



**UNIVERSITI PUTRA MALAYSIA**

**THE EFFECT OF FOLIAR APPLIED ZINC AND COPPER ON YOUNG OIL  
PALM (*Elaeis guineensis* Jacq.)**

**NUR NADIA FARLINA AHMAD FUAD**

**FP 2015 128**

**THE EFFECT OF FOLIAR APPLIED ZINC AND COPPER ON  
YOUNG OIL PALM (*Elaeis guineensis* Jacq.)**

The logo of the University of Putra Malaysia (UPM) is a shield-shaped emblem. It features a central vertical element with a book at the top, flanked by two stylized wings or leaves. The shield is divided into several sections with different colors and patterns. The letters 'UPM' are prominently displayed in a red box at the top left of the shield.

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**FACULTY OF AGRICULTURE**

**UNIVERSITY PUTRA MALAYSIA**

**SERDANG, SELANGOR DARUL EHSAN**

**2014/2015**

**THE EFFECT OF FOLIAR APPLIED ZINC AND COPPER ON YOUNG**

**OIL PALM (*Elaeis guineensis* Jacq.)**

**By**

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**A project report submitted to the Faculty of Agriculture, Universiti Putra  
Malaysia, in fulfilment of the requirement of PRT 4999 (Final Year Academic  
Project) for the award of the degree of Bachelor of Agricultural Science**

**FACULTY OF AGRICULTURE**

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**SERDANG, SELANGOR**

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## ENDORSEMENT

This Project Report Entitled “**The Effect Of Foliar Applied Zinc And Copper On Young Oil Palm (*Elaeis Guineensis* Jacq)** is prepared by Nur Nadia Farlina Bt Ahmad Fuad and submitted to the Faculty of Agriculture in fulfilment of the requirement of PRT 4999 (Final Year Academic Project) for the award of the degree of Bachelor of Agricultural Science.

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## ABSTRACT

Malaysia is the second largest oil palm producer after Indonesia. In 2013, the hectareage of oil palm plantation was 5.3 million hectares. This shows an increase of about 13% compared to 4.69 million hectares in 2009. Malaysian soils consist mainly of Ultisols and Oxisols which are highly weathered. These soils are usually acidic with pH of less than 5. There are major nutritional constraints for oil palm production. Few oil palm plantations on upland soils apply micronutrients such as Zn and Cu. The objective of this study is to determine the effects of Zinc and Copper applied as foliar application and to investigate the difference in amount absorbed between Sulphate and EDTA source for Zinc and Copper on immature oil palm. The hypothesis for this study is that the application of foliar fertilizer as EDTA form will be a better source than Sulphate form in the uptake of Zinc and Copper. For the soil, it does not show any difference. The leaf and soil samples were taken at United Malacca Berhad, Machap Estate, Melaka. The experimental design was Complete Randomized Design (CRD). There were 7 treatments and each treatment will have 3 replications. The treatments were NPKMgB, NPKMgB + CuSO<sub>4</sub>, NPKMgB + CuEDTA, NPKMgB + ZnSO<sub>4</sub>, NPKMgB + ZnEDTA, NPKMgB + ZnSO<sub>4</sub> + CuSO<sub>4</sub> and NPKMgB + ZnEDTA + CuEDTA. The laboratory analysis was conducted in Faculty of Agriculture at Department of Land Management. The analysis involve were soil and plant tissue analysis. For the soil analysis, the total N, available P, CEC, pH, organic carbon and double acid methods for total Zn, Cu, Fe and Mn were determined. For the plant tissue, total N and dry ashing methods were analyzed. The application of Zn and Cu in the form of sulphate and EDTA did not show any significant effect on zinc and

copper concentration on leaves. There was no difference between control and other treatments.



