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The Effect of Administration of Cow Stage And Npk Fertilizer On The Growth and Results of Chrysan Plants (Chrysantthemum morifolium, R.)

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Abstract

Chrysanthemum (chrysanthemum morifolium R.), is an ornamental plant that has economic value and has the potential to be developed in national and international trade. This study aims to determine the effect of the type of cow manure and NPK fertilizer dosage on growth and yield of chrysanthemum plants. The hypothesis put forward in this study was that cow manure (20 tons ha-1) and NPK fertilizer doses (1000 kg/ha) could increase growth and yield of chrysanthemum plants. The experimental design used in this study was a factorial randomized block design with 2 treatments, namely the type of organic cow manure (S) consisting of 4 levels, namely: S0 = without cow manure, S1 = 10 ton/ha-1 cow manure, S2 = 20 tons/ha-1 cow manure, S3 = 30 tons/ha-1 cow manure, and the dosage of NPK fertilizer consists of 4 levels, namely: D0= without NPK fertilizer, D1= 1000 kg/ha, D2= 2000 kg/ha, D3 = 3000 kg/ha. Research data were analyzed statistically using analysis of variance. For a single treatment that had a significant to very significant effect, it was continued with the LSD test at the 5% level. The results of statistical analysis showed that the interaction between the type of cow manure and the dose of NPK fertilizer (S x D) had no significant effect on (P≥0.05) on all observed variables. The highest economic fresh weight of flowers was obtained at the type of manure 20 tons/ha, namely 26.53 g, compared to no organic fertilizer, namely 23.55 g. The highest economic fresh weight of flowers was at a dose of NPK 1000 kg/ha (D1), namely: 26.26 g, compared to NPK 2000 kg/ha is 24.98 g.

Keywords: Chrysanthemum plant, cow manure, NPK fertilizer dose

1. Introduction

Ornamental plants are one of the horticultural commodities that are in great demand by the public, because they have various colors and shapes. Ornamental plants include leaf ornamental plants and flower ornamental plants. One of the ornamental flower plants is the chrysanthemum plant (chrysanthemum morifolium). The attractiveness of the chrysanthemum plant includes its various colors, types and shapes (Kahar, 2008) Chrysanthemum is also used in the health sector, namely consumed as herbal tea or medicinal tea (Arista, 2016; Ariesna *et al*., 2014). Chrysanthemum plant is the most popular plant and has high demand, chrysanthemum plant has relatively high economic value and has the potential to be developed as a basic component in good agribusiness because it has many uses such as raw material for the perfume industry, cosmetic fragrances, traditional medicine, sowing flowers, and flower arrangement. Flowers have become a part of Indonesian life. Currently, chrysanthemum is one of the most popular flowers in Indonesia as cut flowers because it has the advantage of being rich in color, various varieties, and long lasting (Arjana, 2015).

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. 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 (Abrol *et al*., 2018; Kjaer *et al*., 2011)

Chrysanthemum is a subtropical plant which is ideally cultivated in the highlands (elevation 700-1200 masl). The highland environment supports the growth and development of chrysanthemum plants. The air temperature in the highlands is higher than the lowlands and the humidity is higher affecting the soil. Chrysanthemum production in Indonesia has started to increase from year to year. This increase in production shows that Indonesia has business potential for chrysanthemum plants. The chrysanthemum business in Indonesia has considerable export opportunities in line with the increase in chrysanthemum flowers (Rahayu, 2013). Fertilization is an important factor in plant cultivation, especially in intensive cultivation. High quality leaves and flowers are greatly affected by nitrogen and potassium fertilization at the start of chrysanthemum growth. Chrysanthemum plants need fertilizer so that the plants grow optimally and can produce well. Sources of nutrients can be obtained from organic fertilizers or inorganic fertilizers. The most dominant elements in inorganic fertilizers are N, P, and K. Several types of nitrogen fertilizers used by ornamental plant farmers are NPK and KNO3. NPK fertilizer contains more complete nutrients, namely nitrogen, phosphorus and potassium, usually having a balanced percentage of nutrient content, for example 16:16:16 (Sutater, 2015; Situmeang *et al*., 2011).

