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FERTILIZATION APPLICATION FOR RUBBER PLANTATION IN HILLY AREA

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ABSTRACT

The hectarage of rubber has decreased year by year. Thus, future planting has been pushed to the problem soils which are problematic areas especially hilly areas. According to this issue, the government through Malaysian Rubber Board (MRB) decided to address this problem by implementing the MRB Strategies 2010-2020. There are five strategies; to increase planting area by 40,000 hectares per year, to expand rubber area by new planting 20,000 hectares per year, to accelerate replanting by high yielding clones, promote the mechanization and automation and enhance adoption in the latest technology in latex harvesting. This study is related to strategy number two which is to expand rubber area with new planting 20,000 hectares per year. The objective of this experiment is to study the effect of different technique of fertilizer application on the growth rate of rubber trees planted in hilly area. In this study, highly productive rubber clone, PB350 treated with two different of fertilizer application which is deep placing and broadcast application. In terms of the girth increment, there were significant difference between treatments and deep placing showed better performance compared to broadcast. As conclusion, it was shown that applying the correct and suitable fertilizer application especially in hilly areas which gave the higher girth increment of 13.23 cm/year compared to the broadcast application (11.91 cm/year). From this study, it can be suggested that for hilly area, deep placing of fertilizer application should be applied in order to obtain the higher girth increment (cm/year).

KEYWORDS

Fertilizer, Deep placing, Broadcast, Hilly area, Rubber plantation

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INTRODUCTION

Most tropical soils have long been considered to be problematic soils. Due to their low pH and low fertility status, these soils have been considered to be marginal for agricultural production compared to temperate soils. Even though these soils have special management problems, the successful cultivation of rubber countries such as Malaysia, Indonesia, Ivory Coast and Costa Rica have shown that these soils can be used for agricultural production and which hence need special management techniques and practices to have economically sustainable agricultural productivity. These marginal or problem soils include the highly weathered soils which is very low cation exchange capacity, skeletal soils with stones and gravels at shallow depths and sandy soils which is have deep soils with sandy textures (Paramananthan, 2007). The hectarage of rubber has decreased year by year and due to this limited planting area, new planting of rubber should be discovered in new planting areas throughout the country.

Fertilizer recommendations have been made by Malaysian Rubber Board (MRB) and Rubber Industry Smallholders and Development Authority (RISDA) in 1980's (Noordin, 2013; Malaysian Rubber Board, 2009). Since that, there is no revision made to the fertilizer requirement for rubber clones which are, newly developed clones (Shima et. al, 2007). Current recommendation for smallholders in Malaysia should be revised; either increased the fertilizer rate or changes the fertilizer regimes in order to meet the nutrient requirements for new rubber clones or new planting area especially in hilly areas. Terrain classes are grouped as level or flat, undulating, hilly and mountainous. In undulating and hilly terrain, the incline of slopes would exert a strong influence on the flow of water and hence soil formation and its characteristics (RRIM, 1967). For steep slopes where terracing is not practised, forking in of fertilisers or pocketing them into the soil is recommended (Yew, 1992). The objective in this experiment is to study the effect of different technique of fertilizer application on the growth rate of rubber trees planted on at hilly area.

MATERIALS AND METHODS

This study was conducted at Malaysian Rubber Board (MRB) of Research Station, Sungai Sari, Kedah Darul Aman. Highly productive rubber clone, PB 350 treated with two different of fertilizer application which is deep placing and broadcast. The fertilizer rates were based on MRB's recommendation. The details of fertilization programme used in this study are simplified as shown in Table 1.

Table 1. Treatment of Fertilization Application

Location	Method of Fertilizer Application	Parameters
Research Station of MRB, Sungai Sari, Kedah Darul Aman	Broadcast	Girth increment, Soil and Foliar Analysis.
	Deep placing	

The experiment was subjected to randomize completely block design (RCBD) with two replications. Data on growth such as girth and foliar analysis were taken and analysed at the end of this study. The plant girth size reading was measured at the 150 cm from the soil surface using digital Venier Caliper. Initial area measured was marked with permanent marker where the subsequent reading will be considered. For pedological study, soil sample was collected from each horizon at short depth intervals of soil profile for determination of soil physical and chemical properties.

RESULTS AND DISCUSSIONS

Soil Properties

Batang Merbau series is classified as fine loamy siliceous, isohyperthermic, family of Orthoxic Tropudult and developed from igneous and high grade metamorphic rocks. They have yellow colours (7.5 YR to 10 YR), fine clay (35-60%) and fine silt (<30%). In this study, Batang Merbau series has yellow to yellowish brown (10 YR 6/4 – 7/8), consists of 38% is clay, 4% is silt and 58% is sand. There are few types of soil series that are almost similar to Batang Merbau series such as Bungor series and Tembeling series.

