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Utilization of Chrysanthemum Leaf Extract and Molasses in the Cultivation of Chrysanthemum Cut Flowers

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A B S T R A C T

This research aims to determine the effect of extraction of chrysanthemum and molasses leaves and their interactions on growth and yield in the cultivation of chrysanthemum cut flowers. The research method uses a randomized block design of factorial patterns with two factors, namely: extract of chrysanthemum leaves consisting of four levels each: 250 g l^{-1}, 500 g l^{-1}, 750 g $l^{-1,}$ and 1000 g l^{-1}, as well as molasses, consists of three levels respectively: 5 ml l^{-1}, 10 ml l^{-1} and 15 ml l^{-1}. The combination treatment of 12 was repeated 3 replications. The results showed that the interaction between the extraction of chrysanthemum leaves and molasses had not significantly affected all the observed variables. The extraction treatment of chrysanthemum leaves has a significant effect ($P<0.05$) to very significant ($P < 0.01$) on all observed variables except at maximum plant height and stem diameter. The extraction treatment of chrysanthemum leaves 1000 g l^{-1} resulted in the average fresh weight of flower stalks and the highest economic fresh weight of 133.67 g and 110.27g respectively. There was an increase in yield by 24.99% and 26.71% when it was compared to the lowest treatment. Molasses treatment exerts a significant effect ($P < 0.05$) to a very significant ($P < 0.01$) influence on all observed variables, except on the diameter of the rod. Molasses treatment of 15 ml l^{-1} resulted in average fresh weight of flower stalks and the highest economic fresh weight of 120.79 g and 94.51 g compared to the lowest treatment, and there was an increase in yield by 11.86% and 25.51% compared to the lowest treatment

1. INTRODUCTION

1.1. Research Background

Chrysanthemum (*Dendranthema grandiflora*, Tzvelev) or known as Seruni flower, is an important commodity in the world in the international trade of ornamental plants and has a high economic value so that it has the potential to be developed commercially. The prospect of cultivating chrysanthemums as cut flowers is very bright because the potential market that can be high absorption is still very wide open related to the needs of a very wide market in addition to the export market as well as the local market. Currently, chrysanthemums are among the most popular flowers in Indonesia as cut flowers, because they have the advantage of being rich in color, variety, shape, and durable [1][2]. The use of chrysanthemums in each flower arrangement is very dominant until it reaches 30-65%. It is quite prospective to continue to be developed both quality, quantity, and development of the chrysanthemum business industry. The chrysanthemum cultivation business, which was originally concentrated on the island of Java, has now spread widely to Bali.

The data in the last five years shows that the production of cut flowers from year to year has increased on average by about 31.6%. Of the total 9 types of cut flowers in 2012, it shows that the largest production is chrysanthemum flowers reaching about 64.79% of the total production of 9 types of cut flowers. Chrysanthemum production experienced an average growth of 43.2% per year, greater and largest than the average growth of cut flowers [3].

Chrysanthemum flower production in Java and Bali has not been able to meet the needs of the market because productivity is still low. Increased production needs to be continuously improved both through extensibility and intensification. Planting chrysanthemums in Bali is only concentrated in Buleleng and Tabanan regencies so it needs to be developed in other potential areas. Potential areas have not been planted with ornamental plants, due to various considerations such as location away from the marketing center, absence of adequate infrastructure, limited knowledge of cultivation (special maintenance), harvesting, and post-harvest handling. Increased production through intensification along with the problems faced, including pest and disease attacks, planting distance regulation, soil moisture regulation with mulch, determination of optimal doses of organic and organic fertilizers, post-harvest (sorting, assessment, and packaging), and management of production systems. This cultivation factor is the cause of the low production and quality of chrysanthemum flowers that affect the selling price of

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chrysanthemums as cut flowers [4] [5]. One of the special maintenance carried out in the cultivation of chrysanthemums is deflating the lower leaves, which aims to reduce leaf damage both physically and biotically [6]. The results of the arrangement of the leaves will produce enough leaf residue so that it has the potential to be used as liquid organic fertilizer with the addition of molasses, to be returned to cultivation to prevent environmental pollution.

The question that is the problem of this study is whether the extraction of chrysanthemum leaves and molasses can increase the growth and yield of chrysanthemum plants? Is there an interaction between giving chrysanthemum leaf extract and molasses on improving the yield and quality of chrysanthemum plants?

1.2. The Research Objective

This research aimed to determine the effect of chrysanthemum leaves extract and molasses and their interactions on growth and yield in the cultivation of chrysanthemum cut flowers.

2. MATERIAL AND METHOD

2.1. Location, time, and research materials

The research is located in Pancasari Village, Sukasada District, Buleleng Regency, which is 60 km from Denpasar city, with a place altitude of 1,247 meters from sea level and an average temperature of 17 °C to 20 °C. Research materials used include chrysanthemum cutting seeds (spray type) varieties White Reagent (Figure 1) chrysanthemum leaves resulting from weaning/arrangement, molasses, distilled water, fungicides, insecticides, rooticides, and organic fertilizers.