2. Material and Methods

Pada This research was conducted in Pancasari Village, Sukasada sub-district, Buleleng Regency, Bali with an altitude of 1247 meters above sea level. The research was carried out for 3 months, from April to July 2022. This research used standard type (single flower) and spray type (multiple flower) chrysanthemum seeds. This experiment used a factorial randomized block design with 2 treatments, namely doses of organic fertilizer (cow manure) and NPK fertilizer with each treatment as follows: Dosage of cow manure consisted of 4 levels, namely: S0 = Without cow manure, S1 = 10 tons/ha-1 cow manure, S2 = 20 tons/ha-1 cow manure, S3 = 30 tons/ha-1 cow manure. NPK fertilizer dose treatment (D) consisted of 4 levels, namely as follows: D0 = Without NPK fertilizer, D1 = 1000 kg/ha-1, D2 = 2000 kg/ha-1, D3 = 3000 kg/ha-1, With Thus, 16 combination treatments were obtained, each of which was repeated 3 times so that 48 experimental plots of chrysanthemum were treated. The results of the soil analysis in Table 1 are as follows:

Table 1. Results of Soil Analysis of Research Sites

No.	Type of analysis	value	Descprition
1.	Texture		
	Sand (%)	61,59	Sandy Loam
	Dust (%)	15,80	
	Clay (%)	22,61	
2	Water content		
	Air dry (%)	4,22	
	Field capacity (%)	31,59	
3	pH (1:2,5) H20	6,9	Neutral
4	Electrical conduct	0,53	Very Low
5	N – Total (%)	0,27	currently
6	P – Available (ppm)	154,36	Very High
7	K – Available (ppm)	257,62	High
8	C – Organic (%)	2,44	currently

The tools used in this study were as follows: hoes, buckets, trowels, hammers, gembor, sprayers, plant enforcement nets, lighting installations, label paper, tape measure, analytical scales, vernier calipers, stationery, scissors, knives, lights, timers, ruler, mica plastic, poly bag, measuring cup. Administration of Treatment After the experimental plots were completed, the treatment was continued 1 week before planting in each experimental plot, according to the dose and level of treatment being tried. Following are the dosage requirements for cow manure (S) and NPK fertilizer

doses (D) per m2. Planting was carried out 1 week after giving treatment to each plot, by first installing a plant enforcer net and continuing to make planting holes, the spacing of the planting holes was 12 x 12 cm, planting was done in the afternoon.

3. Result and Discussion

3.1 Results

The results of statistical analysis of all variables observed in the study are presented in Appendices 1 to 5. Based on the results of the analysis, the significance of organic cow manure (S) and NPK fertilizer doses (D) and their interactions (S x D) were obtained for all observed variables. can be seen in Table 2. below.

Table 2. Significance of the results of the analysis of variance on the effect of doses of organic cow manure (S) and NPK fertilizer doses (D) and their interactions (S x D) on all variables observed in chrysanthemum plants.

No	Variable	Treatment		
		(S)	(D)	(S x D)
1	maximum plant height (cm)	ns	ns	ns
2	Maximum number of leaves (strands)	ns	**	ns
3	Maximum leaf area (cm)	ns	ns	ns
4	Maximum rod diameter (cm)	ns	ns	ns
5	Maximum flower stalk length (cm)	ns	ns	ns
6	Flower diameter(cm)	ns	ns	ns
7	Long weight of flower stalk (g)	ns	ns	ns
8	Economic fresh weight of flower (g)	*	ns	ns

Information: * = significant effect, ** =very significant effect, ns = not significant

1. Maximum Plant Height (cm)

The results of statistical analysis showed that the interaction of cow manure with NPK fertilizer doses (S x D) had no significant effect ($p>0.05$), cow manure (S) had no significant effect ($p>0.05$) and fertilizer doses NPK (D) had no significant effect ($p>0.05$) on plant height. Table 4.2 shows that the type of cow manure (S1) 10 tons/ha-1 gave the highest plant height, namely 74.55 cm, which was not significantly different from the other treatments. While the treatment of NPK fertilizer (D2) 2000 kg/ha-1 gave a plant height of 77.72 cm, which was not significantly different from the other treatments.

