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GROWTH OF RUBBER PLANT (Hevea Brasiliensis Muell. Arg) ON THE USE OF MATERIALS THAT CAN IMPROVE SOIL FERTILITY

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Abstract

This research was carried out at the PTPN III Sarang Giting plantation, Afdeling II, which is located in Sarang Giting Village, Dolok Masihul District, Serdang Bedagai Regency, North Sumatra Province. Venue Altitude ± 30m above sea level (asl) and flat land topography. The purpose of this study was to determine the effect of stem circumference and production of rubber plants (Hevea brasiliensis Muell. Arg) on potassium (KCl) combined with agricultural lime (CaCO3) and magnesium (MgSO4) and their effect on the dynamics of soil K levels. This study used a factorial randomized block design (RBD) with 3 (three) factors studied, namely the agricultural lime application factor (C), which consisted of C0 = control and C1 = 1500g/tree/year. The second treatment factor was giving magnesium (M) which consisted of M0 = control, M1 = 1500g/tree/year, M2 = 3000g/tree/year, and M3 = 4500g/tree/year. The third treatment factor was the provision of potassium (K) consisting of K0 = control, K1 = 500g/tree/year, K2 = 1000g/tree/year, and K3 = 1500g/tree/year. The results showed that the administration of potassium combined with the application of agricultural lime and magnesium had a significant effect on the growth parameters of stem circumference. Potassium application combined with agricultural lime and kiserite also had a significant effect on the dynamics of K levels in the soil. However, it did not significantly affect the production of liquid latex

Keywords: ***Potassium; CaCO3; MgSO4; Trunk Circumference; Production***

1. INTRODUCTION

PlantRubber (Hevea brasiliensis) is a tall tree with a fairly large trunk reaching 15-25 m. Plant stems usually grow straight and branch high. In some rubber plantations, the direction of plant growth is slightly inclined to the north. The stems of this plant contain latex known as latex (Dewi, 2018).

Rubber is an export commodity that can help increase the exchange rate of the Indonesian rupiah. Indonesia's rubber exports have continued to grow over the last 20 years, from 1.0 million tons in 1985 to 1.3 million tons in 1995 and 2.2 million tons in 2005. Foreign exchange earnings from this commodity in the first half of 2006 reached US $2.0 billion. , and the value of rubber exports was estimated at $4.2 billion in 2006 (Kompas, 2006).

Several places in Indonesia have soil conditions suitable for rubber plantations, mostly in Sumatra and Kalimantan. The area of rubber plantations in Indonesia in 2005 was more than 3.2 million hectares. 85% of these are publicly owned rubber plantations, and only 7% are large state owned plantations and 8% are large private plantations. National rubber production in 2005 amounted to 2.2 million tons. This amount can be increased further by rejuvenating and strengthening farmers' agricultural land and vacant/unproductive land suitable for rubber plantations (Anwar, 2006).

World natural rubber supply increased by more than 3 percent per year over the last two decades to 8.81 million tons in 2005. This increase came from producing countries such as Thailand, Indonesia, Malaysia, India, China and others. Thai rubber production doubled between 1980–1990 and 1990–2000. Since 1991, Malaysia is no longer the world's largest producer of natural rubber, replaced by Thailand, and Indonesia remains the second largest producer. Thailand produced more than 33% of the world's natural rubber in 2005, while Indonesia's share of production was 26% and Malaysia remained at 13% (Bpen, 2003).

To develop national rubber, the development of rubber in Indonesia is primarily aimed at smallholder rubber plantations. This is because smallholder rubber plantations have a very important role, but still face many problems and obstacles. The productivity of smallholder rubber is still relatively low, namely 700-900 kg/ha/year or an average of 820 kg/ha/year. This productivity is still very low when compared to the productivity of large state plantations, which is an average of 1,299 kg/ha/year and private plantations of 1,542 kg/ha/year (Ditjenbun 2016), or the productivity of smallholder rubber in other countries.

The productivity of smallholder rubber in Malaysia has reached 1,100 kg/ha/year, in Thailand 1,600 kg/ha/year, in India 1,334 kg/ha/year, and in Vietnam 1,358 kg/ha/year. The causes of the low productivity of Indonesian rubber are the large area of old rubber plantations that need to be rejuvenated, which is more than 300,000 ha, and the relatively low use of clonal planting material. As an illustration, the use of clonal plants in Indonesia is around 40%, Malaysia is 90%, Thailand is 95%, India is 99%, and Vietnam is 100% (Ditjenbun 2016).

