table 2).

Table 2. Interaction between Type of Fertilizers and Fertilization Intervals on Number of Leaves 7 WAP

Types of Organic Fertilizer	Number of Leaves (strands)		
	Fertilization Intervals		
	once a week	once every 2 weeks	once every 3 weeks
LOF banana stem	25.78 b B	31.17 a AB	36.17a A
LOF Chicken Manure	38.47 a A	38.78 a A	37.78 a A
LOF Nasa	35.50 a AB	40.56 a A	27.33 a B

Note: The numbers followed by the same uppercase letter horizontally and the same lowercase letter vertically are not significantly different according to Duncan's Multiple Range test at 5% significance level

Table 3. Interaction between Type of Fertilizers and Fertilization Intervals on the Number of Leaves of Butterfly Pea Flower Plants 8 WAP

Types of Organic Fertilizer	Number of Leaves (strands)		
	Fertilization Intervals		
	once a week	once every 2 weeks	once every 3 weeks
LOF banana stem	34.56 b B	41.89 a AB	47.22 ab A
LOF Chicken Manure	51.44 a A	50.33 a A	51.34 a A
LOF Nasa	47.11 a AB	52.45 a A	35.22 b B

Note: The numbers followed by the same uppercase letter horizontally and the same lowercase letter vertically are not significantly different according to Duncan's Multiple Range test at 5% significance level

The effects of LOF-type treatment on banana stems at 3-week fertilization intervals showed significantly different results at 7 WAP and 8 WAP higher than once-a-week fertilization and not significantly different from 2-week fertilization (Tables 2 and 3). This is presumably because the research was conducted during the rainy season. Hence, the intensity of the rainwater affected the concentration of the nutrients given, which caused nutrient absorption at once-a-week fertilization intervals not optimal. The intensity of rain causes the possibility of leaching of nutrients needed by plants, such as the macronutrients N, P and K.

However, in the case of LOF-type chicken manure, there was no significant difference between the fertilization cycles: once a week, once every two weeks and once every three weeks. This shows that plants absorb the LOF type of chicken manure more quickly, so leaf growth is more optimal. LOF of chicken manure has NPK elements higher than LOF banana stem. NPK elements in the soil can stimulate plant physiological processes. Adequate nutrients can accelerate plant growth, mainly stems and leaves (Haryadi *et al*., 2015).

In the LOF Nasa treatment, the 2-week fertilization interval gave significantly different results to the 3-week fertilization treatment but not significantly different from the once-a-week treatment. This shows that using LOF Nasa once every 2 weeks is more optimal than other

treatments. This is in line with the results of a study (Zabarti *et al*., 2012), which showed that giving LOF Nasa with a concentration of 8 cc/L with fertilization intervals every 2 weeks was able to increase nutrient uptake by plants to increase tomato plant height. The number of leaves of butterfly pea plants with LOF Nasa fertilization once every 3 weeks gave significantly lower results than the LOF of chicken manure. However, it was not significantly different from the LOF of banana stems. This is presumably because in LOF Nasa fertilization once every 3 weeks, the volume of LOF given is quite a lot, and the nutrient content in LOF Nasa is higher than other fertilizers so that the nutrients in the soil are not balanced, which results in the absorption of nutrients not being optimal. However, the number of leaves produced was more than the plants without adding organic fertilizer, namely 34.45.

Table 4. Number of Leaves of Butterfly Pea 6 WAP

Treatment	Number of Leaves (strands)
Types of Organic Fertilizers	
LOF banana stem	18.85 a
LOF Chicken Manure	22.00 a
LOF Nasa	23.63 a
Fertilization Intervals	
Fertilization once a week	20.11a
Fertilize once every 2 weeks	23.44 a
Fertilization every 3 weeks	20.93 a

Note: The average number followed by different letters in the same column shows a significant difference according to Duncan's Multiple Range test at 5% significance level

The number of leaves of the butterfly pea plant at 6 WAP showed results that were not significantly different in each treatment (Table 4). This is likely due to the slow-release characteristics of the fertilizer.

3.3 Shoot and Root Ratio

The shoot and root ratio reflects the distribution of photosynthetic output during plant growth. A shoot-and-root ratio greater than 1 indicates that the plant is growing toward extinction, while a shoot-and-root ratio less than 1 indicates the plant is rising toward its roots (Irwan *et al*., 2017). The analysis showed an interaction between fertilizer type and application interval on the shoot and root ratio attenuation in WAP 8 (Table 5). Fertilizer type and application interval had no significant effect on the shoot and root ratio of butterfly peas at 6 WAP and 7 WAP (Table 6).

