



**UNIVERSITI PUTRA MALAYSIA**

**INFLUENCE OF GROUND BASALT APPLICATION ON GROWTH AND  
NUTRIENT STATUS OF *Hevea brasiliensis* (RRIM 3001)**

**NURUL AFIFAH ABDUL RAHMAN**

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*Hevea brasiliensis* (RRIM 3001)

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SERDANG, SELANGOR DARUL EHSAN

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INFLUENCE OF GROUND BASALT APPLICATION ON GROWTH  
AND NUTRIENT STATUS OF *Hevea brasiliensis* (RRIM 3001)

BY

NURUL AFIFAH BINTI ABDUL RAHMAN

A project report submitted to the Faculty of Agriculture,  
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## ENDORSEMENT

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## ABSTRACT

Rubber (*Hevea brasiliensis*) belongs to the family of *Euphorbiaceae*. Though many research had been done pertaining to growth of rubber and nutrition, however in Malaysia there is no information on application of basalt to rubber. Thus, the purpose of this experiment is to determine the influence of ground basalt application on growth and nutrient status of *Hevea brasiliensis* (RRIM 3001). The new finding will be useful to rubber plantation industry to improve the nutrient availability, reduce cost of fertilizer and ability to face the problem of acidic soil. The experiment was conducted at Field 2, UPM. The treatments consist of five different treatments 0 g (control), 40 g, 80 g, 160 g and 240 g of basalt application and Christmas Island Rock Phosphate (CIRP) 25 g per polybag. Basalt was sieved using 0.1 mm siever to increase the surface area to fasten the process of reaction. Parameters on girth, height and chlorophyll content were collected every month. Other parameters including dry weight of root, leaves, stem, total dry weight of plant and nutrients content N, P, K, and Mg of plant tissues, were measured after 6 month. Soil chemical properties was analysed after 6 month of the experiment. Data was analysed using Analysis of Variance (ANOVA) and Statistical Analysis System (SAS). Least Significance Different (LSD) was used to determine the significant different between treatment means. From this study, plant that was treated with basalt shows the highest vegetative growth, soil nutrients content, fresh and dry weight. For height and girth T5 (201.11 cm and 1.4 cm) was significantly higher than T1 (122.66 cm and 1.1 cm). Fresh weights, dry weights of each part of plant leaf, stem, and root also highest in T5 and lowest in T1. For fresh weight, highest rate of basalt application, 240 g

(T5) was higher significantly compared to non-applied basalt with value 562.6 g and 386.61 g respectively. Application of basalt seems no significant effect on leaf nutrient content. However, soil chemical properties such as pH, P, K, Ca, Mg, and K were increased with increasing rate of basalt applied. In conclusion, the result shows that ground basalt application enhance the growth performance of *Hevea brasiliensis* RRIM 3001 and increase nutrient status in soil.



## ABSTRAK

Getah (*Hevea brasiliensis*) berasal dari keluarga *Euphorbiaceae*. Walaupun terdapat banyak kajian yang telah dilakukan dalam pertumbuhan dan nutrisi getah, namun di Malaysia tidak ada lagi kajian dan penemuan baru bagi aplikasi basalt terhadap getah. Justeru, tujuan eksperimen ini adalah untuk menentukan kesan aplikasi basalt terhadap pertumbuhan dan status nutrisi *Hevea brasiliensis*, RRIM 3001. Kajian ini sangat berguna dalam industri perladangan getah untuk meningkatkan ketersediaan nutrien, mengurangkan kos baja dan mengatasi masalah tanah berasid. Kajian telah dilakukan di Ladang 2, UPM. Aplikasi basalt terdiri daripada 5 kadar yang berbeza iaitu 0 g (kawalan), 40 g, 80 g, 160 g dan 240 g dan *Christmas Island Rock Phosphate* (CIRP) diletakkan 25 g pada setiap polibeg. Basalt telah diayak menggunakan pengayak 0.1 mm untuk meningkatkan luas permukaan bagi mempercepatkan tindakbalas. Parameter bagi ketinggian, ukurlilit batang dan kandungan korofil diambil pada setiap bulan. Manakala parameter lain misalnya berat kering akar, batang, daun dan keseluruhan berat kering tumbuhan serta kandungan tisu tumbuhan iaitu N, P, K, Mg dan Ca diambil pada 6 bulan selepas kajian dijalankan. Sifat kimia tanah juga dilakukan pada sebelum dan selepas kajian dilaksanakan. Data di analisis menggunakan ANOVA dan SAS. LSD digunakan bagi menentukan perbezaan signifikan antara purata. Dari kajian ini, pokok yang menggunakan aplikasi basalt menunjukkan pertumbuhan pokok, kandungan nutrisi dalam tanah, berat kering dan basah yang paling tinggi. Bagi ketinggian dan ukurlilit, T5 (201.11 cm dan 1.4 cm) adalah lebih tinggi daripada T1 (122.66 cm dan 1.1 cm). Berat basah, berat kering bagi setiap bahagian tumbuhan daun, batang, dan akar yang paling