To overcome this problem, evaluation of soil fertility in rubber land is absolutely necessary, because it is directly related to cultivation and production. By knowing the level of soil fertility, it is hoped that rubber plantation management can be carried out effectively so that productivity is high. When the soil cannot provide sufficient nutrients, external fertilization is needed so that plants can grow well (Susanto, 2005).

The importance of alkaline cations in rubber plantations for growth and production has not been studied much. Preliminary investigations were carried out on three rubber plantations at PT. Perkebunan Nusantara III, distinguished by its productivity, arose from the cultivation of rubber trees, especially on nutrient-poor soils. The main cause is low soil fertility, which is characterized by low concentrations and an imbalance of basic cations K, Ca and Mg. Therefore, additional fertilization is needed to increase concentration and cation balance to stimulate growth and increase plant productivity. Kasno et al. (2004) said that Ca 2+ and Mg 2+ ions can compete effectively with K+ in soil adsorption complexes, thereby affecting the availability of K in the soil.

Potassium plays an important role in osmoregulation, enzyme activation, regulation of cellular pH, cellular cation and anion balance, stomatal transpiration and regulation of assimilatory transport (products of photosynthesis). Because it greatly promotes photosynthesis and plant growth. In contrast to N and P, potassium has no effect on branch damage (Dobermann and Fairhurst, 2000).

2. IMPLEMENTATION METHOD

Place and time

This research was carried out at the PTPN III Sarang Giting plantation, Afdeling II, which is located in Sarang Giting Village, Dolok Masihul District, Serdang Bedagai Regency, North Sumatra Province.$\pm$30 masl. This research was carried out from January 2019 to April 2019.

Research methods

This study used a factorial RAK (randomized block design) with the treatment of potassium fertilizer combined with agricultural lime fertilizer, and kiserite on rubber plants. The basic fertilizer doses and treatment doses at each level.

The first factor is the treatment of giving agricultural lime which is denoted by the letter (C) with two levels as follows:

C0 : (control) = Variables that are made the same in a study
C1 : 1500 g/tree/year (divided by 6 = 250g/tree/each gift)

While the second factor is the treatment of giving Kiserit fertilizer which is denoted (M) which consists of four levels as follows:

M0 : (control)
M1 : 1500 g/tree/year (divided by 6 = 250g/tree/each gift)
M2 : 3000 g/tree/year(divided by 6 = 500g/tree/each gift)
M3 : 4500 g/tree/year (divided by 6 = 750g/tree/each gift)

The third factor is the treatment of giving KCl fertilizer which is denoted (K) which consists of four levels as follows:

K0 : (control)
K1 : 500 g/tree/year (divided by 6 = 83g/tree/each gift)
K2 : 1000 g/tree/year (divided by 6 = 166g/tree/each gift)
K3 : 1500 g/tree/year (divided by 6 = 250g/tree/each gift)

This research was only conducted for four months, so the treatment was only applied twice or every two months, namely at the beginning of the study and at the beginning of the third month.

3. RESULTS AND DISCUSSION

First Month Soil K Content

The results of the significant difference test for the effect of giving potassium (KCl) combined with agricultural lime (CaCO3) and kiserite (MgSO4) on soil K levels can be seen in Table 1. below.

Table 1. Data on Average Soil K Levels in the First Month with the Effect of Giving CaCO3, MgSO4 and KCl (me/100g)

TREATMENT	C0				C1				AMOUNT
	M0	M1	M2	M3	M0	M1	M2	M3	
K0	0.76	0.74	0.56	0.68	0.63	0.52	0.88	0.59	0.67
K1	0.65	0.68	0.67	0.64	0.67	0.59	0.74	0.61	0.65
K2	0.68	0.67	0.86	0.63	0.74	0.74	0.77	0.78	0.73
K3	0.66	0.66	0.68	0.77	0.57	0.51	0.51	0.63	0.62
AMOUNT	0.69				0.62				
	0.67	0.64	0.71	0.66	0.67	0.64	0.71	0.66	

Information : Numbers followed by unequal letters in the same treatment group were significantly different at the 5% level based on the DMRT test

From the analysis data obtained from the table above it can be seen that the K3 treatment (1500g/tree/year) was not significantly different from the K0 (control) treatment, not significantly different from K1 (500g/tree/year) and K2 (1000g/tree) /year), this happens because the K content in the soil still comes from previous fertilization, namely before this research was conducted. The highest K level was found in the C1M2K0 treatment combination 0.88 (high), the lowest was in the C1M1K3 and C1M2K3 0.51 (medium) combination.

