UNIVERSITI PUTRA MALAYSIA

THE EFFECT OF *PSEUDOMONAS SPP*. AND UPMB10 AND DIFFERENT RATE OF UREA FERTILIZER ON PROTEIN CONTENT AND GROWTH OF LEAF MUSTARD

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BY

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ENDORSEMENT

This project paper entitled " **The effect of *Pseudomonas spp.* and UPMB10 and different rate of Urea fertilizer on protein content and growth of leaf mustard** " is prepared by Noorsuraya Hani binti Shahabuddin and submitted to Faculty of Agriculture in fulfillment of the requirement of PRT4999 (Final Year Project) for the award of Degree of Bachelor of Agricultural Science.

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Dedicated to My Beloved Parents

Shahabuddin bin Mohd Kasim & Rozitah binti Muhammad Ali

Strong support - Encouragement - Constant Love

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ABSTRACT

Green mustard (*Brassica sp*.) is a type of plant in the mustard category of the family Cruciferae. This plant is one out of five types of broad leaf vegetables commonly grown in Malaysia every year. Nitrogen is one the most yield limiting nutrients for most crop production in the world except for legumes, which have the ability to fix their own N. A study on the effect of *Pseudomonas spp*. and UPMB10 and different rate Urea fertilizer on protein content and growth of green mustard was conducted. The main objective is to study if the rate of nitrogen fertilizer and used of bacterial inoculum can increase protein content and growth of the plant. There were 10 treatments including two control treatments with four replications arranged in a Completely Randomized Design (CRD). The treatments were; T1 (Not inoculated + 0 g Urea), T2 (Not inoculated + 0 g Urea), T3 [Inoculated with UPMB-10 (*Bacillus sphaericus*) + 0 g Urea], T4 [Inoculated with UPMB-10 (*Bacillus sphaericus*)+0.49 g Urea], T5 [Inoculated with UPMB-10 (*Bacillus sphaericus*) + 0.98 g Urea], T6 [Inoculated with UPMB-10 (*Bacillus sphaericus*) + 2.94 g Urea], T7 (Inoculated with *Pseudomonas spp*. + 0 g Urea), T8 (Inoculated with *Pseudomonas spp*. + 0.49 g Urea), T9 (Inoculated with *Pseudomonas spp*. + 0.98 g Urea), T10 (Inoculated with *Pseudomonas spp*. + 2.94 g Urea). The parameters involved in this project were the plant fresh and dry weight, chlorophyll content, plant height, nutrient composition and protein content. The results indicate that used of bacteria utilization by injection inoculation method significantly improved the growth of the plant. The fresh weight of the plant increase by 20% , dry weight increase by 14%, plant height increase by 22% and chlorophyll content of the plant increase by 9% as compared to the control treatment. While rate of Urea (N) fertilizer improved the

nutrient composition (N- 19%, P- 3%, K- 15%) and protein content of the plant increase by 30%.

