Effect of Foliar Liquid Organic Fertilizer on Neera Production

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ABSTRACT

Coconut plant is important estate plant for supporting palm sugar production. Currently, the neera production is low, especially in dry season. The aim of this research was to study the effect of foliar liquid organic fertilizer on Neera production in Kebumen Regency. This research was conducted from July to October 2016 at Coconut Plantation of Karanggadung Village, Petanahan, Kebumen. The study was arranged in randomized complete block design using factorial treatments. First factor was the liquid foliar fertilizer with varied doses of 250 ml plant^{-1} (d1), 500 ml plant^{-1} (d2), 750 ml plant^{-1} (d3), and 1000 ml plant^{-1} (d4). Second factor was interval of application i.e. 1 week (f1), 2 weeks (f2), 3 weeks (f3), and 4 weeks (f4). The observed variables were volume of neera production, pH of neera, sucrose content, and leaf chlorophyll contents. The result showed that application of foliar liquid fertilizer could increase the leaf chlorophyll content to 80.55 SPAD unit under three weeks interval application. Fertilization of coconut plant with foliar liquid organic fertilizer increased 15.32% of neera production, and the highest volume of neera production was observed in application of foliar liquid organic fertilizer at the dose of 750 ml plant^{-1} and three weeks interval.

Keywords: Foliar liquid organic fertilizer, Dose, Application time, Coconut, Neera

ABSTRAK

Kelapa merupakan komoditas perkebunan rakyat yang memiliki posisi penting khususnya untuk produksi gula kelapa. Kondisi saat ini menunjukkan bahwa produksi nira kelapa rendah, khususnya pada musim kemarau. Penelitian ini bertujuan untuk mengkaji pengaruh pupuk organik cair khusus daun untuk meningkatkan produksi nira kelapa di Kabupaten Kebumen. Penelitian ini dilaksanakan di Desa Karanggadung Kec. Petanahan dari bulan Juni sampai dengan bulan Oktober 2016. Penelitian ini menggunakan rancangan acak kelompok (RAK) faktorial. Faktor pertama adalah dosis aplikasi larutan POC yang terdiri dari d_0 : tanpa pemupukan (kontrol), d_1 : 250 ml/pohon, d_2 : 500 ml/pohon, d_3: 750 ml/pohon, dan d_4 : 1000 ml/pohon. Faktor kedua adalah frekwensi pemupukan yang terdiri dari f_1 : satu minggu sekali, f_2 : 2 minggu sekali, f_3: 3 minggu sekali, dan f_4: 4 minggu sekali. Kombinasi perlakuan yang diperoleh sebanyak 16 kombinasi perlakuan dan diulang tiga kali. Aplikasi pemupukan diberikan di bagian pucuk tanaman kelapa dengan kepekatan larutan pupuk 8 ml/L air. Setiap perlakuan terdiri dari dua pohon. Variabel yang diamati antara lain volume hasil nira per hari, kadar gula (brix), pH nira, dan kehijauan daun kelapa. Hasil penelitian menunjukkan bahwa aplikasi pupuk organik cair meningkatkan kehijauan daun kelapa sebesar 80.55 SPAD unit pada interval aplikasi tiga minggu sekali. Pemupukan tanaman kelapa menggunakan pupuk organik cair melalui pucuk meningkatkan produksi nira (15.32%) dan volume nira tertinggi diperoleh pada aplikasi pupuk organic cair dosis 750 ml per tanaman dengan frekuensi tiga minggu sekali.

Kata kunci: Pupuk organik cair, Dosis, Waktu aplikasi, Kelapa, Nira

INTRODUCTION

Coconut is one of plantation crop that have high economic value. More than 90 % of coconut plantation is cultivated as smallholder plantation, and most of the plant is tapped for collecting neera. Neera is sweet, translucent in color, which sap is extracted from the inflorescence of coconut as a material for producing the brown sugar (Muralidharan and Deepthi, 2013). Diversification of coconut sugar into crystal sugar has a very broad economic opportunity. The demand of crystalline sugar is high because of healthy reason. Crystalline sugar made from pure neera has low glycemic index (GI), and it is good for diabetic due to have very low amount of sugar which is absorbed into blood (Misra, 2016).

Recently, neera production is very low. Konan et. al., (2013) reported that neera production is varied from 0.5 to 1.5 L/sphate/day depend on the cultivar type. The quality of neera is influenced by both genotype and environment such as soil fertility, and climate (Hebbar et. al., 2015). On the other hand, most of farmers do not apply a good agriculture practices for fertilizer application. Tennakoon et. al., (1995) reported

that the application of organic manure anorganic fertilizer was increased the biological activity, N mineralization rate, and nitrification.

