



UNIVERSITI PUTRA MALAYSIA

**PERFORMANCE OF MICRONUTRIENT COATED UREA ON GROWTH
AND YIELD OF *AMARANTHUS GANGETICUS***

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**PERFORMANCE OF MICRONUTRIENT COATED UREA ON GROWTH AND
YIELD OF *AMARANTHUS GANGETICUS***

By

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CERTIFICATION

These project papers entitle “Performance of Micronutrient Coated Urea on Growth and Yield of *Amaranthus Gangeticus*” is prepared by Nurhana binti Mat Daud and submitted to the Faculty of Agriculture in the partial requirement PRT4999 (Final Year Project) for the award of the degree Bachelor of Agricultural Science.

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ABSTRACT

Urea is an important fertilizer as the source of nitrogen. The low efficiency of nitrogen is a problem for the crop growth. Nitrogen is lost through nitrate (NO_3) leaching, ammonia (NH_3) volatilization and denitrification. The high rate of urea hydrolysis also can increase the rate of nitrogen loss. This problem caused the lower rate of urea efficiency and to overcome this problem, micronutrient coated urea is used to increase the rate of efficiency of urea, to reduce the loss of urea and to increase the growth of the *Amaranthus gangeticus*. In this study, five treatments were used, namely: urea; urea+Copper; urea+Zinc; urea+Boron; and urea+Zinc+Copper+Boron. Parameters taken in this study were the nitrogen content in the soil and plant, dry weight and fresh weight. Experimental design used in this experiment was Randomized Complete Block Design and each treatment has four replications. Each replicate was arranged in the randomized position of different block. This study was being conducted using top soil Munchong series, which was taken from Ladang 2, UPM. The duration of study is 4 weeks. The plant used in this experiment was amaranth (*Amaranthus gangeticus*) grown with applied fertilizer. The data of nitrate (NO_3), ammonium (NH_4^+), and total nitrogen were collected every week after the fertilizer application. The data were statistically analyzed using Analysis of Variance (ANOVA) and the mean compared using *Least Significant Differences* (LSD) Test. Expected results by using micronutrient coated urea are the increase in the growth of the plant and uptake of nitrogen by plant in the form of nitrate (NO_3) and decrease in the amount of nitrogen released.

ABSTRAK

Urea merupakan baja yang penting dan sebagai sumber nitrogen. Kecekapan nitrogen yang rendah menjadi masalah kepada pertumbuhan tanaman. Nitrogen akan hilang melalui proses larut lesap nitrat (NO_3), pemeruapan ammonia (NH_3) dan penitritan. Kadar hidrolisis urea yang tinggi juga akan meningkatkan kadar kehilangan nitrogen. Masalah ini akan menyebabkan kadar kecekapan urea yang rendah dan untuk mengatasi masalah ini, urea mikronutrien bersalut digunakan untuk meningkatkan kadar kecekapan urea, mengurangkan kehilangan urea dan meningkatkan pertumbuhan *Amaranthus gangeticus*. Dalam pembelajaran ini, lima rawatan telah digunakan ialah: urea; urea+Copper; urea+Zinc; urea+Boron; dan urea+Zinc+Copper+Boron. Parameter yang diambil didalam pembelajaran ini ialah kandungan nitrogen di dalam tanah dan tanaman, serta berat kering dan berat basah. Rekebentuk eksperimen yang digunakan di dalam eksperimen ini ialah *Randomized Complete Block Design* dan setiap rawatan mempunyai empat replikasi. Setiap replikasi akan disusun secara rawak untuk setiap blok yang berlainan. Pembelajaran ini telah diadakan menggunakan tanah bahagian atas siri Munchong yang diambil dari Ladang 2, UPM. Jangka masa pembelajaran ini ialah selama 4 minggu. Tanaman yang digunakan dalam eksperimen ini ialah penanaman amaranth (*Amaranthus gangeticus*) dengan pemberian baja. Data nitrat (NO_3), ammonium (NH_4^+), dan kandungan nitrogen akan diambil setiap minggu selepas baja diberikan. Data dianalisis statistik menggunakan Analisis of Varian (ANOVA) dan purata akan dibandingkan menggunakan *Least Significant Differences (LSD)*. Keputusan yang dijangka melalui penggunaan urea mikronutrien bersalut adalah peningkatan pertumbuhan tanaman dan pengambilan nitrogen bagi tanaman dalam bentuk nitrat (NO_3) serta pengurangan kehilangan urea.

CHAPTER 1

INTRODUCTION

Nitrogen is one of the important elements and it's necessary in crop's growth. Nitrogen in the form of Nitrogen gas (N_2) cannot be taken up directly by crop. Urea is widely used by farmers as the source of nitrogen for the crop. Urea contains about 46% of nitrogen. The low manufacturing cost and high concentration of N are the reasons why urea is highly recommended and its consumption is about 38%, higher than other nitrogenous fertilizer (Bouwman et al., 1997). Low efficiency of urea is the major problem in the world.

The excessive use of the urea can lead to the high leaching of the nitrate and this will reduce the efficiency of the urea. Soil cannot adsorb NO_3 , so leaching is one of the reasons why this element is easily lost. The reactive element, such as NO_3 and NH_4^+ will release nitrous oxide, which is the main drivers in agricultural emission (Niggli. *et al.*, 2009). This will give negative effect to the environment. This will also cause the high usage of the fertilizer to achieve the recommended quantity of nitrogen for the crop.

Micronutrient coated urea is used to reduce the loss of the nitrogen source. This micronutrient coated urea release the nitrogen slowly and can be taken up by the crop. This will reduce the losses of nitrogen to the surrounding. The continuous supply of nitrogen by micronutrient coated urea can be achieved through this usage.

The micronutrient coated urea can replace the normal urea with the increase of the nitrogen supply and thus reduce the losses of nitrogen to the environment. Thus, this will increase the efficiency of the urea through the usage of micronutrient coated urea.

This study was undertaken with the following objectives:

1. To determine the effect of the micronutrient coated urea on the growth of the *Amaranthus gangeticus*.
2. To determine nitrogen release of micronutrient coated urea in the soil.
3. To determine the uptake of nitrogen by *Amaranthus gangeticus* in the form of nitrate (NO_3).

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