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The Effect of Application of Goat Stage and TSP Fertilizer on The Growth and Production of (C*hrysantemum morifolium* R.)

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Abstract

The litle of this thesis is tapi determine the effect of goat fertilizer and TSP fertilizer on the growth and yield of chrysanthemum (Chrysantemum morifolium R.), conducted at the green house of Pudak Lestari Agrotourism, Pancasari Village, Sukasada District, Buleleng Regency, Bali, from May to in August 2022. This study used a Randomized Block Design (RBD) consisting of 2 factors arranged factorially. The first factor tested was goat manure (K), which consisted of 4 dose levels, namely: K0 = 0 tons/ha, K1 = 15 tons/ha, K2 = 30 tons/ha, K3 = 45 tons/ha while the second factor was TSP (T) fertilizer consisting of 4 dose levels, namely: T0 = 0 kg/ha, T1 = 175 kg/ha, T2 = 350 kg/ha, T3 = 525 kg/ha, each of which was repeated 3 times so that there are 48 trial plots. The research results showed that the interaction between goat manure and TSP fertilizer had no significant effect on all observed variables. Treatment of goat manure had a significant effect only on leaf area, flower diameter, long weight of flower stalks, fresh weight of economic flowers and other variables had no significant effect. The highest economic fresh weight of flowers was obtained from goat manure at a dose of 45 tons ha-1, namely 48.25 g, an increase of 23.97% when compared to no goat manure, namely 38.92 g. The TSP fertilizer treatment obtained the highest plant height and flower diameter in the TSP fertilizer treatment at a dose of 525 kg ha-1, namely 12.67 cm and 10.18 cm compared to that without TSP fertilizer application, namely 10.71 cm and 9.40 cm.

Keywords: chrysanthemum, dosage, fertilizer, goat manure

1. Introduction

Chrysantemum (*Chrysantemum* sp.) is an ornamental flower plant in the form of a shrub, also known as Chrysantemum or Golden Flower, originating from the plains of China, which belongs to the Asteraceae tribe. Chrysanthemum is a short-day plant that is in great demand by the public because it has beautiful flower colors and various shapes and has high economic value. Yellow chrysantemum comes from mainland China, known as *Chrysantemum indicum* (yellow), *Chrysantemum morifolium* (purple and pink) and *Chrysantemum daisy* (round, ponpon) [1]. Currently, chrysanthemums are not only produced as cut flowers, but also as potted ornamental plants. Chrysanthemum as a potted ornamental plant has a relatively longer shelf life compared to cut chrysanthemum. In addition, potted chrysanthemums can be produced throughout the year because growth and flowering time can be regulated and have a long flower freshness life [2].

Potted chrysanthemums are divided into two types, namely standard chrysantemums and spray chrysanthemums. The standard type of chrysanthemum is a type of chrysantemmum flower that has only one flower bud, namely the terminal bud which is maintained on one stem, while the spray type (spray inflorescent) is a type of flower where all lateral buds are allowed to develop, while the first flower that develops is removed to stimulate shoot growth. laterally [3]. The standard potted chrysantemum is a popular type of chrysantemum and is much loved by consumers because it has large flowers with a flower diameter of 6-8 cm and a variety of flower colors. Consumer preference for potted chrysantemum is the standard type, white in color, and has a shelf life of more than 7 days. The high demand for potted chrysanthemum provides opportunities for potted chrysantemum

producers and entrepreneurs to improve the quality of flowers. Chrysanthemum plants have added value, in addition to their beauty, diversity of shapes and colors, chrysanthemum flowers also have a relatively long freshness and are easy to assemble [4].

Chrysanthemum plants apart from being used as ornamental plants, chrysanthemums also have the potential to be used as traditional medicinal plants and producers of insect poisons [5]. Chrysanthemum, which is now widely cultivated, is a plant resulting from complex crosses of various varieties that have been known for thousands of years. rapidly will bring out new varieties of chrysanthemum plants, which are in great demand by the public [6] and [7]. The great demand for chrysanthemum plants in the market makes it possible that chrysanthemum cultivation can be used as a profitable job. In order to achieve benefits in cultivating chrysanthemum plants, good cultivation technology is needed. To achieve superior seeds in chrysanthemum cultivation and optimize chrysanthemum yields, observations were made on the growth of chrysanthemum plants [8].

