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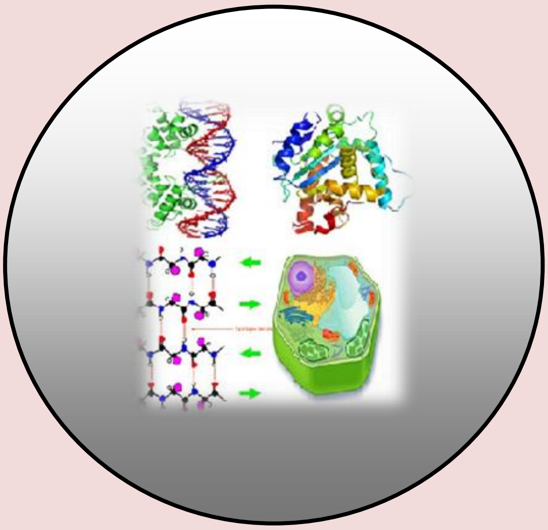

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RESEARCH PAPER

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High Light Variations and Utilization of Mud Lakes in Culture Cut Flow

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ABSTRACT

This study aims to determine the variation of lamp height and utilization of lake mud and its interactions on chrysanthemum plants. The method of data analysis used Analysis of Variants with Factorial Randomized Group Design of two treatment factors, and each factor consisted of 3 levels and 4 levels so that there were 12 combination treatments repeated 3 times so that there were 36 experimental plots. The results showed that the treatment of variations in lamp height and utilization of lake sludge had a very significant effect on all observed variables, while the interaction between treatment of lamp height variation and utilization of lake sludge was significant to very real for all variables observed. The highest economic yield of fresh flowers was obtained from the interaction of variations in lamp height 2 m from the bed surface and utilization of 15 tons ha^{-1} lake sludge sediment amounting to 127.90 g, and the lowest was in the interaction between lamp height variations 3 m from the bed surface and without silt the lake is 83.30 g, an increase in yield of 34.87% when compared to the lowest interaction treatment.

Keywords: Lamp Height Variations; Mud Lake and Chrysanthemum.

INTRODUCTION

Chrysanthemum plants, also known as Seruni flowers, are important commodities in the world in international trade. This ornamental plant has a high economic value so that it is potential to be developed commercially (Arjana, Situmeang, and Suaria, 2015). The prospect of chrysanthemum cultivation as cut flowers is very bright, because the potential market that can be highly absorbent, is still very wide open to be developed because of the vast market needs besides the export market as well as the local market. Currently chrysanthemum is the most popular flower in Indonesia as a cut flower, because it has the advantage of being rich in color, variety, and long-lasting (Sartika 1998 and Arjana *et al* 2015). Chrysanthemum flowers have a high economic value and have the potential to be developed as a basic component in agribusiness both as cut flowers, potted ornamental plants, and medicinal plants (Rukmana, 1997).

Chrysanthemum cultivation business has developed in various production centers in Indonesia as a source of profitable farmers' income. Along with the increasing market demand, chrysanthemum cultivation which was initially concentrated on Java Island, has now spread to Bali. The increasingly rapid development of tourism also has an impact on a variety of horticultural products needed to meet the demands of a quality market and guaranteed continuity, as Bali is a tourist area so the market potential of chrysanthemums is very promising for individual consumers such as florists, weddings and days- big day. As well as institutional consumers (hotels, banks and government and private sector offices). Thus, the development of ornamental plants is directed towards referring to market needs, as well as comparative and economic value benefits. In addition, the development must be in accordance with the potential of resources, agro-climate conditions, agro-ecosystem of a region, supporting facilities and infrastructure and market prospects. According to statistical data on ornamental plants, the Office of Agriculture for Food Crops of the Province of Bali from 2005-2007 continued to increase (2005 = 14,909 stalks, 2006 = 49,783 stalks and 2007 = 59,587 stalks).

Modern and efficient crop management provides many benefits for farmers who cultivate it in various regions. Not all potential areas have been planted with ornamental plants, because various considerations, for example, are located far from the marketing center, there is no adequate infrastructure, limited knowledge of cultivation, harvesting, and post-harvest handling and agro-climate which is not compatible with chrysanthemum cultivation (Darti, 1992).

