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Effect of Phosphorus Fertilization, Methyl Jasmonate and Harvest Time to Production of Pegagan (Centella Asiatica)

KEYWORDS: Centella asiatica, phosphorus, methyl jasmonate, harvesting, production.

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ABSTRACT *One of the wild plants widely used from nature is Centella asiatica. Chemical compounds found in pegagan and the benefits of bioactive content become fundamental need for the research to be conducted. In previuos studies obtained plant material that has the potential to be used as propagation material of pegagan plant with a fairly high content of asiaticoside the lowland accessions from Deli Serdang (2.38%). The goals in this research to see how this pegagan plant responses to given culture technology such as phosphorus fertilization, aplication of elicitor and the appropriate harvest time to examine the pegagan plant production. This study used split plot design by 3 factors consist of P2O5 fertilizer treatment with 4 levels ie F0 = 0 kg P2O5 / ha, F1 = 18 kg P2O5 / ha, F2 = 36 kg P2O5 / ha, F3 = 54 kg P2O5 / ha, concentration of methyl jasmonate treatment consisting of 3 levels ie J0 = 0 µM, J1 = 100 µM, J2 = 200 µM and time of harvest, U1 = harvest at 56 days after planting (weeks after planting), U2 = harvest at 70 days after planting, U3 = harvest at 84 days after planting. The best combination for the production of biomass is without giving of methyl jasmonate with harvesting age 84 DAP. Cultivation action on pegagan is strongly influenced by the desired production of centelloside, whether in harvest time, in methyl jasmonate concentration, or in appropriate doses of phosphorus.*

Introduction

Centella asiatica is still harvested from the wild, and to conduct large-scale development of pegagan should be supported by the cultivation and to produce the required product quality *Centella asiatica* plant material is guaranteed level of production and quality. Many herbal concoction containing herb pegagan (Sembiring, 2007; Wijayakusuma and Dalimartha, 2005). Needs of pegagan (*Centella asiatica*) reached 100 tons, PT. Sidomuncul reach 2-3 tons / month. The need for *Centella asiatica* on local plant reaches 25 tons per year and that could be supplied only by 4 tons per year. Efficacy is due to the chemical content of pegagan include: saponins contains several compounds, including asiaticoside (Matsuda, *et al.*, 2001). Asiaticoside bioactive compounds can accelerate the process of wound healing and is useful in the treatment of leprosy and tuberculosis (Mangas, *et al.*, 2006; Mangas, *et al.*, 2008; Mangas, *et al.*, 2009). *Centella asiatica* has the function of cleaning the blood, blood circulation, laxative urine (diuretic), fever (antipiretika), stop bleeding (haemostatika), improve nerve memory, antibacterial, tonic, antispasma, anti-inflammatory, hipotensis, insecticide, allergy and stimulants. Saponins can also inhibit the production of excessive scar tissue (keloids inhibit) (Mangas, *et al.*, 2008).

Increased content of asiaticoside can be done by giving elicitor. Elicitor is a chemical from a variety of sources, biotic or abiotic, as well as physical factors, which can trigger a response in living organisms resulting in the accumulation of secondary metabolites. Methyl jasmonate (MJ) is one of the widely used elicitor and modulates many physiological events in higher plants. Methyl jasmonate and its derivatives have been proposed as a key signal compounds in the elicitation process towards the accumulation of secondary metabolites (Lambert et al., 2011). Appropriate harvesting time will produce a crude drug containing optimal nutritious ingredients. Chemical constituents in the plant is not the same all the time and will reach optimum levels at specific times (Research Institute for Medicinal and Aromatic Plants, 2010). Herbal health food manufacturers bidder Al-Wahida (HPA) such as Health-B products, Centella asiatica is used quite mature and not too old, harvested at the age of 2 months and 15 days, to get the ingredients switched on high (Herba Al-Wahida, 2011).

Based on the above, the authors are interested to know more influence phosphorus and elicitor methyl jasmonate at different harvest time on the production of Centella asiatica Centella asiatica. Thus it can be known plant responses to phosphorus and methyl jasmonate dose given and proper harvesting to obtain high growth Centella asiatica.