Figure 1. Planting plants on each Block

2.2. Research methods

The research used two factors of factorial design, namely: extract of chrysanthemum leaves consisting of four levels each: 250 g l^{-1}, 500 g l^{-1}, 750 g l^{-1}, and 1000 g l^{-1}, as well as molasses, consists of three levels respectively: 5 ml l^{-1}, 10 ml l^{-1} and 15 ml l^{-1}. The combination treatment of 12 was repeated 3 replications, so 36 plots of experiments were needed. With a trial tile size of 2 x 2 m, the distance between the plots is 30 cm and the distance between the repeats is 50 cm.

The implementation of experiments includes media preparation, weed cleaning, processing, and leveling of the soil for the cultivation of cut chrysanthemums as well as providing a suitable plant rooting system for the production of cut flowers, regulating soil aeration to maintain air exchange in the soil and accordance with the standards of land processing procedures. Before the soil is processed the soil is cleaned from the rest of the plant, the soil is hoeed 30 cm deep, then soil leveling is carried out.

Beddings, after the soil is processed then made beds with a size of 2 m x 2 m, the height of the bed is 30 cm, the distance between the beds is 30 cm, while the distance between repetitions is 50 cm. Planting was carried out in the afternoon with a planting distance of 12.5 cm x 12.5 cm. Plant maintenance, watering, extension, weeding, pest and disease control (Figure 2), and planting and plant development until harvest

Figure 2. Pest and Disease Control

Treatment was carried out in accordance with the level of treatment tried by spraying plants on the ground, applied 4 times at the age of 2, 4, 6, and 8 weeks after planting.

2.3. Observed variables

Observed variables include maximum plant height (cm). Observed at the age of two weeks after planting, measurements are continued weekly until the maximum height is reached. Measured from the base of the stem to the highest end of the plant. The diameter of the stem (cm). By measuring the diameter of the stem with the length of the hollow before harvest, by measuring the stem of the plant between the maximum height. Flower diameter (cm). Measured using the hollow term of a flower that has been in full bloom (Figure 3).

Figure 3. Variable Measurements on Flower Diameter

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The weight of the flower stalk (g), is measured by weighing the entire flower stalk with an electric scale at harvest (Figure 4)

Figure 4. Variable Measurement of Flower stalks

Fresh weight of economical flowers (g). Measured by weighing the fresh weight of economical flowers by 80 cm after harvesting with electric scales (Figure 5).

Figure 5. Fresh Weight Measurement of Economical Flowers

2.4. Research Data Analysis

Observational data is analyzed using variance analysis when a single treatment has a real or very real effect followed by the smallest significant difference test of the 5% level, and if there is a real or very real influence on the interaction is continued with LSD (Least Significant Different) test with a significant level of 5% [7].

3. RESULTS AND DISCUSSIONS

3.1. *Effect of Chrysanthemum Leaf Extraction (E) and Molasses (M) on Chrysanthemum Cut Flower Cultivation*

The results of the variance analysis showed that the extraction treatment of chrysanthemum leaves had a significant effect ($P > 0.05$) to very significant ($P > 0.01$) on all observed variables, except for the maximum plant height and stem diameter had no significant effect, while the treatment of molasses had a significant effect ($P > 0.05$) to very significant ($P > 0.01$) against all observed variables, except in the stem diameter variable had no significant effect. The interaction between the extraction treatment of chrysanthemum leaves and molasses does not have a significant influence on all the variables observed in the growth and development of chrysanthemum plants this is due to the result of no shared influence between the extraction treatment of chrysanthemum leaves with molasses, and there is only its influence from each of the two factors or only one factor that has an effect (Table 1).

3.2. *Effect of Chrysanthemum and Molasses Leaf Extraction treatment on growth variables (Figure 6)*

The treatment of increased extraction of chrysanthemum leaves from 250 g l^{-1}, 500 g l^{-1}, 750 g l^{-1}, and 1000 g l^{-1} resulted in the development of flower diameter, flower stalk weight, and fresh weight of economically higher flowers. The extraction treatment of chrysanthemum leaves 1000 g l^{-1} exerts a significant influence on the fresh weight of economical flowers at each level of treatment but has a non-significant effect on the extraction rate of chrysanthemum leaves 750 l^{-1} on the variable diameter of the flower and the weight of the flower stalk (Table 2).

The average fresh weight of the highest economic flower of 110.27 g is found in the chrysanthemum leaf extract treatment of 1000 l^{-1} and the lowest is found in the chrysanthemum leaf extract treatment of 250 $^{l-1}$ of 80.82 g, there is an increase in yield of 26.71% when compared to the lowest treatment.