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However, they are differentiated by parent material, which is Batang Merbau consists of quartz, while Bungor series consists of shale and Tembeling series consists of Tuffaceous shale (DOA, 2011).
The soil chemical properties before this experiment was started are presented in Table 2. The pH value in the soil was around 4.00 to 5.00 in range shows that the soil is acidic. The value of Cation Exchange Capacity (CEC) in the soil was in range 11.0 cmol(+)/kg. This indicates that CEC is low and it shows the limitation of the soil to retain cations.

Table 2. Soil Chemical Properties

Location	pH	Available Phosphorus (P)	Exch. Potassium (K)	Exch. Magnesium (Mg)	CEC
Research Plot	4.13a	0.13	0.10	0.04	11.0

Plant Girth Increment

The growth vigour of clone PB 350 was evaluated using the girth measurements at the height of 150 cm above ground. The plant girth increment (cm) of the clone from the different treatments based on two different fertilizer applications are presented in Figure 1. The treatment of deep placing fertilizer application supported plant physical traits such as girth size when compared to the broadcast fertilizer application and there was significant difference among the treatment. For instance, the deep placing fertilizer application achieved 13.23 cm/year in girth increment followed by broadcast fertilizer application which is 11.91 cm/year. The result shows that PB 350 planted on hilly area using deep placing fertilizer application performed better in terms of girth measurement compared to the broadcast fertilizer application based on ANOVA and LSD Test showed at the probability level at ($P<0.05$).

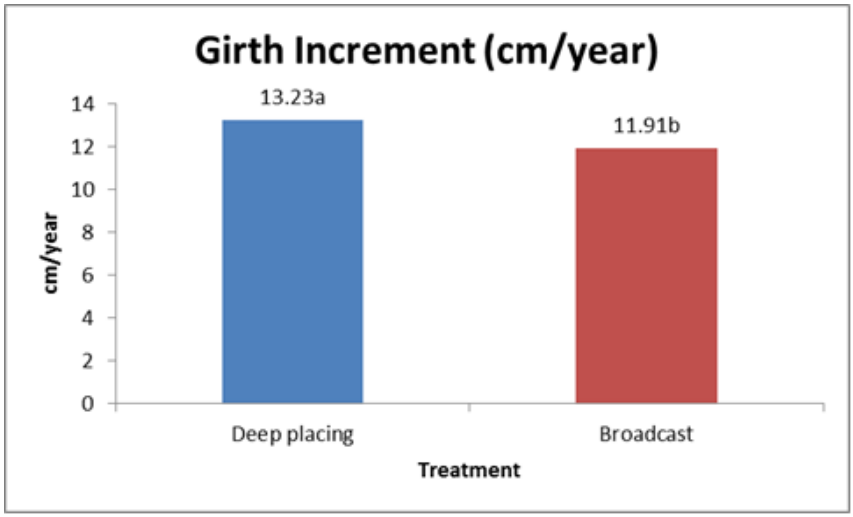

Figure 1. Plant Girth Increment (cm/year)

Fertilizer is defined as a substance that provides nutrients to the plants for their growth and enables it to function well. Pushparajah and Yew (1977) noted that different soil series on different terrain and topography in Peninsular Malaysia have different inherent physical and chemical characteristics and thus influence the yield and performance of Hevea. This is an agreement with the fertilizer recommendation of Malaysian Rubber Board (2009). In addition, the inherent chemical and physical properties of the soil series under which Hevea is cultivated are varied.

Soil pH can be said to be a measure of the acidity or alkalinity of the soil solution. In this study, the soil pH of Batang Merbau series was around 4 to 5 in range shows that these soils are acidic. However, Anon. (1960) emphasized in his previous study that the most commonly quoted pH range for satisfactory growth for Hevea is from 4 to 6.5 on the pH scale. The deep placing of fertilization application showed better performance compared to broadcast of fertilization application in terms of plant growth of PB 350.

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Terrain classes are grouped as level or flat, undulating, hilly and mountainous. In undulating and hilly terrain, the incline of slopes would exert a strong influence on the flow of water and hence soil formation and its characteristics (RRIM, 1967). The degree of soil erosion is a function of rainfall intensity, the topography of the area and soil structure. The higher is the rainfall intensity, the steeper is the terrain and the longer is the slope, together with a poor state of aggregation of the soil particles, the greater is the susceptibility of the soil to erosion.

CONCLUSIONS

In this study, it was shown that rubber tree depended on a range of complementary physiological and morphological characteristics for its growth performance based on fertilizer applied. Deep placing fertilizer application showed better performance in term girth measurement compared to broadcast application. From this study, it can be suggested that for hilly area especially, deep placing technique of fertilizer application should be applied specifically during immature periods.

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