The problem faced by chrysanthemum farmers in new centers outside Java, especially Bali is knowledge about the cultivation of chrysanthemums, one of which is to regulate the height of the lamp from the bed surface, which will have an impact on plant growth and development that is not in accordance with the standard height of chrysanthemum cut flowers. The optimum lamp height for chrysanthemum cultivation used by chrysanthemum farmers is 2 m above ground level. And dosage determination for lake sludge which is not in accordance with cultivation conditions, is the cause of the low production and quality of chrysanthemum flowers which influence the price of selling chrysanthemums as cut flowers. The use of the optimum dose of lake mud in chrysanthemum cultivation is 10 tons ha^{-1}.

Based on the foregoing, it is necessary to do a study of Lamp Height and Utilization of Lake Mud Deposits in Chrysanthemum Cut Flowers in supporting the production and quality of chrysanthemum flowers which at the same time can increase farmers' income.

MATERIAL AND METHODS

The research method was carried out by using factorial pattern randomized group design carried out in the field in greenhouse, using two factors, namely the variation of lamp height consisting of 3 levels, namely: 1 m from the bed surface, 2 m from the bed surface and 3 m from the bed surface. Whereas lake sludge doses consist of 4 levels, namely: without sludge, 5 tons ha^{-1},10 tons ha^{-1}, and 15 tons ha^{-1}. If the analysis of variance shows a real to very real effect on single factors followed by the smallest real distance test and Duncan test 'if the interaction has a real effect to be very real (Hanafiah, 2001).

Operational variables observed include; maximum plant height (cm), stem diameter (cm), flower stem length (cm), flower diameter (cm) and economic weight of fresh flowers (g). The measurement of variables carried out is as follows; plant height is measured from the ground to the highest end of the plant, observations are made at the age of 2 weeks after planting to the maximum plant height. Stem diameter was observed using a calipers at the age of 1, 2 and 3 months after planting. The length of the flower stalk is observed at harvest from the base of the stem to the end of the flower. The diameter of the flower is measured by the calipers at the time of harvest from each flower formed by 10 flowers. The economic weight of fresh flowers is measured by weighing the economical length of 80 cm of fresh flowers.

RESULTS AND DISCUSSION

Significance of the effect of lamp height variation and utilization of lake sludge and their interactions on all variables observed in chrysanthemum can be seen in Table 1. The average interaction effect between variations in lamp height and utilization of lake sludge at maximum plant height (cm), stem diameter (cm), flower stalk length (cm), flower stalk weight (g), flower diameter (cm) and economic weight of fresh flowers (g) can be seen in Tables 2 to 7.

Table 1. The significance of the effect of lamp height variation and utilization of lake sludge and its interactions on all variables observed in chrysanthemum plants.

No	Variable	Treatment		
		High lamp variations	Lake mud deposition	Interaction
1	Maximum plant height (cm)	**	**	**
2	Stem diameter (cm)	**	**	*
3	The length of the flower stalk (cm)	**	**	**
4	Flower stalk weight (g)	**	**	*
5	Flower diameter (cm).	**	**	**
6	Economical weight of fresh flowers (g)	**	**	*

** = very significant (P<0.01), * = significant (P<0.05)

Table 2. Effect of interaction between high light variations and utilization of lake sludge on plants of maximum height.

Treatment	Lake mud deposition			
High lamp variations	0 ton ha^{-1}	5 ton ha^{-1}	10 ton ha^{-1}	15 ton ha^{-1}
1 m	82.99 c	85.39 c	86.39 c	86.72 b
2 m	84.66 c	123.11b	127.22 ab	137.28 a
3 m	74.28 c	78.78 c	84.50 c	85.22 c

Information: the average value followed by the same letter shows a difference that is not evident in the Duncan't 5% test

Table 3. Effect of interaction between variations in lamp height and utilization of lake sludge on stem diameter.