Organic manure contains low nutrient which released slowly. In dry season, coconut plant produced high quality of neera but low amount of neera volume. Application of soil inorganic fertilizer is not effective for increasing the neera production. Application of foliar liquid organic fertilizer is one choice to serve the plant nutrient. Purwanto et al., (2015) reported that application of foliar liquid organic fertilizer in dry season can increase for 10% of neera production, and sucrose content. This research was aimed to study the effect of dose of foliar liquid organic fertilizer and time application on neera production in Kebumen Regency.

MATERIALS AND METHODS

This research was conducted in Coconut Plantations in Karanggadung Village, Petanahan Sub district, Kebumen Regency, Central Java Indonesia from June to October 2016. Soil type on the study area is sandy soil. The research was arranged in Randomized Block Design with three replications. The treatments were the dose and the interval of application of the liquid organic fertilizer. The varied doses of foliar organic fertilizer were d0: without application of liquid organic fertilizer, d1: 250 ml plant^{-1}, d2: 500 ml plant^{-1}, d3: 750 ml plant^{-1}, and d4: 1000 ml plant^{-1}. The intervals of application were f1: once a week, f2: once every two weeks, f3: once every three weeks, and f4: once every four weeks. Each experimental unit consists of two coconut plant.

The nutrient contents of liquid organic fertilizer were N: 9856 ppm, P: 124,81 ppm, K: 1904.492 ppm, Ca: 8318.643 ppm, Mg: 94,715 ppm and S: 5683.400 ppm. The concentration of foliar liquid organic fertilizer was adjusted at 24 ml L^{-1}. The foliar liquid organic fertilizer was sprayed at the shoot tip of coconut plant. The observed variables were the volume of neera, sucrose content (measured by using hand refractometer), and leaf chlorophyll content (measured by Konica Minolta SPAD-502 Plus). The data was analysed using analysis of variance (ANOVA). Data showing significant effect among treatments were tested using Duncan's Multiple Range Test (DMRT) with α = 5 %.

RESULTS AND DISCUSSIONS

Leaves chlorophyll content indicated the interaction between the dose and application frequency of liquid organic fertilizer (Table 1). The results showed that dose of 750 ml plant^{-1} under three weeks interval of application provide the highest level of leaf chlorophyll content on 80.5 SPAD units (Table 1). However, three weeks interval of application was not significantly different from other treatment of application interval. Leaf SPAD value associated with leaf chlorophyll content and leaf nitrogen content. Purwanto (2009) reported that SPAD value in rice plants correlated with the levels of chlorophyll a and b. Effendi et al., (2012) also showed that the SPAD value of maize plants closely related to levels of leaf N. The value of leaf chlorophyll content affects the photosynthesis rate, in which chlorophyll is the main photosynthetic apparatus in leaves.

Adequacy of N in the leaves will sustain the synthesis of proteins and amino acids. N leaf contents can be formed ion NO_3^-, before further assimilated into protein or amino acid ions NO_3^- will be reduced to nitrite by nitrate reductase enzyme with an electron donor NADH or NADPH2 supplied from the process of photosynthesis. Puspitasari (2009) states that ammonium or ammonia will react with the acid

2-oxo-glutaric or glutaric acid or glutamic acid to form glutamic acids by the reaction of amination or transamination, and glutamine provide amino groups to keto-compound for the biosynthesis of amino acids and proteins, nucleic acids and other organic nitrogen compounds for growth of vegetative and generative.

Table 1. Interaction Effect of Dose and Interval of Application of Foliar Liquid Organic Fertilizer on Leaf Chlorophyll Content

Interval of Application	Dose of Foliar Liquid Organic Fertilizer				
	250 ml plant^{-1}	500 ml plant^{-1}	750 ml plant^{-1}	1000 ml plan^{t-1}	Average
1 week	74.53 a A	76.60 a A	72.88 a B	64.50 b B	72.13
2 weeks	61.35 b C	63.08 b B	76.80 a AB	72.28 a A	68.38
3 weeks	68.03 c B	74.20 b A	80.55 a A	32.70 d C	63.87
4 weeks	65.98 b BC	76.38 a A	76.68 a AB	75.03 a A	73.51
Average	67.47	72.56	76.73	61.13	+

Note: The number followed by same lower letter in same row, and the number followed same big letter in same column is not significant different according to DMRT at 95% confidence level.

Fertilization of coconut plants using foliar liquid organic fertilizer increased the yield of neera daily (Figure 1). Fertilization increases the average of neera volume to 15.32% compared to control. The highest neera production was observed at five weeks after the application of fertilizer which amounted at 366.67 ml plant^{-1} or increase of 26.83%.