Potassium (K), Calcium (Ca), and Magnesium (Mg) are macronutrients whose balance has been widely studied. This is because the three nutrients interact with each other in the soil, in other words, the concentration of one nutrient that is too high can cause other nutrients to become depressed. Kasno et al. (2004) said that Ca2+ and Mg2+ ions can compete effectively with K in the soil adsorption complex so that they can affect the availability of K in the soil. Meanwhile Loide (2004) stated that excess Mg exchanged in the soil that is not balanced with Ca will cause a worsening of the physiological characteristics of the roots and cause a decrease in plant production.

In general, the ability of the soil to provide nutrients can reflect the level of soil fertility and has a positive correlation with the yield of cultivated plants. On the other hand, the level of soil fertility is negatively correlated with the need for fertilizer or it can be interpreted that the higher the level of soil fertility, the lower the use of artificial fertilizers and does not need to be added (Suyamto and Z. Arifin, 2002).

Fourth Moon Soil K Content

The results of the significant difference test for the effect of giving potassium (KCl) combined with agricultural lime (CaCO3) and kiserite (MgSO4) on soil K levels can be seen in Table 2. below.

Table 2. Data on Mean Soil K Levels in the Fourth Month with the Effect of Giving CaCO3, MgSO4 and KCl (me/100g)

TREATMENT	C0				C1				AMOUNT
	M0	M1	M2	M3	M0	M1	M2	M3	
K0	0.23	0.38	0.52	0.42	0.79	0.32	0.84	0.47	0.50a
K1	0.81	0.91	0.40	0.72	0.42	0.55	0.49	0.56	0.61 ab
K2	0.45	0.83	0.64	0.73	0.67	0.80	0.39	0.53	0.63bc
K3	0.85	0.70	0.48	0.75	0.61	1.06	0.69	0.85	0.75d
AMOUNT	0.61				0.63				
	0.60	0.69	0.56	0.63	0.60	0.69	0.56	0.63	

Information : Numbers followed by unequal letters in the same treatment group were significantly different at the 5% level based on the DMRT test

From the results of the analysis obtained from the table above it is known that the provision of KCl has a significant effect on the availability of soil K elements in the fourth month. The highest K content was obtained in the K3 treatment (1500g/tree/year), namely 0.75 (medium), which was significantly different from K0 (control), namely 0.50 (moderate), significantly different from K1 (500g/tree/year), namely 0.61 (medium), and significantly different from K2 (1000g/tree/year) with a K content of 0.63 (medium). The treatment combination that had the highest K content was C1M1K3 (1.06), while the lowest was in the without treatment C0M0K0 (0.23).

The reduced levels of K in the soil indicate that there has been absorption of nutrients by plants within four months of the study. This can be seen in the table of average soil K content at the beginning of the study and at the end of the study. The factor that affects the rate of absorption of nutrients is the condition of plants that have not received fertilization for a long time.

Another source of nutrient loss is production, as several studies have shown that the level of nutrient loss due to production varies. In Sri Lanka, for example, the loss of potassium ranges from 8-22 kg/ha/year (Samarapulli, 2003), while in Brazil it is around 5 kg/ha/year (Murbach et.al., 2003).

KCl fertilizer is somewhat hygroscopic, has a weak acid reaction and moderate action so it can be used for initial or post-planting fertilization (BPTP 2013).

Soil analysis is carried out in the first and fourth months in order to obtain appropriate results, because if the analysis is carried out in the second and third months it is feared that the nutrient content in the soil is not yet available for plants.