Treatment of chrysanthemum leaf extracts that are getting higher at each treatment results in the highest variable observational average (Table 2). Plant growth due to the treatment of chrysanthemum leaf extract can provide a real response to chrysanthemum plants because chrysanthemum leaf extract contains elements such as N, P, K, Mg, Ca with an N content of 1.421%, P by 0.2262%, K by 4.819%, Mg by 0.1883%, and Ca by 0.419% [8]

Table 1. Effect of Chrysanthemum Leaf Extraction (E) and Molasses (M) on Chrysanthemum Cut Flower Cultivation

No	Variable	Treatment		
		Extraction of chrysanthemum leaves (E)	Molasses (M)	Extraction of chrysanthemum leaves x Molasses (EM)
1	Maximum plant height (cm)	ns	**	ns
2	Stem Diameter (cm)	ns	ns	ns
3	Flower diameter (cm)	*	*	ns
4	Weight of flower stalks (g)	*	*	ns
5	Fresh weight of economical flowers (g)	**	*	ns

Noted: * = significant, ** = very significant, ns = non-significant

Figure 6. Plant Growth after treatment

Nitrogen is an important irritant in the formation of chlorophyll, protoplasm, proteins, and nucleic acids. This element has an important role in the growth and development of all living tissues [9]. Phosphorus is an important constituent component of compounds for energy transfer (ATP and other nucleoproteins), genetic information systems (DNA and RNA), cell membranes (phospholipids), and phosphoproteins [10].

Potassium serves to balance the charges of the anion and affects the intake and transport of the anion potassium can also reduce the outbreak of certain diseases. The role of calcium is as a binder between phospholipid molecules or between phospholipids and membrane constituent proteins, causing the membrane to function normally in all cells. Calcium can also spur the activity of several enzymes while inhibiting enzyme activity [11].

Increased molasses treatment from 5ml l^{-1}, 10ml l^{-1}, and 15 ml l^{-1} resulted in maximum plant height development, flower diameter, flower stalk weight, and higher fresh weight of economical flowers (Table 2). The average maximum plant height, flower diameter, and highest flower stalk weight are 104.45 cm, 8.25 cm, and 120.79 g are found in molasses treatment of 15 ml $^{l-1}$ and the lowest is in molasses treatment of 5 ml l^{-1}. The treatment of giving molasses 15 ml l^{-1} is different from the treatment of 10 ml $^{l-1}$ on the variable diameter of the flower and the weight of the flower stalk. While the highest fresh weight of economic interest of 94.51 g is found in the treatment of giving molasses 15 ml l^{-1} and real-scale with other treatment levels, the lowest in the treatment of molasses 5 ml l^{-1} is 70.40 g. There is an increase in the yield of fresh weight of economic flowers Molasses 15 ml l^{-1} 25.51% when compared to the lowest treatment at the administration of molasses 5 ml l^{-1}.

Table 2. The average effect of Chrysanthemum leaf extraction treatment and molasses on all observed variables

Treatment	Maximum plant height (cm)	Stem Diameter (cm)	Flower diameter (cm)	Weight of flower stalks (g)	Fresh weight of economical flowers (g)
Extraction of chrysanthemum leaves					
250 g l^{-1}	86.30 a	0.75a	6.63a	100.26b	80.82d
500 g l^{-1}	89.08 a	0.77 a	6.85a	108.50b	90.64c
750 g l^{-1}	93.23 a	0.78a	7.56ab	112.15ab	91.67b
1000 g l^{-1}	123.47a	1.80a	8.50a	133.67a	110.27a
LSD 5%	*tn*	*tn*	1.54	21.56	16.96
Molasses					
5 ml l^{-1}	87.37b	0.75 a	5.16b	106.46b	70.40c
10 ml l^{-1}	88.94b	0.76a	7.62a	108.18ab	88.64b
15 ml l^{-1}	104.45a	0.79a	8.25a	120.79a	94.51a
LSD 5%	14.23	*tn*	2.15	9.23	14.69

Description: The numbers in the same column for each factor followed by the same letter do not differ markedly on the 5% significant level.

Increased plant growth and development on each variable observed in the treatment of molasses administration of 15 ml $^{l-1}$ is due, molasses can help convert some chemical nutrients into forms that are easily available for use by plants and organisms, in addition to molasses containing sulfur, potassium, iron, and micronutrients, carbohydrates, sugars, monosaccharides, and disaccharides [12].

4. CONCLUSION

From this study it can be concluded several things as follow: (1) The interaction between the treatment of chrysanthemum leaf extraction and molasses has no noticeable effect on all the variables observed in the growth and yield of chrysanthemum plants; (2) The extraction treatment of chrysanthemum leaves has a real effect ($P<0.05$) to very real ($P < 0.01$) on all observed variables except at maximum plant height and stem diameter has no noticeable effect. The extraction treatment of chrysanthemum leaves 1000 g l^{-1} resulted in the average fresh weight of flower stalks and the highest economic fresh weight of flowers of 133.67 g and 110.27 g, respectively, there was an increase in yield by 24.99% and 26.71% when compared to the lowest treatment; and (3) Molasses treatment exerts a significant influence ($P < 0.05$) to very real ($P < 0.01$) on all observed variables, except at the diameter of the rod has no noticeable effect. Molasses treatment of 15 ml l^{-1} produces an average fresh weight of flower stalks and the highest economic fresh weight of 120.79 g and 94.51 g compared to the lowest treatment, and there is an increase in yield by 11.86% and 25.51% compared to the lowest treatment.

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