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Testing the Types and Concentrations of Growth Regulators on the Growth of Patchouli Cuttings (Pogostemon cablin Benth.)

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ABSTRACT

This study aims to determine the effect of concentrations of Rooton F, young coconut water, and cow urine on the growth of cuttings patchouli stem. Patchouli plant (Pogostemon cablin Benth.) is one of the important essential oil producing plants. The export volume of essential oils has always increased, in 2001 it reached 5,080 tons. Indonesia is the main supplier of patchouli oil in the world, which is almost 90% of the world's needs (Emmyzar, 2004). However, in recent years, patchouli oil exports have shown a downward trend. The cause of the decline was the limited ability to produce patchouli oil. Therefore efforts to increase the production of patchouli oil by way of development patchouli plants wide open. One of these efforts can be done by producing patchouli plants that have good quality. Patchouli plant propagation can be done by cuttings. The success of cuttings can be seen from their roots. Good rooting will produce quality plants fine too. Auxin is a type of plant hormone that can stimulate root growth. Rooton F is an example of a synthetic ZPT ingredient, while young coconut water and cow urine are natural ZPT ingredients. The three materials have their advantages and disadvantages. With the difference in the content of the three ingredients, it will also have a different effect on the growth of patchouli cuttings. In observing the number of leaves aged 6 wap, 75% rooton-F gave a yield of 4.67 leaves and was not different from the treatment of 75% coconut water, 50% cow urine, and 100 cow urine. At 5 wap, 75% and 100% treatments gave the effect is the same and different from other treatments.

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1. INTRODUCTION

Patchouli plant (Pogostemon cablin Benth.) is one of the essential oil producing plants which is widely used in the cosmetic industry and is much sought after by foreign consumers. Indonesian patchouli oil has been known to the world since 65 years ago. The export volume of essential oils in 2001 reached 5,080 tonnes with a value of US$ 52.97 million or 4.4% of the world trade value of essential oils. As for patchouli oil, Indonesia is the main supplier, which is almost 90% of the world's needs (Emmyzar, 2004). Patchouli is a bush plant that grows in the tropics.

Niam plant height can reach 0.3 – 1.3 m. Patchouli plants have brownish-green stems that are soft and knuckled (Santosa 1993). Sundaryani and Endang (1999) added that patchouli plant

stems have a diameter of 10-20 mm. The branching pattern is many and stratified around the trunk (there are 3-5 branches per level). The green leaves of the Patchouli plant are arranged in opposite pairs. Oval-shaped, 10 cm long, 8 cm wide, with a slightly tapered tip. The petiole is about 4 cm long, reddish-green and hairy. The leaf veins branch out in all directions (Santosa, 1993).

However, in recent years, patchouli oil exports showed a downward trend. The cause of the decline is Indonesia's limited production capacity of patchouli oil. Therefore efforts to increase patchouli oil production by developing patchouli plants are very wide open (Sundaryani, 1990).

One of these efforts can be done by producing good quality patchouli plant seeds. Patchouli plant propagation can be done by cuttings. This propagation is more often used because it is easy and does not require a large amount of money. However, in practice, cuttings that are planted directly on the land have a smaller chance of surviving. Therefore, patchouli plant nurseries need to be done for the efficiency of the amount of planting material (Sundayani, 1990). One indicator of the success of cuttings can be seen from the root system.

Good rooting will produce good quality plants, because with good rooting all the elements and minerals needed by plants can be optimally absorbed by the roots and used in the plant's metabolic processes.

Auxin is a type of hormone/plant growth regulator that can stimulate root growth and shoot growth. The types of auxins that are often used are indoleacetic acid (IAA), indolebutyric acid (IBA), 2-4 dichlorophenoxyacetic acid (2,4D), and naphthalene acid (NAA). Rooton F, young coconut water, and cow urine are several types of ingredients that contain auxin Growth Regulatory Substances (ZPT). Coconut water is a versatile natural product.

Coconut water can be consumed because it is beneficial to health, but it can also be used as medicine. Coconut water can also be used as a supplement for plant tissue growth because it contains several types of minerals and vitamins that plants need to grow and develop. The coconut water hormone is a natural exogenous hormone, namely a hormone that comes from plant parts, functions as a regulator in plant growth. , and able to regulate physiological processes in plants

Urine is the result of excretion from the kidneys which contains water, urea and other metabolic products. It also contains various types of minerals and hormones extracted from food that can be digested in the intestine. Several factors affect the auxin content in cow urine, including: sex, creman or working cows and type of feed for cows. The type of feed affects the hormone levels contained in urine. Grass-fed livestock had higher levels of auxin and GA in their urine than cattle that were fed bran. In general, it can be said that in cattle that eat a lot of forage, their urine contains a lot of auxin and GA (Supradji, 1992). Based on Supradji's research (1992) it was concluded that the levels of auxin and GA in the urine of female livestock were higher than those of male livestock.

2. METHOD

2.1 Types of research

The research method used in this study is the experimental method. The experimental method is a form of observation under artificial conditions, where these conditions are created and regulated by the researcher. That is, basically conducting an experiment to see the results, and the results of the experiment will confirm how the causal position is between the variables being investigated.