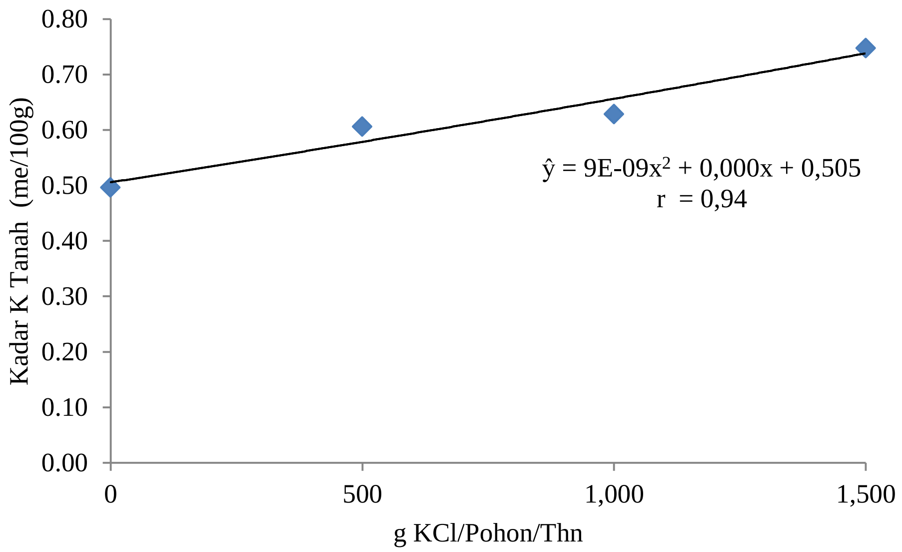

Figure 1. Graph of Relationship of KCl Dosage to Soil K Levels in the Fourth Month

The element potassium is the easiest element to form compounds with other elements or substances, such as chlorine and magnesium. The element of potassium functions for plants, namely to accelerate the formation of carbohydrates in plants, strengthen plant bodies, increase resistance to pests and diseases and drought, improve seed quality (Sutedjo and Kartasapoetra, 1988).

First Moon Bar Circumference

The results of the significant difference test of giving potassium (KCl) combined with agricultural lime (CaCO3) and kiserite (MgSO4) on stem circumference growth can be seen in Table 3 below.

Table 3. Data on Mean Stem Circumference (cm) in the First Month with Influence Administration of CaCO3, MgSO4 and KCl

TREATMENT	C0				C1				AMOUNT
	M0	M1	M2	M3	M0	M1	M2	M3	
K0	58,13	66,83	58,60	63.00	58,80	64.97	59,37	57,87	60.95
K1	59,87	60,47	64,17	59,53	57.90	64,47	60.07	58,10	60,57
K2	67,77	60,87	62,63	67.50	62,77	64,40	63.00	61,83	63.85
K3	67,83	61,70	65,90	64,63	60,67	67.50	67,47	64.50	65.03
AMOUNT	63.09				62,10				
	61,66	63,90	62.65	62,12	61,72	63,90	62.65	62,12	

Information : Numbers followed by unequal letters in the same treatment group were significantly different at the 5% level based on the DMRT test

The table data above is the length of the stem circumference from a total of 96 plants that were sampled in this study, this data was taken at the beginning of the month, before the treatment was given, the measurement of the stem circumference was carried out using a tape measure, the part that was measured was the stem that was right above the tapping area .

In measuring the circumference of the first month's stem circumference, it was found that the sample plants that had the largest stem circumference were the sample plants with the C0M0K2 treatment combination (67.77 cm) and the smallest was C1M3K0 (57.87 cm).

Stem circumference growth includes secondary growth. Secondary growth occurs due to activity in the cambium tissue (secondary meristematic). The division of the cambium outward forms the secondary phloem. While the division inward, will form secondary xylem. This division in the cambium tissue will cause widening of the stem, formation of annual rings, and pith radii (Tedy, 2017).

Fourth Moon Circumference

The results of the significant difference test for the effect of giving potassium (KCl) combined with agricultural lime (CaCO3) and kiserite (MgSO4) on stem circumference growth can be seen in Table 4 below.