ABSTRAK

Sawi hijau (*Brassica sp*.) adalah sejenis tumbuhan dalam kategori mustard daripada keluarga Cruciferae. Tumbuhan ini adalah salah satu daripada lima jenis sayur-sayuran berdaun luas yang selalu ditanam di Malaysia. Nitrogen adalah satu nutrien yang paling mengekang hasil pengeluaran tanaman di dunia, kecuali kekacang yang mempunyai keupayaan untuk mengikat sendiri N. Satu kajian mengenai kesan *Pseudomonas spp*. dan UPMB10 dan kadar baja urea yang berbeza pada kandungan protein dan pertumbuhan sawi hijau telah dilaksanakan. Objektif utama adalah untuk mengkaji jika baja urea dan inokulum bakteria yang digunakan boleh meningkatkan kandungan protein dan pertumbuhan tumbuhan. Terdapat 10 rawatan termasuk dua rawatan kawalan dengan empat replikasi disusun dalam rekabentuk rawak lengkap (CRD). Rawatan ialah; T1 (Tidak disuntik + 0 g urea), T2 (Tidak disuntik + 0.98 urea), T3 [disuntik dengan UPMB-10 (*Bacillus sphaericus*) 0 g urea], T4 [disuntik dengan UPMB-10 (*Bacillus sphaericus*) + 0.49 g urea], T5 [disuntik dengan UPMB-10 (*Bacillus sphaericus*) + 0.98 g urea], T6 [disuntik dengan UPMB-10 (*Bacillus sphaericus*) + 2.94 g urea], T7 (disuntik dengan *Pseudomonas spp*. + 0 g urea), T8 (disuntik dengan *Pseudomonas spp*. + 0.49 g urea), T9 (disuntik dengan *Pseudomonas spp*. + 0.98 g urea), T10 (disuntik dengan *Pseudomonas spp*. + 2.94 g urea). Parameter yang terlibat dalam projek ini adalah berat segar dan berat kering, kandungan klorofil, ketinggian tumbuhan, komposisi khasiat dan kandungan protein. Keputusan menunjukkan bahawa penggunaan bakteria kaedah suntikan inokulasi dengan ketara meningkatkan pertumbuhan tumbuhan. Berat segar dengan kenaikan 20%, peningkatan berat kering sebanyak 14%, peningkatan ketinggian sebanyak 22% dan kandungan

CHAPTER 1

INTRODUCTION

Agriculture sector remain as one of the important sector contributing to Malaysia's economy. It provides an employment to 16 percent of the population and contributes about 12 percent to the national GDP. In spite of the policy emphasizing on developing vegetable production to meet the domestic requirements, Malaysia remain as a net importer of vegetables. Since Peninsular Malaysia seldom experience droughts and hurricanes, its tropical climate is very favorable and suitable for the production of various fruits and vegetables.

Vegetables are grown for their leaves, roots, flower or fruits but leafy vegetables are mainly grown for their leaves although other parts of the plants are also edible. It is harvested as a whole with the shoots or stems still attached. These plants are harvested before flowering takes place that is at the vegetative stage because they are grown mainly for leaves. If the leafy vegetables reached flowering stage, it is too fibrous and old for consumption. For example, *Brassica chinensis* locally known as leaf mustard are never allowed to reached the flowering stage before harvesting. It is usually harvested with their shoots and have a higher market price.

Department of Agriculture Malaysia (2012) stated that during the year of 2011, the planted area for *Brassicas* are about 9171.58 hectares, harvested area about 8672.42 hectares and production of 128647.14 metric tonnes. To achieve high level of production, many methods have been used including the use of chemical fertilizer and compost. In additon to these method, the use of beneficial microorganisms can also be done. These microorganisms such as *Pseudomonas, Bacillus, Azotobacter,* and *Rhizobium,* can be classified as nitrogen fixing microorganisms which is bacteria and includes cyanobacteria or blue green algae. With the aid of an enzyme complex-nitrogenase, both of these types of bacteria can reduce dinitrogen to ammonia, increase plant performance such as nutrient uptake and help to fix nitrogen.

Nutritionally, leafy vegetables are a great source of fibre and vitamins and provide good roughage for our digestive system but mostly they are low in calories and protein content. It is well known that proteins are of prime importance to health, but they are deficient in diets of most people in the developing countries. Protein is an important component in our diet and lots of people obtain protein by consuming meat, fish, or egg but not vegetables. The proteins of vegetables are built from amino acids but other related simple nitrogenous compound also occurs. To biosynthesize basic building blocks of plants such as amino acids for protein, DNA and RNA, nitrogen (N) is required. Bacteria such as Rhizobium, are able to perform biological nitrogen fixation in which atmospheric nitrogen (N_2) is converted into ammonia (NH_3) and plants are able to use to synthesize protein.

Therefore, this project is conducted to achieve the following objectives :

i. To study if the rate of nitrogen fertilizer in the form of Urea influence the total protein content in green mustard

ii. To determine the effect of nitrogen fixing organism on total protein content of green mustard

iii. To observe the effect of different bacteria used and rate of nitrogen fertilizer on growth performance of green mustard

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