Bali as an international tourist destination, one of the best in the world, is faced with various advances and also problems that must find solutions related to the development of its community, especially farming communities supporting tourism. As a tourist destination, Bali provides opportunities for agricultural development including horticultural farming in particular and chrysanthemum cultivation which can support tourism, especially tourism in the Bedugul area. However, opportunities for the development of cut chrysanthemum cultivation in Bali, especially in the Bedugul area which includes Candi Kuning Village, Tabanan Regency, have not been worked out optimally. This is still evident in the low interest of farmers in improving their economy through chrysanthemum cultivation [9].

Economically cut chrysanthemums provide quite high profits, one chrysanthemum plant provides a profit of IDR 400 to IDR 600 or for one acre the profit in one growing season (3 months) is IDR 1,600,000 to IDR 2.400.000,-. Other things that support the challenges of developing chrysanthemums in Candi kuning are: (1) the demand for chrysanthemums for the Bali market is still dominated by flowers from Java, and (2) geographically Candi kuning Village is very suitable for chrysanthemum cultivation and is located very close to the marketing center. Chrysanthemum is a plant that is often cultivated as a seasonal plant and an ornamental plant that has high economic and aesthetic value. Even the chrysanthemum plant is included in the five most popular flower ornamental plants. In Indonesia, chrysanthemum plants are commonly cultivated in the medium plains and highlands [10].

Chrysanthemum plant production in Indonesia in 2016 reached 433,100,145 stalks and became an ornamental plant with the highest production, followed by roses (181,884,630 stalks) and tuberose plants (117,094,086 stalks). Chrysanthemum plants are also ornamental plants with the highest harvested area in Indonesia, which is 10,914,154 m2 with a productivity of 39.68 stalks per m^2 [11].

The high production of chrysanthemum plants needs to be balanced with the quality of the flowers produced. One effort to increase production (increase shoots) and crop quality can be done by intensification efforts, one of which is through both organic and inorganic fertilization (chemical fertilizers) [12] and [13]. Excessive use of chemical fertilizers will result in a decrease in soil quality (decrease in pH), soil compaction, and reduced soil organic matter. Based on these conditions, efforts to increase soil organic matter so that the potential of chrysanthemum plants can be maintained, one of which is by adding goat manure. Goat manure is an organic fertilizer containing 0.97% N, 0.69% P, 1.66% K where the nutrient content can improve the physical, chemical and biological properties of the soil [14].

Besides having macro elements, goat manure also has micro elements such as 1.64% Ca, 0.60% Mg, 233 ppm Mn and 90.8 ppm Zn [15]. Meanwhile, according to [16], the nutrient content in goat manure is 0.6% Nitrogen, 0.3% Phosphorus, and 0.17% Potassium. The advantages of goat

manure for plants are to help improve soil structure so that plant growth can be optimal, provides macro and micro nutrients and has high ionic binding capacity so that it will make inorganic materials in the soil effective. The application of manure can improve soil structure, increase the ability of soil to hold nutrients, increase water holding capacity, increase soil buffering capacity, as a source of nutrients and a source of energy for soil microorganisms [17]. Based on the Standard Operating Procedure (SOP) the recommended dose for using goat manure in cut chrysanthemum cultivation is 30 tons/ha which has been decomposed, with an application 2 weeks before planting and a TSP fertilizer dose of 350 kg/ha applied the day before planting. The results of the study, at a dose of 30 tons/ha showed that goat manure had the best effect on the growth and yield of chrysanthemum plants[18]. Because there is still a step of research on the application of goat manure with TSP fertilization on chrysanthemum plants, the author wants to examine the dosing of goat manure combined with TSP fertilizer.