Table 4. Data on Mean Stem Circumference (cm) in the Fourth Month with Influence Administration of CaCO3, MgSO4 and KCl

TREATMENT	C0				C1				AMOUNT
	M0	M1	M2	M3	M0	M1	M2	M3	
K0	59,33	68,70	60,13	64,37	61,20	66,63	61,47	59,27	62,64
K1	60,80	62,17	66,33	63,83	60.50	66,30	62.90	58,77	62,70
K2	73,43	62,63	64,30	68,47	65,17	67,10	67,33	64,83	66,66
K3	69,60	63,80	68,33	66,27	65,73	71,27	70,67	66,33	67,53
AMOUNT	65,16				64,72				
	64,47	66.08	65,18	64.02	64,19	66.08	65,18	64.02	

Information : Numbers followed by unequal letters in the same treatment group were significantly different at the 5% level based on the DMRT test

The table data above is the result of measuring the length of the stem circumference of a total of 96 sample plants. This measurement was carried out in the fourth month, which means 4 months after the first treatment. From the results of these measurements it is known that the sample plants that have the largest stem circumference is C0M0K2 (73.43cm) and the smallest is C1M3K1 (58.77cm).

Factors affecting the growth and development of rubber plants can be broadly divided into two, namely internal factors and external factors. Both of these factors have their respective roles in the process of plant growth and development. Internal factors include genes and hormones, while external factors include nutrition, sunlight, water, humidity, and soil (Siregar, 1983).

Wood and bark are formed due to the activity of the cambium which is between the xylem and phloem. Wood is formed by splitting inward by the feloderm, and also the bark which is formed as a result of splitting outwards by the felem (Muljono, 2017).

This potassium deficiency will trigger yellowing of the leaves, especially on the edges. Yellowing of the leaves is usually accompanied by yellowing of the tissue between the veins, then necrosis occurs in the yellowed tissue. In addition, this nutrient deficiency can also cause rubber plants to collapse easily. Meanwhile, if there is an excess of potassium, it will have an impact on inhibiting the process of plant growth due to the occurrence of NK bonds which result in difficulty absorbing nitrogen elements by plants (Balittra, 2018).

The difference between the first and fourth month's trunk circumference

The results of the significant difference test for the effect of giving potassium (KCl) combined with agricultural lime (CaCO3) and kiserite (MgSO4) on stem circumference growth can be seen in Table 5 below.

Table 5. Data on the difference between the circumference of the trunk circumference (cm) in the first and fourth months with
The Effect of Giving CaCO3, MgSO4 and KCl

TREATMENT	C0				C1				AMOUNT
	M0	M1	M2	M3	M0	M1	M2	M3	
K0	2,20	1.87	1.53	1.37	2.40	1.67	2,10	1.40	1.82a
K1	0.93	1.70	2,17	4.30	2.60	1.90	2.83	0.67	2,14ab
K2	5,67	1.77	1.67	0.97	2.40	2.70	4,33	3.00	2.81bc
K3	1.77	2,10	2.43	1.63	5.07	3.77	3,20	1.83	2,86d
AMOUNT	2,2				2.62				
	3.02	2,18	2.53	1.90	3.02	2,18	2.53	1.90	

Information : Numbers followed by unequal letters in the same treatment group were significantly different at the 5% level based on the DMRT test

The table above is the data on the difference in the circumference of the stem circumference in the measurement of the first month and the fourth month. From these results it is known that the administration of KCl with three levels had a significantly different effect on the growth of the circumference in the fourth month. Plants with the highest stem circumference growth were obtained from the K3 treatment (2.86 cm) which was significantly different from the K0 treatment (1.82 cm), significantly different from the K1 treatment (2.14 cm) and significantly different from the K2 treatment (2, 81 cm). The treatment combination that had the most effect on stem circumference growth was the C0M0K2 treatment (5.67cm) and the one that had the least effect was the C1M3K1 treatment combination (0.61cm).

The increase in stem circumference caused by giving potassium because the function of potassium itself is to increase photosynthesis which means accelerating the manufacture of food through biochemical processes in chlorophyll with the help of sunlight, so that the results of these biochemical processes accelerate cell division in plants which ends with increased growth.