2. Maximum Number of Leaves (leaves)

The results of statistical analysis showed that the interaction of cow manure with NPK fertilizer dose (S x D) had no significant effect ($p>0.05$), cow manure (S) had no significant effect ($p>0.05$) and the dose of NPK fertilizer (D) had a very significant effect ($p<0.01$), on the maximum number of leaves. Based on table 4.2, it shows that the dose of cow manure (S2) 20 tons/ha-1 gives the highest maximum number of leaves of 13.17 leaves with the lowest yield found at the dose of cow manure (S3) 30 tons/ha-1 12.25 leaves. The dose of NPK fertilizer (D1) 1000 kg/ha-1 gave a maximum number of leaves of 13.88 leaves and the lowest was at (D3) 3000 kg/ha-1 11.31 leaves. **Leaf area (cm)** The results of statistical analysis showed that the interaction of cow manure with NPK fertilizer dose (S x D) had no significant effect ($p>0.05$), cow manure (S) had no significant effect ($p>0.05$) and NPK fertilizer dose (D) had no significant effect ($p>0.05$), on maximum leaf area. Based on table 4.2, it shows that the type of cow manure (S2) 20 to/ha-1 gives the highest maximum total leaf area of 107.68 cm with the lowest yield obtained at (S0) without cow manure, namely 91.21 cm. The dose of NPK fertilizer of 1000 kg/ha (D1) gave a maximum total leaf area of 104.92 cm and the lowest was obtained without NPK fertilizer (D0), which was 92.38 cm.

3. Maximum Stem Diameter (cm)

The results of statistical analysis showed that the interaction of cow manure with doses of NPK fertilizer (S x D) had no significant effect (p>0.05), cow manure (S) had no significant effect (p>0.05) and the dose of NPK fertilizer (D) had no significant effect (p>0.05) on the maximum stem diameter. Table 4.2 shows that organic fertilizer (S3) 30 tons/ha-1 gave the highest stem diameter of 3.37 cm which was not significantly different from the dose of cow manure (S1) 10 tons/ha-1 3.20 cm. NPK fertilizer dose (D1) 1000 kg/ha-1 gave the highest stem diameter of 3.42 cm with the lowest obtained at dose (D2) 2000 kg/ha-1 3.24 cm.

Tabel 3. Average plant height, number of leaves, leaf area and stem diameter in organic fertilizer (S) and doses of NPK fertilizer (D).

Treatment	Plant height (cm)	Number of leaves (cm)	Leaf area (cm^2)	Stem Diameter (cm)
Cow manure				
(S0) No feltilizer	74.39 a	12,96 a	91.21 a	3.28 a
(S1) 10 tons/ha^{-1}	74.55 a	12.27 a	95.42 a	3.20 a
(S2) 20 tons/ha^{-1}	72.57 a	13.17 a	107.68 a	3.37 a
(S3) 30 tons/ha^{-1}	74.13 a	12.25 a	100.99 a	3.37 a
BNT 5%	-	-		
NPK Dosage (D)				
(D0) No feltilizer	70.79 a	12.92 a	92.38 a	22.48 a
(D1) 1000 kg/ha^{-1}	75.20 a	13.88 a	104. 92 a	20.05 b
(D2) 2000 kg/ha^{-1}	77.72 a	12.54 ab	93.79 a	18.32 b
(D3) 3000 kg/ha^{-1}	71.94 a	11.35 b	104.21 a	18.40 b
BNT 5%	-	1.44	-	-

Description: The average value followed by the same letter in the same column shows no significant difference in the BNT test at the 5% level

4. Maximum flower stalk length (cm)

The results of statistical analysis showed that the interaction of cow manure with NPK fertilizer doses (S x D) had no significant effect (p>0.05), cow manure (S) had no significant effect (p>.05) and NPK fertilizer dose (D) had no significant effect (p>0.05) on flower stalk length. Table 4.3 shows that the dose of cow manure gave the highest flower stalk length, namely (S2) 20 tons/ha-1 85.50 cm which was not significantly different from (S1) 10 tons/ha-1 79.67 cm. The dose of NPK (D1) 1000 kg/ha-1 gave the highest flower stalk length of 84.67 cm, with the lowest obtained at the dose of NPK (D2) 2000 kg/ha-1 78.48 cm.

5. Flower Diameter (cm)

The results of statistical analysis showed that the interaction of cow manure with NPK fertilizer dose (S x D) had no significant effect (p>0.05), cow manure (S) had no significant effect (p>0.05) and NPK fertilizer dose (D) had no significant effect (p>0.05) on flower diameter. Table 4.3 shows that the type of cow manure organic fertilizer (S0) without cow manure, gave the highest flower diameter of 6.80 cm which was not significantly different from cow manure (S3) 30 tons/ha-1 6.68 cm. The dose of NPK (D1) 1000 kg/ha-1 gave the highest stem diameter of 6.84, with the lowest obtained at no dose of NPK (D0) 6.65 cm.