2. Material and Methods

The research was conducted at the green house, Agro Pudak Lestari, Pancasari Village, Sukasada District, Buleleng Regency, Bali, starting from May to August 2022. The altitude is 1.247 meters above sea level, with an average temperature of around 17^o to 20^o C. The materials used in this study were chrysanthemum seeds of the Bacardi variety in goat manure, TSP fertilizer, insecticides (prevathon and reagent types) and cozeb fungicide. The tools used in this study were: hoes, scales, nets, scissors, knives, lamps, timers, rulers, stationery, markers, mica plastic, bamboo, canopy, stationery hoses, calipers and bellows.

This experiment used a factorial randomized block design (RBD) with 2 treatment factors, namely goat manure (K) and TSP (T) fertilizer. The first factor was goat manure with 4 dose levels, namely: K_0 = 0 tons/ha, K_1 = 15 tons/ha, K_2 = 30 tons/ha, K_3 = 45 tons/ha. While the second factor is TSP fertilizer consisting of 4 dose levels, namely: T_0 = 0 kg/ha, T_1 = 175 kg/ha, T_2 = 350 kg/ha, T_3 = 525 kg/ha. Thus there were 16 combination treatments, each of which was repeated 3 times so that there were 48 experimental plots.

Variables observed in this study were: plant height (cm), number of leaves (strands), leaf area (cm), stem diameter (cm^2), flower stalk length (cm), flower diameter (cm), flower stalk length weight (g), and the economic fresh weight of interest (g).

Prior to planting the seeds, tillage was carried out with the aim of better plant growth and development, then formed bunds with a width of 100 cm x 100 cm, height of mounds of 20 cm and distance between plots in replicates of 30 cm. Goat manure application was carried out 2 weeks before planting the seeds with the dose according to the treatment. While the application of TSP fertilizer is given 1 day before planting according to the treatment dose.

Experimental data were analyzed using analysis of variance, for a single treatment that had a significant to very significant effect, then it was continued with a BNT 5% test, while if there was an interaction between the two treatments, it was continued with a Duncan's test at a level of 5%, to determine the closeness of the relationship between the observed variables correlation analysis.

3. Results and Discussion

Based on the results of statistical analysis, it was obtained the significance of the effect of giving goat manure (K) and TSP fertilizer (T) and their interactions (KxT) on all observed variables are presented in Table 1. The average variable observed was due to the effect of goat manure (K)

treatment and TSP (T) fertilizers are presented in Table 2 and Table 3. The correlation tables between the observed variables are presented in Tables 4 and 5.

Table 1
Significance of the results of the analysis of variance in the effect of goat manure (K) and TSP (T) fertilizer and interaction (KxT) on all variables observed in chrysanthemum plants.

No	Variable observed	Treatment		
		(K)	(T)	(KxT)
1	Plant height (cm)	ns	*	ns
2	Number of leaves (cm)	ns	ns	ns
3	Leaf area (cm)	*	ns	ns
4	Stem diameter (cm)	ns	ns	ns
5	Flower diameter (cm)	*	*	ns
6	Flower stalk length (cm)	ns	ns	ns
7	Long weight of flower stalk (g)	*	ns	ns
8	Economical fresh flower weight (g)	*	ns	ns

Description: ns = Not significant (P> 0.05)
* = Significantly influential (P<0.05)
** = very significant effect (P<0.01)

Table 1 shows that the interaction between goat manure and TSP fertilizer (KxT) has no real effect (P≥ 0.05) on all observed variables. The goat manure treatment had no significant effect on most of the observed variables except for leaf area, flower diameter, long weight of flower stalks and fresh economic weight of flowers. While the TSP fertilizer treatment had a significant effect on plant height, flower diameter and other variables had no significant effect.

The highest economic fresh weight of flowers was obtained in the treatment of goat manure at a dose of 45 tons ha-1 (K3), which was 48.25 g, or an increase of 23.97% compared to that without goat manure (K0), which was 38.92 g (Table 3). This is caused by the application of goat manure, where the nitrogen content in goat manure plays a role in increasing plant growth in the vegetative part of chrysanthemum plants [22]. The increase in the economic fresh weight of flowers was supported by the variable leaf area (r = 0.892*), flower diameter (r = 0.822*), flower stalk length (r = 0.956**) and flower stalk length weight (r = 0.999**) (Table 4). In this study, the highest leaf area was found in the treatment of goat manure with a dose of 45 tons ha-1 (K3), namely 107.66 cm2 but not significantly different from the treatment of K2 (100.99 cm2) and K1 (95.42 cm2) and the lowest in treatment without goat manure (K0) is 91.25 cm2 (Table 2).