## ABSTRAK

Malaysia merupakan pengeluar kedua terbesar kelapa sawit selepas Indonesia. Pada tahun 2013, kawasan penanaman kelapa sawit adalah 5.3 juta hektar. Ini menunjukkan peningkatan sebanyak 13% berbanding 4.69 juta kawasan penanaman pada tahun 2009. Tanah di Malaysia terdiri terutamanya daripada Ultisols dan Oxisols dimana merupakan sangat terluluhawa. Tanah ini kebiasaannya adalah berasid dengan pH kurang daripada 5. Terdapat banyak kekangan nutrien utama dalam pengeluaran kelapa sawit. Beberapa ladang kelapa sawit di tanah tinggi memberi beberapa mikronutrien seperti Zn dan Cu. Objektif kajian ini dijalankan untuk mengesan penggunaan pada daun terhadap Zn dan Cu yang dibekalkan dalam bentuk sulfat dan EDTA ke atas kelapa sawit yang belum matang. Sampel daun dan tanah telah diambil di United Malacca Berhad, Machap Estate, Melaka. Reka bentuk eksperimen ini adalah *Completely Randomized Design (CRD)* yang terdiri daripada 7 rawatan dengan 3 replikasi. Rawatan adalah NPKMgB, NPKMgB + CuSO<sub>4</sub>, NPKMgB + CuEDTA, NPKMgB + ZnSO<sub>4</sub>, NPKMgB + ZnEDTA, NPKMgB + ZnSO<sub>4</sub> + CuSO<sub>4</sub> and NPKMgB + ZnEDTA + CuEDTA. Analisis makmal telah dijalankan di Jabatan Pengurusan Tanah, Fakulti Pertanian, Universiti Putra Malaysia (UPM). Untuk analisis tanah, jumlah N, P, CEC, pH, karbon organik dan Zn, Cu, Fe dan Mn telah dianalisiskan. Bagi analisis tisu daun, jumlah N, P, karbon organik dan Zn, Cu, Fe dan Mn telah dijalankan. Penggunaan Zn dan Cu dalam bentuk sulfat dan EDTA tidak menunjukkan apa-apa kesan yang besar ke atas kepekatan Zn dan Cu pada daun. Tiada perbezaan didapati antara kawalan dan rawatan lain.



## CHAPTER 1

### 1.0 INTRODUCTION

Malaysia is the second biggest oil palm producer after Indonesia. In 2013, the hectareage of oil palm plantation was 5.3 million hectares. This shows an increase of about 13% compared from 4.69 million hectares in 2009. While the production of oil palm products showed a slight increase from 2013 to 2014. Statistics showed that the production of crude palm oil in 2013 was 13,714,429 tonnes and this increases to 14,658,666 tonnes in 2014. This shows an increases of about 6%.

The oil palm originated from Africa, but then was successfully grown in Southeast Asia. The climate of Asian countries are suitable for the growth and production of oil palm. In Malaysia, this industry has been developed for more than five decades. Oil palm plays a crucial role in our agriculture industry.

Oil palm is a perennial crop that needs sufficient amount of fertilizers in order to grow and produce well. Therefore, supplying enough quantity of fertilizer and applying it at the right time must be recommended. Fertilizer can be applied in two ways either to the soil or direct to the leaves, also known as foliar application.

The first foliar fertilization was used a long time ago in 1844 where iron was sprayed to correct plant chlorosis. Foliar application usually use specific nutrients to increase yields and efficiency of fertilizer used (Oosterhuis, 2009). After some time, some researchers from California and Oregon tried to apply fertilizers together with insecticides in 1914. In 1956, Tukey had studied foliar application by using radio isotopes and confirmed the highly efficient uptake of fertilizers through foliage.

Nowadays, this method has very slow, gradual acceptance by the industry and academic institutions.

The application of fertilizers through foliar can be carried out for using macronutrients or micronutrients. The macronutrients can be listed as Nitrogen, Potassium, Phosphorus, Magnesium and Calcium. Foliar application of macronutrients can help plants to recover from temporary stress due to moisture problems, pests or disease. For the micronutrients are Zinc, Copper, Chlorine, Boron, Manganese, Iron, and Molybdenum (Mills and Jones, 1996). Plants can absorb a small amount of nutrients from dilute solutions sprayed on to the leaves. Since the amount of micronutrients needed by plants is very small, these can be supplied as foliar sprays, especially if nutrients are chelated for better absorption. Plants can also absorb macronutrients through the leaves, but it is not possible to supply sufficient amounts this way. Therefore, it must be taken up by the roots.

The main objective of this research is to study the effect of foliar application of Zinc and Copper in immature oil palm and to study the differences in absorption between Sulphate and EDTA source for Zinc and Copper.

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