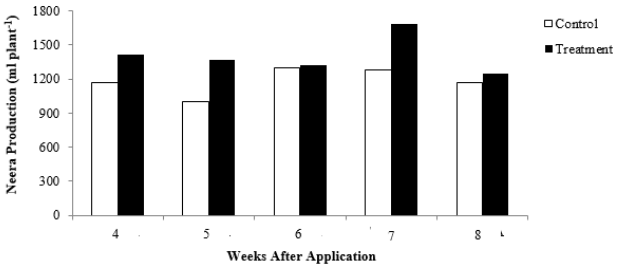

Figure 1. Comparison of neera production between control and fertilized plant

Table 2. Effect of Dose and Interval of Application of Foliar Liquid Organic Fertilizer on Neera Production

Treatments	Neera Production (mL)				
	4 WAA	5 WAA	6 WAA	7 WAA	8 WAA
250 ml plant^{-1}	1445.8 a	1395.8 a	1470.8 a	1687.5 a	1175.0 a
500 ml plant^{-1}	1520.8 a	1458.3 a	1429.2 a	1554.2 a	1341.7 a
750 ml plant^{-1}	1604.2 a	1529.2 a	1354.2 a	1741.7 a	1387.5 a
1000 ml plant^{-1}	1100.0 b	1083.3 b	1025.0 b	1445.8 a	1166.7 a
1 week	1545.8 a	1541.7 a	1475.0 a	1770.8 a	1279.2 a
2 weeks	1400.0 a	1404.2 a	1316.7 a	1508.3 a	1104.2 a
3 weeks	1416.7 a	1270.8 a	1245.8 a	1616.7 a	1370.8 a
4 weeks	1308.3 a	1250.0 a	1241.7 a	1533.3 a	1316.7 a

Note: The number followe by same letter in the same column is not significant different according to DMRT at 95% confidence level. WAA: week after application.

The dose of foliar liquid organic fertilizer showed a significant effect on neera volume, although there was no interaction effect between dose and interval of application (Table 2). Increasing 750 ml plant^{-1} of foliar liquid organic fertilizer affects on volume of neera, but 1000 ml plant^{-1} dose tends to decline the neera production. A dose of 750 ml plant^{-1} was the best dose compared to other treatments.

Fertilization through shoot is faster in providing nutrients for coconut plants in various conditions of the season. Nutrients are easily and quickly absorbed by the plants will be faster effect on plant physiological processes (Taiz and Zeiger, 1991). The frequency of fertilization has not shown any significant effect on the production of Neera. There is a tendency that the frequency of fertilizing three weeks to produce the highest volume of neera at 8 WAA amounted to 1370.8 ml plant^{-1}.

Fertilization through shoot showed the significant different on increasing levels of sucrose, as reflected by the value of neera brix. However, fertilizer treatment tends to increase the value of neera brix (Figure 2). Brix levels of neera in fertilization treatment increased by 0:23 point of control. The dose of 250 ml plant^{-1} to 1000

ml plant^{-1} showed any significant different on the levels of value of neera brix, as well as the frequency of fertilization from one week to four weeks (Table 3).

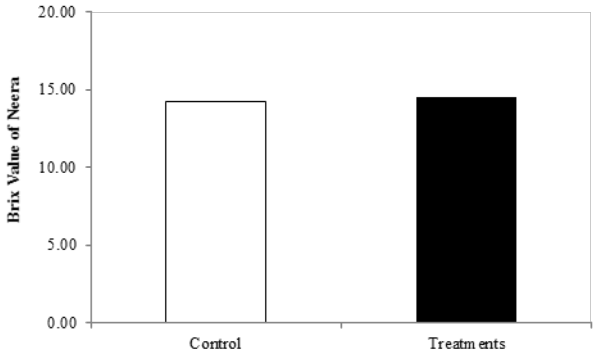

Figure 2. Brix Value of Neera

Table 3. Effect of Dose and Interval of Application of Foliar Liquid Organic Fertilizer on Brix Value of Neera

Treatments	Brix Value of Neera
250 ml plant^{-1}	13.91 a
500 ml plant^{-1}	15.07 a
750 ml plant^{-1}	14.31 a
1000 ml plant^{-1}	14.73 a
1 week	14.32 a
2 weeks	13.87 a
3 weeks	15.10 a
4 weeks	14.72 a

Note: The number followed by same letter in the same column is not significant different according DMRT at 95% confidence level.

CONCLUSION

Application of foliar liquid organic fertilizer increase the leaf chlorophyll content to 80.55 SPAD unit under three weeks interval of application. Fertilization of coconut plant with foliar liquid organic fertilizer increased the neera production about 15,32 %, and the highest volume of neera was observed at 750 ml plant^{-1} dose of foliar liquid organic fertilizer and three weeks interval of application.

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