The higher economic fresh weight of flowers in the K3 treatment compared to the K0 treatment, is inseparable from the function of goat manure and the nutrients contained therein which function to help improve soil structure so that root growth in the soil grows well and will determine plant growth above ground (lingga and marsono, 2010). such as an increase in leaf area. Increasing leaf area to the optimum limit will be able to increase photosynthetic activity so that more photosynthates are produced.

The photosynthate will be used for plant growth and development such as to extend flower stalks, increase flower diameter which will ultimately increase flower weight. In the opinion of Rahayu and Hasrat (2013) that goat manure contains 0.6% nitrogen, 0.3% phosphorus, and 0.17% potassium, where these elements are needed by plants for their growth, both vegetative and generative. The highest flower diameter and flower stalk length were obtained in the treatment of goat manure at a dose of 45 tons ha-1 (K3), namely 9.99 cm and 82.76 g respectively compared to the treatment without goat manure (K0), namely 9. 22 cm and 65.54 g (Table 3).

Table 2
The average plant height, number of leaves, leaf area and stem diameter at the type of goat cage dose (K) and TSP dose (T).

Treatment	Plant height (cm)	Number of leaves (cm)	Leaf area (cm^2)	Stem diameter (cm)
Goat manure (K)				
K_0 (0 ton ha^{-1})	109.63 a	54.55 a	91.21 b	9.22 b
K_1 (15 ton ha^{-1})	107.55 a	55.02 a	95.42. ab	9.55 ab
K_2 (30 ton ha^{-1})	109.24 a	55.33 a	100.99 ab	9.73 ab
K_3 (45 ton ha^{-1})	109.25 a	56.33 a	107.68 a	9.99 a
BNT 0,05	-	-	13,84	-
TSP Fertilizer (T)				
T_0 (0 kg ha^{-1})	108.23 b	55.15 a	92.38 a	9.40 b
T_1 (175 kg ha^{-1})	108.41 b	55.23 a	93.79 a	9.50 ab
T_2 (350 kg ha^{-1})	109.56 b	55.35 a	104.21 a	9.79 ab
T_3 (525 kg ha^{-1})	109.48 a	55.81 a	104.92 a	10.18 a
BNT 0,05	1,37	-	-	-

Note: The mean value followed by the same letter treatment and the same column means that the difference is not significant at the 5% BNT test level.

Table 3
The average flower diameter, flower stalk length, flower stalk length weight and flower fresh weight economically influenced the dose of goat cage (K) and TSP dose (T).

Treatment	Flower diameter (cm)	Flower stalk length (cm)	Long weight of flower stalk (g)	Economical fresh flower weight (g)
Goat manure (K)				
K_0 (0 ton ha^{-1})	5.13 a	103.66 a	65.54 b	38.92 b
K_1 (15 ton ha^{-1})	5.15 a	104.61 a	69.92 ab	42.94 ab
K_2 (30 ton ha^{-1})	5.14 a	110.66 a	82.06 a	44.08 ab
K_3 (45 ton ha^{-1})	5.19 a	109.86 a	82.76 a	48.25 a
BNT 0,05	0,72	-	15,36	8,47
TSP Fertilizer (T)				
T_0 (0 kg ha^{-1})	5.11 a	104.61 a	69.88 a	38.02 a
T_1 (175 kg ha^{-1})	5.12 a	107.72 a	72.38 a	41.31 a
T_2 (350 kg ha^{-1})	5.23 a	107.50 a	79.02 a	43.23 a
T_3 (525 kg ha^{-1})	5.14 a	109.26 a	76.13 a	41.63 a
BNT 0,05	0,72	-	-	-

Note: The mean value followed by the same letter treatment and the same column means that the difference is not significant at the 5% BNT test level.