Problem in this research are high demand, botanicals and environmental factors as well as the reason for uniform quality (standardized), the cultivation step was necessary, production and Centella asiatica optimal quality is obtained by performing several acts agronomist. Objectives of this research are getting the right dose of phosphorus to obtain optimum production, the right concentration of the hormone methyl jasmonate right to obtain optimum prodution, the proper harvesting to obtain optimum production, interaction dose of phosphorus, the concentration of methyl jasmonate and proper harvesting to obtain optimum production of Centella asiatica. Outcomes Research, material potential plant, which has an optimal production. Centella asiatica cultivation techniques to produce optimal production.

Material and Methods

The materials used are of *Centella asiatica* accession Deli Serdang, TSP, Urea, KCl. The equipment required to support this research is digital camera, GPS 12 XL 12 channel Garmin, USA. This study used split plot design by 3 factors consist of P2O5 fertilizer treatment with 4 levels ie F0 = 0 kg P2O5 / ha, F1 = 18 kg P2O5 / ha, F2 = 36 kg P2O5 / ha, F3 = 54 kg P2O5 / ha, concentration of methyl jasmonate treatment consisting of 3 levels ie J0 = 0 µM, J1 = 100 µM, J2 = 200 µM and time of harvest, U1 = harvest at 56 days

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after planting (weeks after planting), U2 = harvest at 70 days after planting, U3 = harvest at 84 days after planting, repeated 3 times to determine the effect of treatment on the components of biomass production. Data were analyzed using analysis of variance (F test) at the 5% level. If there is a real effect then followed by Duncan's multiple range test (Duncan's multiple range test) and regression equation relationship patterns. Observations were made when the plant HST 56, 70 and 84 days after planting.

Results and Discussion

Data of Production

Wet weight per plot (g) test of methyl jasmonate treatment and phosphorus fertilizing (JXF) on wet weight per plot are presented in Table 1.

Table 1. Test of Mean Difference in Wet Weight (g) Per Plot in Interaction of Methyl Jasmonate and Phosphorus fertilizing

Methyl Jasmonate (J)	Phosphorus fertilizing (F)				Mean
	F_0 (0 kg P_2O_5/ha)	F_1 (18 kg P_2O_5/ha)	F_2 (36 kg P_2O_5/ha)	F_3 (54 kg P_2O_5/ha)	
J_0= 0 µM	280,878ab	406,849ab	368,898ab	363,144ab	354,942
J_1= 100 µM	351,711ab	487,411a	221,926ab	262,136ab	330,796
J_2= 200 µM	207,526b	259,311ab	401,837ab	467,744a	334,105
Mean	280,038	384,524	330,887	364,342	

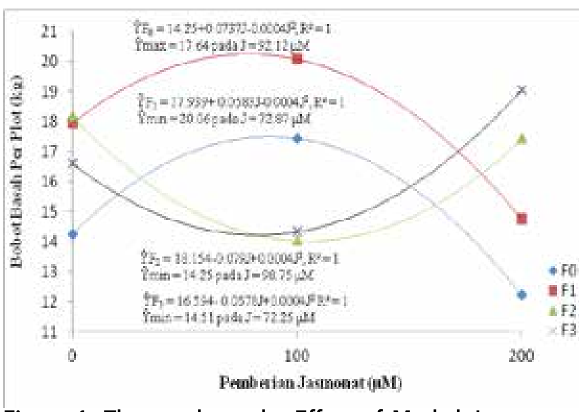

Figure 1. The graph on the Effect of Methyl Jasmonate and Various Doses Phosphorus in Wet Weight Per Plot (g)

In the treatment without giving methyl jasmonate generate maximum fresh weight per plot 18.52 (± 342.90 g) with phosphorus fertilizing 32.36 kg P2O5 / ha, whereas treatment of 100 µM methyl jasmonate wet weight per plot decreased with phosphorus fertilizing 54 kg P2O5 / ha and the provision of 200 µM methyl jasmonate, wet weight per plot increased with phosphorus fertilizing 54 kg P2O5 / ha.

Dry weight per plot (g)

Mean treatment difference test harvesting the dry weight per plot are presented in Table 2. In Table 2., the highest dry weight per plot was obtained at harvest age 12 WAP treatment is 6.197 (± 45,150 g) and significantly different harvesting age 8 WAP treatment and not significant at the age of 10 WAP harvest is 5.320 (± 33,674 g). Harvesting treatment difference (can be seen in Figure 2.).