Treatment of chicken manure with LOF manure at a fertilization interval of 3 weeks showed significantly higher values than LOF NASA and was not substantially different from LOF banana stems. Additionally, LOF fertilization with chicken manure at 3-week intervals gave better results than once weekly but did not differ from 2-week intervals. However, LOF banana stems and LOF NASA did not show significant differences in each fertilization period. This indicates that fertilizing with LOF chicken manure every 3 weeks is more favorable for plant frost. Chicken manure LOF had higher N-fixing bacteria and P-solubilizing bacteria, which were 1.24 x 109 and 1.65 x 107, respectively, which increased soil N and P content as compared to banana stems LOF and NASA LOF. This is consistent with the study by Sutresnawan *et al*. (2015), who found that chicken manure treatment increased total forage

dry weight and eggplant leaf dry weight. Furthermore, the application of chicken manure to eggplant plants showed a significant difference in eggplant plants' shoot and root ratio.

Table 5. Interaction between Fertilizers and Intervals of Fertilization on the Shoot and Root Ratio 8 WAP

Types of Organic Fertilizer	Shoot and Root Ratio		
	Fertilization Intervals		
	once a week	once every 2 weeks	once every 3 weeks
LOF banana stem	4.18 a A	4.30 b A	4.47 ab A
LOF Chicken Manure	4.52 a B	5.33 a AB	5.51 a A
LOF Nasa	4.29 a A	4.97 ab A	3.32 b A

Note: The numbers followed by the same uppercase letter horizontally and the same lowercase letter vertically are not significantly different according to Duncan's Multiple Range test at 5% significance level

Table 6. Shoot and Root Ratio at 6 WAP and 7 WAP

Treatment	Shoot and Root Ratio	
	6 WAP	7 WAP
Types of Organic Fertilizers		
LOF banana stem	2.17 a	2.61 a
LOF Chicken Manure	2.79 a	2.94 a
LOF Nasa	2.21 a	2.74 a
Fertilization Intervals		
Fertilization once a week	2.56 a	2.63 b
Fertilize once every 2 weeks	2.57 a	3.04 a
Fertilization every 3 weeks	2.02 a	2.63 b

Note: The average number followed by different letters in the same column shows a significant difference according to Duncan's Multiple Range test at 5% significance level

Plant growth occurs through plant metabolic processes, including photosynthesis and respiration. There was no significant difference in the shoot and root ratio (Table 6) when plants were 6 WAP and 7 WAP. This is probably because the plant is still growing roots in the vegetative stage. Plant growth is mainly stem and leaf growth, so the shoot and root ratio is low (Mustikawati *et al*., 2020). When the plant is 8 WAP, the number of leaves on the plant increases so that the process of photosynthesis is even better. More leaves can increase photosynthesis to increase plant growth. Photosynthate will diffuse to all parts of the plant, increasing the dry weight of the plant. Plants require nitrogen nutrients for plant growth to increase chlorophyll content and leaf size to improve photosynthetic processes (Arnawa *et al*., 2017)

3.4 Number of Flowers

The number of flowers observed since the first flower appeared until the last harvest was 12 WAP. There was an interaction between the type of fertilizer treatment and the fertilization interval on the number of flowers at harvest at 10 and 12 WAP (Tables 7 and 8).

The independent effect of the type of fertilizer treatment and fertilization intervals did not show a significant difference in the number of flowers per plant at 6 WAP and 8 WAP (Table 9).

Table 7. Interaction of Fertilizer Types and Fertilization Intervals on the Average Number of Flowers per Plant at 10 WAP

Types of Organic Fertilizer	Number of Flowers per Plant		
	Fertilization Intervals		
	once a week	once every 2 weeks	once every 3 weeks
LOF banana stem	9.11 b B	11.67 a AB	16.00 ab A
LOF Chicken Manure	16.67 a A	17.33 a A	17.33 a A
LOF Nasa	15.45 a A	16.56 a A	7.22 b B

Note: numbers followed by the same uppercase letter horizontally and the same lowercase letter vertically do not show a significant difference according to Duncan's Multiple Range test at 5% significance level

Table 8. Interaction of Fertilizer Types and Fertilization Intervals on the Number of Flowers per plant at 12 WAP

Types of Organic Fertilizer	Number of Flowers per Plant		
	Fertilization Intervals		
	once a week	once every 2 weeks	once every 3 weeks
LOF banana stem	26.22 a B	32.89 a A	33.22 ab A
LOF Chicken Manure	32.11 a A	39.22 a A	48.11 a A
LOF Nasa	32.22 a AB	49.89 a A	23.44 b B