Treatment	Lake mud deposition			
High lamp variations	0 ton ha^{-1}	0 ton ha^{-1}	0 ton ha^{-1}	0 ton ha^{-1}
1 m	2.44 e	2.72 d	2.97 cd	3.19 abcd
2 m	2.69 de	3.32 abcd	3.47 abc	3.63 a
3 m	2.42 e	3.09 bcd	3.27 abcd	3.50 ab

Information: the average value followed by the same letter shows a difference that is not evident in the Duncan't 5% test

Table 4. Effect of interaction between variations in lamp height and utilization of lake sludge on flower stalk length.

Treatment	Lake mud deposition			
High lamp variations	0 ton ha^{-1}	0 ton ha^{-1}	0 ton ha^{-1}	0 ton ha^{-1}
1 m	87.30 d	88.79 d	90.73 d	95.41 c
2 m	84.66 d	130.09 b	138.00 ab	143.86 a
3 m	80.46 d	86.62 d	89.86 d	93.28 d

Information: the average value followed by the same letter shows a difference that is not evident in the Duncan't 5% test

Table 5. Effect of interaction between variations in lamp height and utilization of lake sludge on the weight of flower stalks.

Treatment	Lake mud deposition			
High lamp variations	0 ton ha^{-1}	0 ton ha^{-1}	0 ton ha^{-1}	0 ton ha^{-1}
1 m	110.22 bcdef	115.40 bcdef	118.06 bcdef	120.05 bc
2 m	120.00 bcd	126.44 a	144.18 a	149.58 a
3 m	94.45 f	98.83 f	104.99 ef	106.93 def

Information: the average value followed by the same letter shows a difference that is not evident in the Duncan't 5% test

Table 6. Effect of interaction between variations in lamp height and utilization of lake sludge at flower diameter.

Treatment	Lake mud deposition			
High lamp variations	0 ton ha^{-1}	0 ton ha^{-1}	0 ton ha^{-1}	0 ton ha^{-1}
1 m	7.03 e	8.13 cd	8.41 c	8.92 bc
2 m	8.63 bc	9.29 bc	9.66 b	12.33 a
3 m	7.43 d	7.94 cd	8.50 bc	8.80 bc

Information: the average value followed by the same letter shows a difference that is not evident in the Duncan't 5% test

Table 7. Effect of interactions between variations in lamp height and utilization of lake sludge on the economic weight of fresh flowers.

Treatment	Lake mud deposition			
High lamp variations	0 ton ha^{-1}	0 ton ha^{-1}	0 ton ha^{-1}	0 ton ha^{-1}
1 m	85.22 f	92.07 ef	100.51 cd	107.28 c
2 m	110.20 bc	118.47 ab	120.33 ab	127.90 a
3 m	83.30 f	83.38 f	88.70 ef	99.16 de

Information: the average value followed by the same letter shows a difference that is not evident in the Duncan't 5% test

The results of analysis of variance showed that the treatment of variation in lamp height and utilization of lake sludge had a very significant effect ($P<0.01$) on all observed variables, while the interaction between the treatment of variations in lamp height and utilization of lake sludge was significant ($P<0.05$) to very real ($P<0.01$) of all variables observed.

The interaction between the treatment variation of lamp height 2 meters from the bed surface and the utilization of 15 tons ha^{-1} lake sludge, produced the highest average economic weight of fresh flowers per plant at 127.90 g, and the lowest at the interaction between lamp height variations 3 m from the bed surface and without the provision of lake sludge by 83.30 g, and an increase in the economic weight yield of fresh flowers was 34.87% when compared to the lowest interaction treatment. The interaction between the treatment variation of lamp height 2 meters from the bed surface and the utilization of 15 tons ha^{-1} lake sludge differed not significantly with the treatment of variations in lamp height 2 meters from the bed surface and utilization of lake sludge 5 tons ha-1, and 10 tons ha^{-1} (Table 7).

