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PENGGUNAAN INFUS NUTRISI UNTUK PENINGKATAN PRODUKSI LATEX PADA KARET (*Hevea brasiliensis*)

INCREASING LATEX PRODUCTION OF RUBBER TREE (*Hevea brasiliensis*) BY NUTRIENT INFUSION

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ABSTRACT

Penelitian bertujuan untuk mengetahui pengaruh pemberian nutrisi secara infus pada batang karet terhadap produksi latex. Penelitian dilaksanakan di Perkebunan karet milik PTPN VIII di Garut, Tasikmalaya pada bulan April sampai Agustus 2015. Larutan nutrisi terdiri dari unsur ara makro dan mikro yaitu: N-NH_2^+ : 0,2 %, N-NO_3^-: 2,3 %, P_2O_5 total: 1,0%, total K_2O : 2,4%, total Ca : 0,08 %, total Mg : 0,07 %; total SO_4^{2-} : 0,28 %.; total Fe :67,9 mg.kg^{-1}, total Cu : 28,9 mg.kg^{-1}, total Mn : 38,7 mg.kg^{-1}, total Zn : 16,4 mg.kg^{-1}. Larutan nutrient diencerkan 100 x sebelum aplikasi, dengan nilai electrical conductivity 3,83 mS/cm dan pH 5,52. Larutan tersebut diaplikasikan dengan cara infus batang karet. Hasil yang diperoleh menunjukkan adanya peningkatan berat latex dan kadar karet kering. Tanaman karet yang telah mengalami kering sadap akibat penggunaan stimulan sebelumnya, setelah dilakuakan aplikasi infus nutrisi, dapat memproduksi latex kembali.

Keywords : rubber tree, latex, nutrient infusion

INTRODUCTION

In general, the new rubber plant began to be tapped in the early years to six and tapped for 15 to 20 years. Latex production normally takes approximately 8-10 months in the rainy season. To increase latex usually used stimulant which can increase the volume of latex, but it resulted in the death of the skin and tapping area. Rubber plants older than 20 years had less response to fertilizer because the roots are already aging. Meanwhile, plant health and latex production capability is determined by the availability of nutrients and water (Ginting, 2011).

Nitrogen is absorbed by plants in the form of nitrate (NO_3) and ammonium (NH_4^+). Phosphorus is absorbed by plants in the form of phosphate or

oxidized compounds, namely $H_2PO_4^-$ or HPO_4^{2-}, depending on the pH of the medium. Potassium is absorbed by plants in the form of K^+. Calcium is absorbed by plants in the form of Ca^{2+}. Magnesium is absorbed by plants in the form of Mg^{2+}. Sulfur is absorbed by plants in the form SO_4^{2-}. Plants absorb iron in the form of chelate-Fe^{3+}. Copper is absorbed in the form of Cu^{2+}. Zinc is absorbed in the form of Zn^{2+}. Manganese is absorbed in the form of Mn^{2+}. Boron is absorbed in the form BO_3^{3-}. Molybdenum is absorbed in the form MoO_4^{2-} (Mengel & Kirkby, 1978; Marchner, 1986; Jones *et al.*, 1991; Barker & Pilbeam, 2007).

Plants absorb nutrients in the form of cations and anions in an equal number and equilibrium charge arranged through the release of a number of H^+ or OH^- ions (Haynes, 1990). Transpiration is a measure of the flow of sap or sap flow that can be used as a guide in order to maintain the water balance between soil and plants (Granier, 1986). The composition of xylem sap can be a means of measuring the ability of plants to capture nutrients (Dambrin *et al.*, 1995). The concentration of nitrate, phosphate and calcium in xylem sap has decreased in line with the decrease in water content in the soil, whereas the concentration of potassium, magnesium, manganese and sodium stabilized (gollan *et al.*, 1992). There is fast in response of the rubber leaf to nitrogen and potassium fertilizers, and less in response to phosphorus (Sorrocks (1961). There is a correlation between latex yield and nitrogen content in the leaf tissue (Feng *et al.*, 2005). Isopentenyl pyrophosphate known as latex produced by the rubber tree (*Hevea brasiliensis*) containing Mg ions. Polymerase enzyme activity depends on the presence of Mg (Abraham *et al.*, 2008). Plant mineral nutrition as a solute in solution xylem transported to the top of the plant affected by the water flow rate. Mass flow in the xylem occurs because the walls of xylem vessels are negative charge. This causes the cations move in the vessel. The subsequent absorption of solutes from xylem is by radially surrounding tissue. The absorption is selective depending on the metabolic processes in the target cell. Ion transfer from the cell into the xylem parenchyma cells surrounding affected by Na^+ in xylem sap and transfer to the phloem (Jacoby & Moran, 2001; Hopkins & Huner, 2004; Alexou & Peuke, 2013).