Note: numbers followed by the same uppercase letter horizontally and the same lowercase letter vertically do not show a significant difference according to Duncan's Multiple Range test at 5% significance level

The type of LOF of chicken manure did not significantly affect the number of flowers per plant at 10 WAP and 12 WAP, either once a week, 2 weeks, or 3 weeks. However, the amount of butterfly pea flowers with LOF chicken manure once a week gave significantly higher results than the LOF of banana stems at 10 WAP. LOF fertilization of chicken manure at intervals of 3 weeks gave significantly higher yields than LOF Nasa and was not significantly different from LOF banana stems. This is thought to be due to the LOF of chicken manure having high phosphate solubilizing microbes. This can help the availability of phosphate in the soil. Phosphate is needed by plants to stimulate flower growth. In the flowering process, the need for phosphate will increase because energy needs increase, and phosphate is a component of enzymes and ATP, which play a role in energy transfer (Kurniawan *et al*., 2014).

Phosphate solubilizing microbes can extract phosphate from an insoluble form to become available through the secretion of organic acids so plants can absorb that element P (Lovitna *et al*., 2021). The element phosphate serves as a source and transfer of energy in plants. ATP and ADP are phosphate compounds that play a role in many plant reactions, such

as photosynthesis, respiration, protein and amino acid synthesis, and nutrient transport through plant cells (Naser & Grouh, 2012).

The LOF Nasa fertilization interval every 2 weeks gives significantly higher results than the interval 3 weeks. The number of Telang flowers in the Nasa LOF application every 3 weeks is less than once every 2 weeks and once a week. This is because with the application of LOF Nasa every 3 weeks, the plant growth could be better, so the flower production produced is also low. Using LOF Nasa with fertilization intervals once every 2 weeks can meet the needs of plants so that plants optimally absorb nutrients. Plants can translate nutrients to the parts that need them more quickly, one of which is for the formation of flowers. This is by the results of research by Zabarti *et al*. (2012), who showed that applying LOF Nasa concentration of 9 cc/l with fertilization intervals every 2 weeks resulted in a higher number of flowers per plant on tomato plants.

Table 9. Number of Flowers per Plant at 6 WAP and 8 WAP

Treatment	Number of Flowers per Plant	
	6 WAP	8 WAP
Types of Organic Fertilizers		
LOF Banana Stem	0.22 a	2.63 a
LOF Chicken Manure	0.67 a	4.04 a
LOF Nasa	0.52 a	3.04 a
Fertilization Intervals		
Fertilization once a week	0.74 a	2.89 a
Fertilize once every 2 weeks	0.15 a	4.15 a
Fertilization every 3 weeks	0.52 a	2.67 a

Note: The average number followed by different letters in the same column shows a significant difference according to Duncan's Multiple Range test at 5% significance level

The fertilizer type and fertilization interval did not significantly affect the number of flowers per plant at 6 WAP and 8 WAP. This is presumably because the number of flowers produced in the early flowering phase is not too much, and the plants have yet to reach the optimal flowering phase. However, the average yield of the number of flowers in the LOF treatment of chicken manure showed results that tended to be higher than other LOF. Fertilization intervals once a week showed higher yields at the beginning of flowering, but at 8 WAP, the number of flowers produced was higher with fertilization intervals once every 2 weeks. This is because plants with chicken manure flower slower than LOF banana stems, but the number of flowers produced is higher after the first flowers appear.

3.5 Flower Size

The size of the flower petals is one indicator of the quantity of flowers. So far, there is no standard for the size of butterfly pea flowers (Abubakar *et al*., 2022). Flower size can affect flower yields. The larger the size of the flower, the higher the weight of the flower produced. The availability of sufficient nutrients in the soil can increase the size of flower petals. The analysis results showed no interaction between the type of organic fertilizer treatment and the fertilization interval on flower size (Table 10).