2.2 Research variable.

The observed variables were ZPT materials, namely cow urine, coconut water and ruoofton and the variable effect of these materials by giving different concentrations on the growth of niam plants.

2.3 Research design

To determine the effect of ZPT material type and ZPT material concentration, the design used was a factorial experiment in a 3x5 Split Plot Design (RPT) pattern with 3 replications, so there were 45 experimental plots.

2.4 Sampling location

Non-destructive observations were carried out 7 times with an interval of 1 week. The samples observed in non-destructive observations were 4 plants in each treatment unit and destructive observations were carried out 3 times, namely on the 3rd, 5th and 7th week. The samples observed in destructive observations were 2 plants in each treatment unit.

2.5 Time and Place of Research.

This experiment was conducted from November to December 2010 at the "Venus Orchid" Plastic House, Jl. Supit Urang Etc. Doubt in Tegalweru Village, Dau District, Malang Regency. The location is located at an altitude of ± 650 masl, with an average minimum temperature of 21-22 ºC and an average maximum temperature of 27-28 ºC and an average humidity of 50-60%.

2.6 Tools and materials

The equipment used includes: Plastic tub: used as a planting medium; Plastic cover: to cover the plastic tub at the beginning of the nursery; Hand sprayer: used for watering; Digital camera: for documentation during the panel research; Stationery. Materials used include: Patchouli plant of the Sidikalang variety, the top, middle and baseused as planting material; Soil and sand as a planting medium; Rooton F as a synthetic ZPT material; Young coconut water and cow urine as natural ZPT ingredients.

2.7 Research procedure

The research was carried out starting with the preparation of nursery media. The planting media used was a mixture of soil and sand with a ratio of 2:1, which had previously been watered with dithane solution with a concentration of 1 g/l as a fungicide and preparation of growth regulators and observations.

2.8 Data analysis.

Data obtained from observations were tested using the F test with an error rate of 5%. If the data shows a significant difference, continue with the BNT test with an error rate of 5%.

3. RESULTS AND DISCUSSION

3.1 Research result

3.1.1 Number and Area of Leaves.

From the results of the analysis that has been carried out, it can be seen that there is an interaction between the type of ZPT material and the concentration of ZPT material on the number of leaves at the age of observation 6 weeks after planting.

Table 1. Average number of leaves per plant as a result of interactions between ZPT material types and material concentrations at the age of 6 weeks after planting (wap)

Observation	Material type concentration	Number of leaves		
		Coconut water(A1)	Cow Urine (A2)	Rooton-F (A3)
Number of leaves	Without ZPT (K0)	2.67 a	2.56 a	2.67 a
	25% (K1)	3.00a	,78 a	3.06a
	50% (K2)	3.11 a	3.56 ab	3,17 a
	75% (K3)	3.56 ab	3.06a	4.67 b
	100% (K4)	3.50a	4.61 b	3.39a
	BNT5%		1,13	

Note: Numbers accompanied by the same letters are not significant based on the Least Significant Difference Test (LW) at p = 0.05

From the table above it can be seen that at the age of observation 6 weeks after planting, coconut water treatment, there was no effect on the number of leaves at all concentrations. While the cow urine treatment, the 100% concentration treatment gave the best number of leaves compared to other concentration treatments. In the Rooton-F treatment, the 75% treatment had the best effect on the number of leaves compared to other concentration treatments.

From the results of the analysis that has been carried out, it is known that there is an interaction between the type of ZPT material and the concentration of ZPT material on the leaf area of the observation age 7 weeks after planting.

Table 2. Average leaf area per plant (cm2) as a result of interactions between ZPT material types and material concentrations at 7 weeks after planting (wap).

Observation	Material type concentration	leaf area		
		Coconut water(A1)	Cow Urine (A2)	Rooton-F (A3)
Leaf area	Without ZPT (K0)	13.00 a.m	15.03 ab	10.28 a
	25% (K1)	18.11 abc	16.62 abc	12.00 a.m
	50% (K2)	29.08 de	17.64 abc	15.48 ab
	75% (K3)	24.79 cds	17.04 abc	24.20 cds
	100% (K4)	22.19bcd	30.09 de	31,433 e
	BNT5%		8.56	

Note: Numbers accompanied by the same letters are not significantly different based on the Least Significant Difference Test (LW) at p = 0.05

In Table 2 it can be seen that at the age of observation 7 weeks after planting, 50% coconut water treatment gave the best leaf area results and was no different from the 75% treatment. While the treatment of cow urine with a concentration of 100% gave the best leaf area results and was different from other concentration treatments. In the Rooton-F treatment, 100% concentration had the same effect as 75% concentration on leaf area.

3.1.2 Number of roots and dry weight of plants.

From the results of the analysis performed, it is known that there is a significant interaction between the type of ZPT material and the concentration of the material on the root dry weight at the age of observation 3 weeks after planting. Meanwhile, the concentration of ZPT materials had a significant effect on root weight.