6. Flower Stalk Length Weight (g)

The results of statistical analysis showed that the interaction of cow manure with NPK fertilizer doses (S x D) had no significant effect (p>0.05), cow manure (S) had no significant effect (p>0, 05) and the dose of NPK fertilizer (D) had no significant effect (p>0.05) on the long weight of flower stalks. Table 4.3 shows that the type of cow manure organic fertilizer (S1) 10 tons/ha-1 gave the

highest flower stalk length weight of 21.06 g which was not significantly different from other treatments. The dose of NPK fertilizer (D2) 2000 kg/ha-1 gave the highest flower stalk length weight of 21.38 g, with the lowest obtained at the dose of NPK fertilizer (D1) 1000 kg/ha-1 which was 20.53 g.

7. Fresh Weight of Economic Interest (g)

The results of statistical analysis showed that the interaction of cow manure with NPK fertilizer dose (S x D) had no significant effect (P≥0.05), the type of organic fertilizer (S) had a significant effect (P<0.05) and NPK fertilizer dose (D) had no significant effect (p>0.05) on fresh weight of economic flowers. Table 4.3 shows that the type of cow manure (S2) 20 tonnes/ha-1 gave the highest economic fresh weight of interest, namely 26.53 g, which was not significantly different from the other treatments. The dose of NPK (D1) 1000 kg/ha-1 gave the highest fresh economic weight of 26.26 g, which was not significantly different from the treatment.

Table 4. Average flower stalk length, flower diameter, flower stalk length weight, fresh weight of economic flowers at doses of cow manure and NPK fertilizer doses.

Treatment	Maximum flower stalk length(cm)	Flower diameter(cm)	Long weight of flower stalk (g)	Economic fresh weight of flower (g)
Cow manure				
(S0) No feltilizer	82.79 a	6.80 a	20.65 a	23.55 b
(S1) 10 tons/ha^{-1}	79.67 a	6.59 a	21.06 a	25.78 ab
(S2) 20 tons/ha^{-1}	85.50 a	6.64 a	20.93 a	26.53 ab
(S3) 30 tons/ha^{-1}	79.34 a	6.68 a	20.77 a	24.84 a
BNT 5%	-	-	-	1.65
NPK Dosage (D)				
(D0) No feltilizer	82.79 a	6.65 a	20.65 a	25.94 a
(D1) 1000 kg/ha^{-1}	84.67 a	6.84 a	20.53 a	26.26 a
(D2) 2000 kg/ha^{-1}	78.48 a	6.48 a	21.38 a	25.51 a
(D3) 3000 kg/ha^{-1}	81.36 a	6.74 a	20.85 a	24.98 a
BNT 5%	-	-	-	-

Description: The average value followed by the same letter in the same column shows no significant difference in the BNT test at the 5% level.

3.2. Discussion

The results of this study showed that the highest economic fresh weight of interest was obtained for cow manure (S2) 20 tons/ha-1, namely 26.53 g, compared to no fertilizer (S0), namely 23.55 g. The increase in economic fresh weight of flowers was supported by a significant correlation with the variable diameter of flowers (r=0.997**). The higher economic fresh weight of flowers in treatment S2 compared to S0, is inseparable from the function of cow manure which can help improve soil structure so that deep root growth Planting plants can grow well and will determine the growth of plants above ground such as increasing the number of leaves and leaf area. The increase in the economic fresh weight of flowers is due to the increased leaf area. Leaves are the main photosynthetic organs that carry out the function of transferring and exchanging important energy gases (Andrieu, 2016).

Therefore, leaf area is an important parameter in the growth and development of good chrysanthemum flowers. 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. The highest flower stalk length and flower stalk length were obtained in the treatment of cow manure dose (S2) 20 tons/ha-1, namely 85.50 cm and 20.93 g respectively compared to the treatment without cow manure (S0), namely 82.79 cm and 20.65 g.