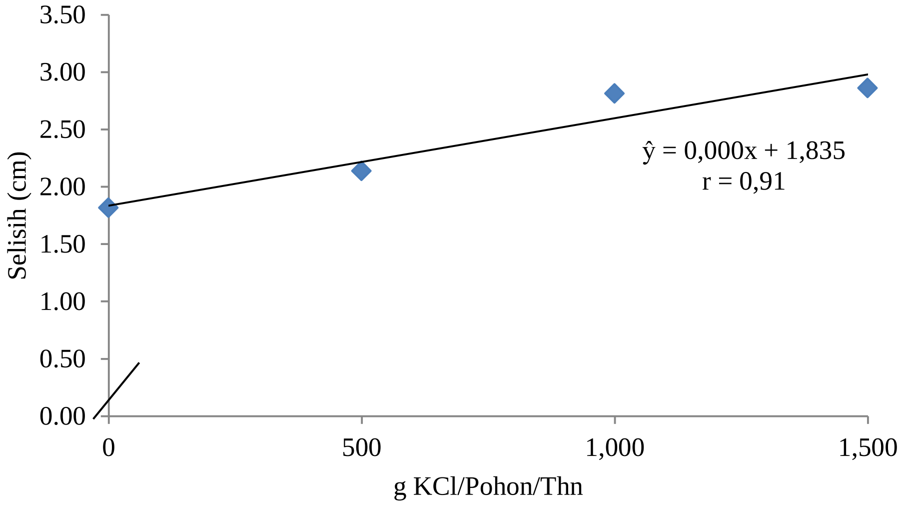

Figure 2. Graph of the Relationship of KCl Dosage to the Growth of Circumference Stems in the Fourth Month

From the graphical data above it can be seen that there is a growth in the circumference of the stem which is getting bigger along with the higher dose of potassium (KCl) applied with the combination of agricultural lime (CaCO3) and kiserite (MgSO4).

Latex Production

First Month Latex Production

Latex issapviscous, often similarmilk, which produced a lotplantand freezes when exposed to air. In plants, latex is produced bycell-cells that form a separate vessel, called latex vessels. These cells are located around the sieve tubes (phloem) and havecorenumerous and produce small latex granules in sectionsthe cytosol. If the vascular tissue of these cells is opened, for example due to cutting, a process of releasing these granules will occur into the vessels and come out as thick sap. (Zuhra, 2006).

The results of the significant difference test for the effect of giving potassium (KCl) combined with agricultural lime (CaCO3) and kiserite (MgSO4) on latex production can be seen in Table 6. below.

Table 6. Data on Average Latex Production (g) in the First Month with the Effect of Giving CaCO3, MgSO4 and KCl

TREATMENT	C0				C1				AMOUNT
	M0	M1	M2	M3	M0	M1	M2	M3	
K0	116,18	95,92	73,31	86,44	30,53	102,41	27,46	79.54	76,47
K1	102.05	20,60	84,15	28,42	67,97	75.96	60,32	85.06	65,56
K2	24,81	60,14	76,68	60,51	51.94	33.07	51.00	41,17	49,92
K3	120,13	51,69	72,81	65,90	44.94	49.08	45,41	85,14	66,89
AMOUNT	71,23				58,19				
	69,82	61,11	61,39	66,52	69,82	61,11	61,39	66,52	

Information : Numbers followed by unequal letters in the same treatment group were significantly different at the 5% level based on the DMRT test

From the data table above it can be seen that the effect of giving calcium did not make a significant difference, the result of giving magnesium did not give a significant difference, and the effect of giving potassium also did not give a significant difference. This can happen because there has not been absorption of the fertilizer given in the first month, as it is known that the nutrients absorbed through the roots are positively charged ions such as K+, Ca2+, Mg2+, this means that cation exchange has not occurred.

The table above states that the highest production was in the treatment C0M0K3 (120.13g) and the lowest in the treatment C0M1K1 (20.60g), but these results cannot be said to be the result of the treatment because the plants still absorb nutrients from the fertilization that was done before the study This.

Potassium is needed by rubber plants, especially for the growth of immature plants (TBM) and mature plants (TM). Potassium plays a role in skin regeneration in the lead area which in turn will give a positive response to production. Besides that, potassium also plays a role in latex stability and regulation of the balance of excess magnesium (Mg) through absorption inhibition mechanisms (Jalil bin Haji Yusoff, 1988).