Table 3. Average number of roots per plant as a result of ZPT material type treatment and Material Concentration.

	Number of roots at the age of observation (wap)		
Observation	5	6	7
Material Type			
Cow Urine (A1)	12.70	11.73	12.50
Coconut Water (A2)	10.80	10,23	15.90
Rooton-F (A3)	10,23	11.00	13.50
BTN	mr	mr	mr
Concentration			
Without ZPT (K0)	9.44 a	8.56 a	11.50 a.m
25% (K1)	10.33 a	9.94 ab	3.11 ab
50% (K2)	9.39a	10.39b	13.61 ab
75% (K3)	11,11a	12.56c	14.78 BC
100% (K4)	15.94b	13.50c	16.83c
BNT	1.74	1.56	2,31

Note: Numbers accompanied by the same letters in the same column are not significantly different based on the Least Significant Difference Test (LW) at p = 0.05.

From the results of the analysis carried out, it is known that there is a significant interaction between the type of ZPT material and the concentration of the material on the root dry weight at the age of observation 3 weeks after planting and it is known that at the age of observation 3 wap, 100% cow urine treatment (A2K4) gives the results of the weight the highest root dryness compared to other treatments. Treatment of 100% coconut water and 100% cow urine gave the same results on root weight, both of which gave the highest results compared to other concentration treatments. While the Rooton-F treatment did not have a significant effect on all concentration treatments.

Table 4. Average dry weight of roots per plant (grams) as a result of interactions between ZPT material types and material concentrations at the age of 3 weeks after planting (wap).

	Material type	Dry weight		
Observation	concentration	Coconut water(A1)	Cow Urine (A2)	Rooton-F (A3)
Dry weight	Without ZPT (K0)	0.022a	0.026 ab	0.026 ab
	25% (K1)	0.021a	0.023 a	0.030 ab
	50% (K2)	0.026 ab	0.023 a	0.031 abc
	75% (K3)	0.023 a	0.058c	0.039 abc
	100% (K4)	0.048 bc	0.093d	0.040 abc
	BNT5%	0.027		

Note: Numbers accompanied by the same letters are not significantly different based on the Least Significant Difference Test (LW) at p = 0.05

From the results of the analysis carried out, it is known that there is a significant interaction between the type of ZPT material and the concentration of the material on the root dry weight at the age of observation 3 weeks after planting and it can be seen that at the age of observation 3 wap, 100% cow urine treatment (A2K4) gives results the highest root dry weight compared to other treatments. Treatment of 100% coconut water and 100% cow urine gave the same results on root weight, both of which gave the highest results compared to other concentration treatments. While the Rooton-F treatment did not have a significant effect on all concentration treatments.

3.2 Discussion

The purpose of propagating by cuttings is so that the plant parts can form new roots and grow shoots, so as to produce new plants. In propagation by cuttings, the ease of root formation is related to the concentration of natural hormones formed in the plant's body. Auxin is a very effective PGR that stimulates the growth of plant roots (Ashari, 1999).

Treatment of various types of ZPT materials at various concentrations is an attempt to increase the success of cuttings growth. The success of patchouli cuttings is based on the rooting of the resulting cuttings. Good roots will allow plants to optimally absorb nutrients available in the planting medium, which plants can use as energy to grow optimally. Plant growth is indicated by the addition of plant size and weight that cannot be returned.

In this study, the growth of patchouli cuttings was indicated by the variable number of roots, dry weight of roots, dry weight of plants, number of leaves and leaf area of patchouli plants. on the number of leaves. Rooton-F 75% (A3K3) treatment gave the highest number of leaves, but it was not different from 50% cow urine (A2K2), 100% cow urine (A2K4), and 75% coconut water (A1K3). This is because the auxin content contained in the Rooton-F 75% (A3K3) treatment has been able to produce good cutting roots so that the roots can absorb the elements available in the media which will then be used in metabolic processes for the development of cuttings. At the age of observation 6 wap, roots that have been formed on patchouli cuttings, are thought to have been well formed, so they are able to absorb water and nutrients contained in the media so that in week 6, the treatment of cow urine is 100%, cow urine is 50%, coconut water is 75% and Rooton-F 75% can have a significant effect on the number of leaves in the 6th week.

4. CONCLUSION

There was an interaction between the type of ZPT material and the concentration of ZPT material on root dry weight at 3 wap, the number of leaves at 6 wap, and leaf area at 7 wap was influenced by the type of ZPT material and treatment of cow urine could produce leaf number and leaf area that did not differ from the Rooton-F treatment and the 75% concentration treatment gave results that were not different from the 100% treatment on the number of leaves at 5 wap, the number of roots at 5 wap and 7 wap, and the dry weight of the roots at 5 wap.

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In the application of natural ZPT ingredients, to make it more effective, it is necessary to carry out tests to determine the endogenous auxin content in patchouli plants, as well as how much maximum auxin is needed for patchouli plants. It is necessary to carry out laboratory tests to determine the auxin content contained in coconut water and cow urine materials.

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