The highest fresh weight of economic interest was found in the dose of NPK 1000 kg/ha (D1), which was 26.26 g, compared to the dose of NPK 3000 kg/ha (D3) which was 24.98 g. The application of NPK fertilizer doses has a very significant effect on the number of leaves, this is because NPK fertilizer is fast release (decomposes quickly) which is very suitable for plants that need and take advantage of the fast availability of nutrients such as chrysanthemum plants. NPK fertilizer is able to provide nitrogen in sufficient quantities and is available to meet the needs of plant nutrients. The elements N, P and K have their respective functions which are equally important for plant growth both in the vegetative phase and during the generative phase.

Table 5. Correlation between variables due to the influence of cow manure

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	1							
2	0.046ns	1						
3	0.219ns	0.985**	1					
4	0.219ns	0.120ns	0.133ns	1				
5	-0.516ns	0.320ns	0.241ns	-0.836*	1			
6	-0.844*	-0.215ns	-0.345ns	-0.696ns	0.772ns	1		
7	-0.528ns	-0.868*	-0.941**	-0.121ns	-0.090ns	0.548ns	1	
8	-0.857*	-0.146ns	-0.280ns	-0.688ns	0.801ns	0.997**	0.497ns	1

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

Table 6. correlation between variables due to the influence of NPK fertilizer doses

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	1							
2	-0.318ns	1						
3	-0.034ns	0.187ns	1					
4	-0.459ns	-0.262ns	0.699ns	1				
5	-0.435ns	0.128ns	0.897*	0.904*	1			
6	-0.511ns	-0.640ns	-0.286ns	0.483ns	0.097ns	1		
7	0.333ns	0.066ns	-0.887*	-0.950**	-0.980**	-0.185ns	1	
8	-0.959**	0.428ns	0.306ns	0.581ns	0.643ns	0.341ns	-0.530ns	1

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

Information:

1. Plant Height
2. Number of Leaves
3. Stem Diameter
4. Flower Diameter
5. Long flower stalk
6. Leaf Area
7. The weight of the flower stalk
8. Economical Fresh Weight of Flowers

ns = Not significant (P>0.05)

* = Significant effect (P<0.05)

** = Very significant effect (P<0.01)

4. Conclusion

From the results of the above research it can be concluded as follows: The interaction between organic fertilizers and NPK fertilizer doses (S x D) had no significant effect on all observed variables. The cow manure treatment had no significant effect (p>0.05) on most of the variables observed and had a significant effect (p<0.05) on the economic fresh weight of interest, the NPK fertilizer treatment had no significant effect (p>0.05) on most of the variables and very significant effect (p<0.01) on the number of leaves.

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Referensi

Ariesna, F. D, Sudiarso and Herlina, N. 2014. Respon 3 varietas tanaman krisan pada berbagai cahaya tambahan. Jurnal Produksi Tanaman, 2(5), 410-426.

Arjana, I G, M. 2015. *National Featured Chrysanthemum Cultivation*. Warmadewa University Faculty of Agriculture. Denpasar.

Arjana, I. G. M., Situmeang, Y. P. and Suaria, I. N. (2015). Study of Development Potential Chrysanthemum in Buleleng Regency. International Journal on Advanced Science, Engineering and Information Technology, 5(5), 350-354

Andrieu, R. 2016. *Leaf Area in Plants*. New Press Library. Yogyakarta. 170 p.

Abrol, A.S.R. 2018. "Technology Package Engineering in Cultivation in the Context of Increasing Production and Quality of Chrysanthemum Flowers (C. Morifolium, R.)

Arista, R.S. 2016. Ornamental Plants and Cultivation. PD. Crown, Jakarta.

Kahar, S. A. (2008). Effects of photoperiod on growth and flowering of *Chrysanthemum morifolium* Ramat cv. Reagan Sunny. Journal of Tropical Agriculture and Food Science, 36(2), 1–8

Kjaer, K. H., & Ottosen, C. O. (2011). Growth of chrysanthemum in response to supplemental light provided by irregular light breaks during the night. Journal of the American Society for Horticultural Science, 136(1), 3–9.

Rahayu, SM and Hasrat EP. "Addition of organic matter to chrysanthemum (Dendrathema grandiflora travelve) growth media in vitro". Bull. Agrohorti 1 (4): 94-100 (2013).

Situmeang, Y. P. (2011). Respon Tanaman Krisan pada Pemberian Dosis Pupuk Kandang Ayam dan TSP. Gema Agro, 11 (29), 6-13.

Sutater, T. (2015). Dosage of N and K fertilizers on chrysanthemum plants. J. Hort, 2(2), 59.