Table 10. Size of Butterfly Pea Flowers

Treatment	Flower Size (cm)	
	Flower Length	Flower Width
Types of Organic Fertilizers		
LOF banana stem	5.34 a	3.95 a
LOF Chicken Manure	5.24 ab	3.91 a
LOF Nasa	5.14 b	3.91 a
Fertilization Intervals		
Fertilization once a week	5.26 a	3.91 a
Fertilize once every 2 weeks	5.22 a	3.89 a
Fertilization every 3 weeks	5.24 a	3.97 a

Note: The average number followed by different letters in the same column shows a significant difference according to Duncan's Multiple Range test at 5% significance level

LOF banana stem type produces a longer LOF than NASA but is not significantly different from the LOF of chicken manure. Fertilization interval treatments had no significant effect on flower length or flower width. Organic fertilizers contain essential nutrients that support flower growth. The type of LOF can affect nutrients in the soil, which in turn can affect plant uptake. The amount of nutrients the plant absorbs can affect butterfly pea petal size (Abubakar *et al*., 2022). Plants absorb nutrients from the soil along with sunlight and water and undergo the process of photosynthesis. The results of photosynthesis continue within the plant from the leaves through the phloem tissue to the floral organs, increasing flower size (Luthfiana & Haryono, 2019).

3.6 Flower Weight per Plant

The number of flowers and flower size affect flower weight per plant. The greater the number of flowers and the greater the size of the flowers, the weight of the flowers per plant will increase. The results of the analysis show that there is an interaction between the type of fertilizer treatment and the interval of fertilization on the weight of the flowers per plant (Table 11).

Table 11. Interaction of Fertilizer Types and Fertilization Intervals on Flower Weight per Plant

Types of Organic Fertilizer	Flower Weight per Plant (g)		
	Fertilization Intervals		
	once a week	once every 2 weeks	once every 3 weeks
LOF banana stem	17.92 b B	22.19 b A	23.53 b A
LOF Chicken Manure	27.04 a A	30.58 a A	30.44 a A
LOF Nasa	24.59 a B	30.10 a A	18.19 c C

Note: The numbers followed by the same uppercase letter horizontally and the same lowercase letter vertically are not significantly different according to Duncan's Multiple Range test at 5% significance level

LOF fertilization of chicken manure at intervals of 3 weeks showed significantly higher LOF types of banana stems and LOF Nasa. However, there was no significant difference between fertilization intervals once a week or once every 2 weeks. LOF Nasa types with fertilization intervals every 2 weeks show significantly higher interest weights than fertilization intervals once a week and once every 2 weeks. The flower weight value equals the number of flowers, so the more flowers a plant produces, the more weight each flower will have. This shows that the LOF of chicken manure can provide a higher yield of flower weight per plant. The amount the flower absorbs is influenced by the nutrients used during plant growth. Optimum nutrient availability can increase the amount of chlorophyll and, thus, photosynthetic activity, leading to more assimilation and further supporting flower weight (Purnomo *et al*., 2021).

Table 12. Flower Weight per Plant 6 WAP, 8 WAP and 12 WAP

Treatment	Flower Weight per Plant (g)		
	6 WAP	8 WAP	12 WAP
Types of Organic Fertilizers			
LOF banana stem	0.79 a	0.99 a	9.63 b
LOF Chicken Manure	0.83 a	1.60 a	12.70 a
LOF Nasa	0.77 a	1.15 a	12.19 a
Fertilization Intervals			
Fertilization once a week	0.74 a	1.09 a	10.36 a
Fertilize once every 2 weeks	0.82 a	1.65 a	12.53 a
Fertilization every 3 weeks	0.83 a	0.99 a	11.64 a

Note: The average number followed by different letters in the same column shows a significant difference according to Duncan's Multiple Range test at 5% significance level

There was no interaction between the type of fertilizer and the fertilization interval on flower weight at 6, 8, and 12 WAP (Table 12). Planting flower weight at 6 and 8 WAP did not show any difference in the type of fertilizer treatment or fertilization interval. However, at 12 WAP, there was a significantly lower difference in the LOF treatment of banana stems. However, the flower weight with the addition of LOF banana stems gave higher yields than without organic fertilizer, namely 9.28 g per plant.

The flower weight at 12 WAP was higher than the previous harvest because, at 3-4 months, the number of flowers produced by the plants had started to be optimal (Reformasintansari & Waluyo, 2021). This shows that the LOF of chicken manure can provide higher yields of flower weight per plant. Flower weight is affected by nutrient absorption during plant growth. Optimal nutrient availability can increase the amount of chlorophyll so that it can increase photosynthetic activity, which results in more assimilation that supports flower weight (Purnomo *et al*., 2021).

4. Conclusion

There is an interaction between the type of organic fertilizer treatment and the fertilization interval on the growth and yield of butterfly pea flowers. The interaction of the type of chicken manure treatment with fertilization intervals once every 3 weeks gave significantly higher results than other treatments on the parameters of leaf number, shoot and root ratio, number of flowers, and flower weight.

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