Table 2. Mean Difference Test Dry Weight Per Plot (g) in Different Harvest Time

Harvest at (U)	Mean
U_1 = 56 DAP	24,169b
U_2 = 70 DAP	33,674ab
U_3 = 84 DAP	45,150a
Mean	34,331

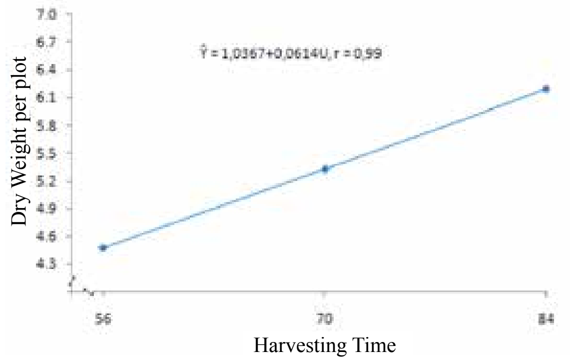

Figure 2. Effect of Harvesting Time Per Plot To Dry Weight (g) of ***Centella asiatica***

Different test mean dry weight per plot methyl jasmonate treatment with phosphorus fertilizing (JXF) of the dry weight per plot are presented in Table 3.

Table 3. Mean Difference Test in Dry Weight Per Plot (g) in Interaction of Methyl Jasmonate Treatment and Phosphorus fertilizing

Methyl Jasmonate (J)	**Phosphorus** fertilizing **(F)**				Mean
	F_0 (0 kg P_2O_5/ha)	F_1 (18 kg P_2O_5/ha)	F_2 (36 kg P_2O_5/ha)	F_3 (54 kg P_2O_5/ha)	
J_0= 0 µM	29,437abc	40,405abc	35,014abc	32,796abc	34,406
J_1= 100 µM	36,449abc	52,**094a**	21,681bc	26,193abc	34,104
J_2= 200 µM	19,248c	28,826abc	42,254abc	47,601ab	34,482
Mean	28,378	40,442	32,983	35,521	

Note : * = transformation $(X+0,5)^{1/2}$

Table 3. showed the highest dry weight per plot on treatment provision jasmonate 100 µM methyl and phosphorus fertilizing 18 kg P205 / ha (J1F1) 6.617 (± 52,094 g) and did not differ significantly with treatment of 200 µM methyl jasmonate and phosphorus fertilizing 54 kg P205 / ha (J2F3) 6.181 (± 47,601 g) followed by treatment of methyl jasmonate and other phosphorus fertilizing as can be seen in Table 3. on top. Lowest dry weight per plot was obtained giving methyl jasmonate 200 µM and without fertilizer phosphorus (J2F0) is 3.980 (± 19,248 g). Treatment

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provision of methyl jasmonate and phosphorus fertilizing (can be seen in Figure 3.).

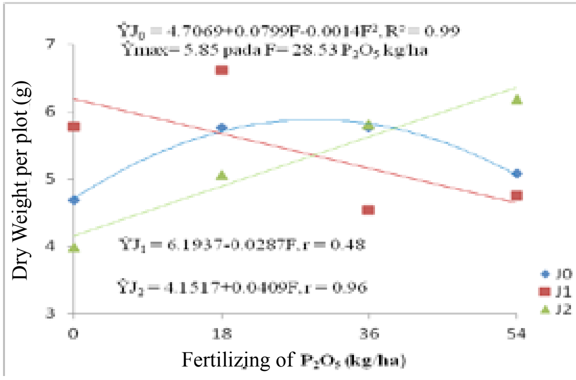

Figure 3. Effect of Methyl Jasmonate with Phosphorus Fertilizing To Dry Weight Per Plot (g)

Without giving methyl jasmonate (0 μM) resulted in a maximum dry weight per plot of 5.85 (± 43 g) with phosphorus fertilizing 28.53 kg P2O5 / ha, whereas treatment of 100 μM methyl jasmonate dry weight per plot decreased with phosphorus fertilizing 54 kg P2O5 / ha while giving methyl jasmonate 200 μM led to increased dry weight per plot to 54 kg P_2O_5/ha.

Conclusions and Suggestions

Conclusions

Harvesting much longer (84 DAP) will increase the dry weight per plot.

The best combination for the production of biomass is without giving of methyl jasmonate with harvesting age 84 DAP.

In component production, wet weight and dry weight per plot, is highest in giving methyl jasmonate treatment of 100 mM and 18 kg of phosphorus fertilizing P205 / ha respectively 401.743 g and 43,285 g.

There was no interaction effect of phosphorus dose, the concentration of methyl jasmonate and harvesting of all production parameters.

Suggestion

Centella asiatica cultivation needs to be done at high and middle latitudes.

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