The TSP fertilizer treatment gave the highest plant height obtained at a dose of 525 kg ha-1 (T_3), which was 12.67 cm, which was not significantly different at a dose of 350 kg ha^{-1} (T_2), which was 10.85 cm, a dose of 175 kg ha^{-1} (T_1) is 11.10 cm and the lowest is in the treatment without TSP fertilizer (T_0) which is 10.71 cm (Table 2). The highest flower diameter in the TSP fertilizer treatment dose of 525 kg ha^{-1} (T_3) was 10.18 cm and the lowest in the treatment without TSP fertilizer (T_0) was 9.40 cm (Table 3). For other variables, the application of TSP fertilizer did not have a significant effect, possibly because the P nutrient contained in the soil from the results of the previous soil analysis was very high (154.36 ppm) which caused the response of plants to the application of TSP fertilizer as a very low treatment. Supported by the opinion of [20], stating that the size, diameter and quality of flowers in the generative phase will be greatly influenced by the availability of the K nutrient, while the P nutrient plays a role in flower formation. Plant growth and production is determined by the rate of photosynthesis which is controlled by the availability of nutrients. Excess/deficiency of nutrients given to plants can result in poor photosynthetic processes thereby reducing photosynthate yields, so

the amount of photosynthate translocated to flowers decreases, indirectly reducing flower weight and quality.

From tables 4 and 5 it can be seen from the r value obtained from the relationship between variables compared to the r value of the table. Comparison can be done if the r value is calculated > r table which means there is a correlation between the variables connected. Then, if the value of r is calculated < r the table can be interpreted that there is no correlation between the variables that are connected. The aim is to find real and unreal results from research data [23].

Table 4.
Correlation table of goat manure treatment (K)

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	1							
2	0.248ns	1						
3	0.138ns	-0.884*	1					
4	-0.002ns	-0.628ns	0.395ns	1				
5	-0.792ns	-0.767ns	0.495ns	0.262ns	1			
6	-0.688ns	-0.358ns	0.289ns	-0.406ns	0.770ns	1		
7	-0.845*	-0.306ns	0.128ns	-0.334ns	0.811*	0.968**	1	
8	-0.866*	-0.286ns	0.892*	-0.328ns	0.822*	0.956**	0.999**	1

r (0.05, 6, 1) = 0,811 r (0.01, 6, 1) = 0,917

Table 5.
TSP fertilizer treatment correlation table (T)

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	1							
2	0.301ns	1						
3	0.087ns	0.464ns	1					
4	0.789ns	-0.338ns	-0.308ns	1				
5	-0.819*	-0.506ns	0.250ns	-0.539ns	1			
6	0.899*	0.014ns	-0.719ns	0.666ns	-0.838*	1		
7	0.901*	0.111ns	-0.353ns	0.857*	-0.894*	0.882*	1	
8	0.669ns	0.097ns	-0.642ns	0.677ns	-0.889*	0.994**	0.916*	1

r (0.05, 6, 1) = 0,811 r (0.01, 6, 1) = 0,917

Information :
1. Maximum Plant Height
2. Maximum number of leaves
3. Leaf Area
4. Stem Diameter
5. Flower Diameter
6. Length of flower stalk
7. Weight Length of Flower Stalk
8. Economic Fresh Weight of Flowers

4. Conclusion

Based on the results of the research it can be concluded that: the interaction between goat manure and TSP fertilizer had no significant effect on all observed variables. Treatment of goat manure had a significant effect only on leaf area, flower diameter, long weight of flower stalks, fresh weight of economic flowers and other variables had no significant effect. The highest economic fresh weight of flowers was obtained from goat manure at a dose of 45 tons ha^{-1}, namely 48.25 g, an increase of 23.97% when compared to no goat manure, namely 38.92 g. TSP fertilizer treatment had a significant effect only on plant height, flower diameter and other variables had no significant effect. The highest plant height and flower diameter were obtained in the TSP fertilizer treatment with a dose of 525 kg

ha^{-1}, namely 12.67 cm and 10.18 cm compared to those without TSP fertilizer application, namely 10.71 cm and 9.40 cm.

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