The high economic weight of fresh flowers on the interaction between the treatment variation of lamp height 2 meters from the bed surface and the utilization of 15 tons ha^{-1} lake sludge is supported by the high average plant height, stem diameter, flower stalk length, flower stalk weight and diameter flower. The growth of plant growth due to the administration of lake sludge is able to respond to chrysanthemum plants due to the inclusion of total N and total P from agricultural land of 22.46 tons/year and 2.44 tons/year to lakes, and community activities based on land use impact on water quality for N and P parameters, respectively are agriculture (62.15% and 78.56%). The impact of community activities on total N intake and total P from the catchment area causes high levels of N and P in lake water. The agricultural zone shows total N (0.41 mg/l) and total P (0.90 mg/l) (Endarini, 2004). This situation also has an impact on the quality of lake mud containing elements needed for plant growth and development. Water sediments are indicated to contain various organic and inorganic chemical elements because they are accumulations or the accumulation of various chemical processes that occur in the waters.

The results of the analysis also showed the presence of calcium and potassium in sediments, which are elements needed in large quantities (macronutrients) in fertilizers commonly used in agriculture and fisheries, where the concentration of these two elements in each fertilizer is different . Phosphate contained in waters will bind to other elements to form complex compounds and will dissolve or settle in sediments (Elfrida, 2011). Based on predictions, the total erosion at Lake Buyan reached 1723.84 tons which caused sedimentation of 413.72 tons per year, sedimentation at the bottom of the lake, also carrying chemical content (as plant nutrients, such as N, P, and K) (Antara Bali, 2010).

Chrysanthemums are classified as facultative short-lived plants, this characteristic implies that chrysanthemum plants will be induced to enter the generative phase and flowering if the length of the day received by plants is shorter than Critical Day (CDL). If the length of day the chrysanthemum plant receives in the juvenile period is longer than the CDL, the chrysanthemum plant will maintain its vegetative phase. With the basis of the characteristics of the chrysanthemum plant, to maintain the standard height of plants (flower stalk length) in chrysanthemum cut flowers, plants are maintained in the vegetative phase for a certain time to grow to a certain height with the application of artificial irradiation (Balai Penelitian Tanaman Hias, 2006). So that the variation of the lamp height of 2 meters from the surface of the beds is closely related to the intensity of light falling on the surface of plants ranging from 75-100 lux, adding light at night for 4 hours with a lamp height of 2 meters from the surface of the beds in accordance with the photoperiod required chrysanthemum plants cut, to extend the vegetative period before entering the generative phase.

Regarding the sensibility of chrysanthemum plants to light, the presence of light between these dark phases needs attention. The existence of light (light) between the dark phases during flowering induction (short days) will affect the growth of flowers, new branches will grow at the same time and over branching (Hicklenton, 1984). In addition, it will affect the growth and development of flowers that arise from changes in apical growth, the appearance of the flower will reduce the shape and physical quality of chrysanthemum flowers (Budiarto and Marwoto, 2007).

Interaction between the treatment variation of lamp height 2 meters from the bed surface and the utilization of 15 tons ha^{-1} lake sludge, the possibility of a 2 m lamp height from the bed surface provides better light intensity for plant growth and development. Light intensity influences the photosynthesis process of chrysanthemum plants. Photosynthesis requires nutrient intake sourced from lake sludge to produce high photosynthates to be translocated to parts of chrysanthemum plants to support the growth and development of chrysanthemum plants. Based on the quality requirements of fresh cut chrysanthemum from the National Standardization Agency (BSN) in 2007, the results showed that the AA quality standard for stem length was minimal (76 cm), flower diameter (>5 mm), and flower diameter (> 80 mm), thus the results of the study support standard quality demands.

CONCLUSIONS

Interaction between the treatment of variations in lamp height and utilization of lake sludge has a significant effect to very significant for all observed variables. The highest economic weight of fresh flowers is in the interaction of treatment variation of lamp height 2 meters from the bed surface with utilization of 15 tons ha^{-1} lake sludge of 127.90 g, and the lowest on the interaction of treatment of 3 m high light variation from the bed surface without giving lake mud deposition of 83.30 g, and an increase in the economic weight yield of fresh flowers was 34.87% when compared to the lowest interaction treatment. From the results of this study it can be suggested that chrysanthemum cultivation can be done by setting a 2 m lamp variation from the bed surface and utilization of lake mud deposits 5 tons ha^{-1}.

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