An effort has been made in increasing the production of latex is infusion of a complete nutrient include macro and micro elements. This formula has been tested previously on hydroponic lettuce plants (Ginting, 2008) and since then the formula is constantly tested on varieties of other crops. The test results in rubber showed that the application of infusion formula at various age levels of less than 10 years to over 20 years, there is an increase volume of latex reaches 100%, ie 900 mL in the stands without infusion, 1800 mL in the stands with infusion applications. Volume greater latex obtained in the stands aged> 20 years in the amount of 2500 mL, whereas in the stands aged <20 years was obtained latex volume of 1500 ml. Dry rubber content results obtained in the range of 25-34%. Subsequent trials have been conducted in January 2014 and still continues today at PTPN VIII Tasikmalaya in West Java (Ginting, 2012). This research aims to know the effect of nutrient infusion into xylem in latex production of rubber tree.

RESEARCH METHOD

Research was conducted at Bagjanegara Plantation in Tasikmalaya district and Bunisari Lendra Plantation in Garut, PTPN VIII. Research activities were done from April to August 2015.

This study consisted of two locations, namely Bagjanagara Plantation and Bunisari Lendra Plantation. Each plantation is distinguished in the age group of 100 plants age <20 years and 100 plants age> 20 years. Each age group divided into two sub groups, 50 plants was given nutrient, while 50 other plants as a control. Infusion application in all the plants was at 1 m above ground level. The other treatment was done three ways of applications: infusion, splash and injection and three compositions formula on different plants (3x3x5 = 45 plants).

Materials consisting of calcium nitrate and mixed micro nutrient (as group 1), potassium nitrate, magnesium sulphate and monokalium dihidrophosphate (as group 2) with a certain ratio of weight. nutrient solvent contained micro nutrient which consist of $N\text{-}NH_2^+$: 0,2 %, $N\text{-}NO_3^-$: 2,3 %, P_2O_5 total: 1,0%, total K_2O : 2,4%, total Ca : 0,08 %, total Mg : 0,07 % and total SO_4^{2-} : 0,28 %. Another nutrients are : total Fe :67,9 $mg.kg^{-1}$, total Cu : 28,9 $mg.kg^{-1}$, total Mn : 38,7 $mg.kg^{-1}$, total Zn : 16,4 $mg.kg^{-1}$. This composition named

formula A. Formula B consist formula A plus 200 mg magnesium sulphate ($MgSO_4$)and formula C consist formula A plus 100 mg monokalium dihidrophosphate ($KHPO_4$). Preparation of the concentrated solution (stock): Materials that have been prepared (point 1) are grouped into 2 (solution 1 and 2). Each group of materials put into jerry cans.

Dilution of the concentrated solution: Solution 1 and solution 2 (each volume is 10 mL) is loaded into the bottle, add water until a volume of 1 liter as infusion solutions. The solution containing nutrients in ionic forms of N, P, K, Ca, Mg, S, Fe, B, Zn, Cu, Mn, and Mo. Plastic bottle of mineral water capacity of 1500 mL was used as infusion fluid tank. Infusion bottle fitted with a lid facing the ground on a tree with a position on the hole 20 cm in deep with 10 mm in diameter. Bottle wrapped in black plastic to prevent algae growth.

Three days after infusion applications, tapping is done by the S/2 D3 system. Latex weighed and measured values of dry rubber content, on stands infusion and without infusions, as much as 40 times the tap. The need for supporting information / additional : Two weeks after the application, the gum leaves drawn at random at the same age, up to 3 times the retrieval and analysis of the nutrient content.

The collected data will be analyzed statistically using ANOVA in two age groups, t test in age groups, to obtain a close relationship between the length of time the application with latex yield.

RESULTS AND DISCUSSION

The collected data will be analyzed statistically using ANOVA in two age groups, t test in age groups, to obtain a close relationship between the length of time the application with latex yield.