Second Month Latex Production

The results of the significant difference test for the effect of potassium (KCl) combined with agricultural lime (CaCO3) and kiserite (MgSO4) on latex production can be seen in Table 7 below.

Table 7. Data on Average Latex Production (g) in the Second Month with Effects Giving CaCO3, MgSO4 and KCl

TREATMENT	C0				C1				AMOUNT
	M0	M1	M2	M3	M0	M1	M2	M3	
K0	124.71	143,14	140.47	181.33	83,32	190.67	142.74	179,19	148,19
K1	200.95	110.82	169.58	93.33	91.60	145.01	152,62	111.23	134,39
K2	90,40	108,29	131.79	220.58	137.00	161.43	162,23	84,39	137.01
K3	168,37	115.63	153.95	192.81	121.91	165,44	175.74	130.56	153.05
AMOUNT	146,43				139.69				
	127,3	142.6	153.6	149,2	127,3	142.6	153.6	149,2	

Information : Numbers followed by unequal letters in the same treatment group were significantly different at the 5% level based on the DMRT test

Production table data in the second month stated that there was an increase in production from the first month, but still did not give significantly different results to the treatment of calcium, magnesium and potassium. In the second month, the highest production was produced by the C0M0K1 treatment (200.95g) and the lowest production was the C1M3K2 treatment (84.39g).

The average production caused by the provision of potassium has increased quite drastically, this is due to the faster absorption of K compared to Ca and Mg. Element K has high solubility properties, so it is more quickly available to plants. The provision of Ca and Mg is similar to K, the only difference lies in the fixation. Because these two elements are available in divalent cation forms, the fixation of these two elements is weaker than that of K elements.

Third Month Latex Production

The results of the significant difference test for the effect of potassium (KCl) combined with agricultural lime (CaCO3) and kiserite (MgSO4) on latex production can be seen in Table 8 below.

Table 8. Data on Average Latex Production (g) in the Third Month with Effect Giving CaCO3, MgSO4 and KCl

TREATMENT	C0				C1				AMOUNT
	M0	M1	M2	M3	M0	M1	M2	M3	
K0	59,63	86.01	71.00	123.38	70,31	95.30	73.59	89.98	83.65
K1	92,22	82.77	114.60	70.04	50,48	101.65	137,42	86.06	91.91
K2	88.56	45,77	88.74	117.08	86,66	107.35	110,40	45,48	86,26
K3	72,18	64,78	120.99	131.25	90.77	118,19	127,40	64.55	98.76
AMOUNT	89.31				90.97				
	76.35	87,73	105,52	90.98	76.35	87,73	105,52	90.98	

Information : Numbers followed by unequal letters in the same treatment group were significantly different at the 5% level based on the DMRT test

The third month's production data stated that there was no significant effect on the treatment of calcium, magnesium and potassium, production decreased compared to the second month, but tended to be higher than the first month's production. The treatment with the highest production was C1M2K1 (137.42g) and the lowest was CIM3K2 (45.48g).

In addition, the low production is due to the fact that the rubber plant has entered the leaf fall phase which is marked by the appearance of signs of partial yellowing of the leaves. According to Gapkindo (2019) the leaf fall phase of rubber plants in North Sumatra occurs in the range from January to March.

Physiologically, mature rubber plants shed their leaves periodically every year. The addition of potassium can also occur through falling leaves, twigs and rubber fruit. Medrado et al. (1991) in Murbach et al. (2003) stated that the number of rubber pods/seeds and leaves that were aborted in rubber plantations in Brazil each year was 160 and 5,700 kg/ha respectively, with the amount of potassium returned being 15 kg/ha. Research results from several countries show that the amount of potassium returned to the soil varies.

This phenomenon results in low production because the food reserves in rubber plants are used for the growth and development of new leaves so that the allocation of food reserves used for the formation of latex begins to decrease and has an impact on decreased production.

Fourth Month Latex Production

The results of the significant difference test for the effect of potassium (KCl) combined with agricultural lime (CaCO3) and kiserite (MgSO4) on latex production can be seen in Table 9 below.