tinggi juga adalah T5 dan yang paling rendah adalah T1. Bagi berat basah, kadar aplikasi basalt paling banyak 240 g (T5) adalah lebih tinggi berbanding tidak menggunakan basalt dengan nilai masing-masing 562.6 g dan 386.61 g. Aplikasi basalt tidak mempunyai kesan yang besar ke atas kandungan nutrisi daun. Walau bagaimanapun, sifat kimia tanah seperti pH, P, K, Mg, Ca dan K telah meningkatkan dengan kadar peningkatan aplikasi basalt. Kesimpulannya, keputusan kajian menunjukkan kadar aplikasi basalt meningkatkan pertumbuhan *Hevea brasiliensis* (RRIM 3001) dan meningkatkan kandungan nutrisi di dalam tanah.

## CHAPTER 1

### INTRODUCTION

*Hevea brasiliensis* known as rubber tree is a tropical crop which comes from Amazon forest, South America. In 1770, Priestly was the person who named it natural rubber. Nowadays, rubber trees have been the main source of natural rubber production worldwide. South East Asia is the main producer of natural rubber (Noordin *et al.*, 2012). From the Economic Intelligence Unit (EIU), natural rubber supply for the global market is predicted to grow by 1.9% in 2014.

For example, the predicted rubber market for Kuala Lumpur will grow due to demand for rubber tyres. Besides, consumption of natural rubber in China is expected to increase by four percent on average 2014 until 2015 due to high and strong demand of the consumer for 2013 that continue until 2014. Moreover, demand for natural rubber in India's is expected in 2014 until 2015 will grow steadily to nearly 1.1 million tonnes (MRB Digest, 2014).

The world demand for natural rubber will be an increasing trend especially with emergence of rapid development among Asian Countries such as China and India. This

study will focus on investigate influence of ground basalt application on growth and nutrient status of *Hevea brasiliensis* (RRIM 3001) in Rengam soil series.

Malaysia is the third largest natural rubber producer with 1,029,00 ha planted after Indonesia (3,445,00 ha) and Thailand (2,785,000 ha). Malaysia is also the third largest natural rubber producer with 0.93 million tonnes in 2010 and the sixth largest consumer of natural rubber in the world at 0.46 million tonnes in 2010. The world rubber industry scenario for the future shows brighter prospect as evidenced by its steady growth (Noordin, 2013).

Rubber will assume greater importance for economic and income generation. Therefore, new technologies that could boost rubber production to increase nation's income and serve the world consumption of rubber are needed. In order to sustain growth and yield potential of rubber plantation, considerable amount of fertilizer is required (Noordin, 2013).

Moreover, for high quality and high amount of latex production in rubber, the most crucial factor is to ensure the soil nutrients status and fertilizer application. High cost is needed to maintain fertilization for optimum plant growth. Besides, one of the problems in planting rubber is the time factor that the smallholders need to face in order to wait for tapping periods.



For example, RRIM 3001 clone can be tapped after 4 years of planting. In this situation smallholders need another source of income. Thus, there must be new researches and technologies that can improve the plantation of rubber such as shorten the immature period and reduce the cost of fertilizer application.

Besides, research and development (R&D) on application of basalt on agronomic practises are still lacking. Development in R&D will help to create potential yield of *Hevea brasiliensis*. In Malaysia there is no new findings about application of basalt on *Hevea brasiliensis* and no new research about basalt that originated come from Malaysia rock. Thus, study on application of basalt needs to be tested on *Hevea brasiliensis*.

There is a research about application of basalt to other crops that caused exchangeable Ca, Mg, K, and available P to increase significantly, increase pH of soil and improve fertility of acid soil. Basalt used in this research is imported from a company in Australia (Shamshuddin and Che Fauziah, 2010). This shows that application of basalt has big potential to increase the productivity of plant. This can reduce the cost of fertilizer and liming.

Objective of this study was to determine the effect of basalt application on growth of *Hevea brasiliensis* (RRIM 3001). This study was conducted in order to evaluate the response of rubber tree to basalt application. Additionally, the other objective was to investigate the different rate of ground basalt applications on nutrient status clone RRIM 3001 of *Hevea brasiliensis*.



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