Latex obtained from plants aged less than 20 year with nutrient infusion was heavier than it without nutrient infusion (Table 1). Latex production increased almost 2 kg. Latex obtained from plants aged more than 20 year with nutrient infusion tends heavier than it without nutrient infusion (Table 1). Latex production increased almost 2 kg. This is due to the possibility of differences in land contour where the growth of these plants. For trees aged more than 20 years are at hilly land, while for trees aged less than 20 years were in the valley. The contour difference is suspected there are differences in soil fertility. The various

types of formulas and application show there are no significantly different of latex weight before 20 days after application, but after 30 days after applications, the treatments give significantly different results (Table 3).

Table 1. Latex weight and dry rubber with the application of nutrients in the tree more than the age of 20 years and less than the age of 20 years in Bunisari Lendra plantation and Bagjanagara plantation.

Production	Plant age (>20 years)		Plant age (< 20 years)	
	Nutrient infusion	Without nutrient	Nutrient infusion	Without nutrient
Bunisari Lendra plantation				
Latex (kg/50 trees)	9,38 ± 2.40 a	8,28 ± 1.90 b	10,27 ± 2.90 p	8,45 ± 2.40 q
(Dry) rubber (%)	23,63 ± 2.02 a	21,94 ± 2.46 b	22,37 ± 1.90 p	20,23 ± 1.70 q
Bagjanagara plantation				
Latex (kg/50 trees)	21,14 ± 3.58 a	16,63 ± 2.05 b	8,82 ± 1.99 p	8,18 ± 1.85 p
(Dry) rubber (%)	27,17 ± 2.15 a	25,67 ± 1.41 b	27,79 ± 1.34 p	26,97 ± 2.02 q

Note: means ±SD followed by similar letter in the same row is not different significantly.

The various types of formulas and concentration show there are significantly different of latex weight before 10 days after application, but after 20 day after applications, the treatments give no significantly different results (Table 2).

The various types of formulas and application show there are no significantly different of latex weight before 20 days after application, but after 30 days after applications, the treatments give significantly different results (Table 3).

Table 2. Latex weight in various types and concentrations of formulas for 6 periods tapping, age more than 20 years, in Bagjanagara plantation

Treatment	Latex weight (g/tree), on tapping period (day after application) 3	10	20	30	60	90
Formula:						
A	103,73b	162,73b	236,93a	250,60a	285,67a	249,87a
B	53,27a	96,20a	177,13a	208,60a	242,93a	195,47a
C	71,07a	117,13ab	198,53a	234,07a	257,60a	211,73a
Consentration ($mL.L^{-1}$):						
10	55,20p	96,40p	170,13p	198,87p	218,07p	173,60p
20	100,60q	155,60q	205,73p	246,40p	255,60p	242,80p
30	72,27p	124,07pq	236,73p	248,00p	312,53p	240,67p

Data are presented as means ± SE/SD (n=30). Data not followed by the same letter in a column are significantly different (P<0.05). A : Formula A (compound fertilizer as above on research method); B: Formula A + $MgSO_4$; C : Formula A + $KHPO_4$.

Table 3. Latex weight in various types and application nutrient for 6 tapping period, aged less than 20 years, in Bunisari Lendra plantation

Treatment	Latex weight (g/tree), on tapping period (day after application) 3	10	20	30	60	75
Formula:						
A	163,80a	238,67a	288,30a	331,73a	374,13a	335,47a
B	244,07a	298,80a	343,40a	380,93ab	412,07a	352,33a
C	227,93a	257,07a	365,90a	457,53b	478,20b	413,60b
Application method:						
infusion	213,53a	296,33a	336,60ab	352,33a	347,87a	295,40a
injection	248,20a	285,33a	388,00b	443,67b	495,47c	459,40c
flush	174,07a	208,87a	273,07a	374,20ab	421,07b	346,60b

Data are presented as means ± SE/SD (n=30). Data not followed by the same letter in a column are significantly different (P<0.05). A : Formula A (compound fertilizer as above on research method); B: Formula A + $MgSO_4$; C : Formula A + $KHPO_4$.

CONCLUSIONS

Based on these results it can be concluded that the treatment of the application of nutrients on the rubber rods can increase the production of latex and dry rubber content value. It occurs in trees aged less than 20 years and more than 20 years. Similar results were found in two plantations, the Bagjanagara plantation and Lendra Bunisari plantation. Both plantations are included in the working area of PTPN VIII West Java Province. Three types of formula and three concentration levels were tested had the same effect on the increase in the production of latex. Nutrient injecting applications can be an alternative to the infusion applications.

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