Table 9. Latex Production Average Data (g) in the Fourth Month with the Effect of Giving CaCO3, MgSO4 and KCl

TREATMENT	C0				C1				AMOUNT
	M0	M1	M2	M3	M0	M1	M2	M3	
K0	67,17	69,61	56,89	75,78	75,67	80.67	42,44	67,56	66,97

K1	82.50	57,78	85,18	88,28	41.56	68,33	148.94	109.56	85,27
K2	89.50	46,78	106,61	119,17	102,28	95.83	115,39	34.89	88,81
K3	78.56	59,39	145.78	107,72	67.50	92.78	80,31	46,83	84,86
AMOUNT	83.54				79,41				
	75.59	71.4	97,69	81,22	75.59	71.4	97,69	81,22	

Information : Numbers followed by unequal letters in the same treatment group were significantly different at the 5% level based on the DMRT test

Production data for the fourth month also did not have a significant effect on latex production, even being the lowest production within four months of the study, when referring to the results of soil content analysis in the fourth month in Table.2, indicating that there has been absorption of nutrients by plants. .

This can be seen from the data on the average K content in the fourth month in Table 2, namely the decrease in the average K content compared to the first month. Besides that, the fourth month coincides with the dry month which is also the peak of the leaf fall phase, so that the concentration of nutrients is not in the primary stem, but in the secondary stems which function to restore the formation of new leaves, the dynamics of the decline in latex production in the fourth month is also influenced by the interval accelerated tapping, from D5 to D4 (four days), so that the plant's recovery period for latex production is reduced. The treatment combination that had the highest production was C1M2K1 (148.94g) and the lowest was C1M3K2 (34.89g).

Potassium can play a role in spurring water absorption as a result of the presence of K+ ions, so that it can stimulate increased cell turgor pressure which results in the process of opening and closing stomata (Marschner, 2012).

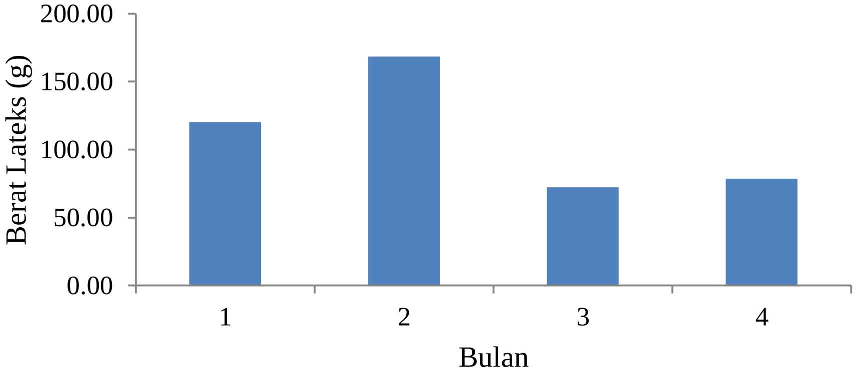

Figure 3. Graph of Mean Production on Treatment Combinations C0M0K3

The graph above is data on the average production of the CO0M0K3 treatment combination for four months of the study, the graph above only illustrates how potassium is administered and its effect on latex production for four months, COM0K3 is used as an illustration because it obtains the highest average production in the first month and also as a level with the highest dose for provision of potassium (K3 = 1500g/tree/year) so that it is used as a benchmark parameter for the next month.

From the graph above it can be seen that production in the second month increased quite drastically from the first month's production, which indicated that there was a real effect from the treatment given at the beginning of the study, but it turned out that production in the third month decreased dramatically compared to the second month, even though the treatment was given at the beginning of the third month. for the second time, this happened because in the third month was the peak of the leaf fall phase that occurred in rubber plants in the study area, so that the latex concentration was in the secondary branches which aim to form new leaves, resulting in a decrease in production is unavoidable. Likewise in production in the fourth month,

4. CONCLUSION

Potassium fertilizer application combined with agricultural lime and kiserite had a significant effect on the dynamics of increasing and decreasing soil K levels at 4 months after application. Potassium fertilizer application had no significant effect on latex production even though it experienced an increasing trend, but it could not be said to have experienced a significant difference. Giving potassium combined with agricultural lime and kiserite had a significant effect on increasing the difference in stem circumference at 4 months after application. The treatment combination that obtained the largest difference in stem circumference was C0M0K2 (5.67cm) and the smallest was the C1M3K1 treatment combination (0.67cm).

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