



## Nodulation Of Green Chicken (*Vigna Radiata* L.) With Pupuk P Application On Soil Covered Land (*Mucuna Bracteata*)

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### ABSTRACT

Mung bean plants include legume plants whose roots have root nodules which are a symbiosis between the roots and *Rhizobium japonicum* bacteria. Root nodules function to fix free nitrogen elements, besides that they can also fertilize the soil because they can save the use of NH<sub>3</sub> available in the soil and provide nitrogen elements to the soil. *Rhizobium* is a genus of soil bacteria that are able to symbiotize with plants. There are many types of *Rhizobium* bacteria, especially in soils with high organic matter content. This study was conducted to determine the compatibility of *Rhizobium japonicum* in mung bean plants (*Vigna radiata* L.) with *Rhizobium* sp grown on *Mucuna bracteata* land. To determine the effect of some phosphate fertilizers on the modulation of mung bean (*Vigna radiata* L.) The results showed that the application of *Rhizobium japonicum* on mung bean (*Vigna radiata* L.) with *Mucuna bracteata* land did not show a significantly different adjustment (compatibility) to the height and number of plant leaves. The P<sub>0</sub> treatment showed significant differences in the root nodule parameters of the P<sub>1</sub>, P<sub>2</sub> and P<sub>3</sub> treatments. Phosphate fertilizer with 50% RP TSP content is the best composition.

**Keywords:** Mung bean, P fertilizer, Covered field

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## INTRODUCTION

Mung bean plants (*Vigna radiata* L.) have long been known and grown by Indonesian farming communities. The origin of the mung bean plant comes from the Indian region which was brought into the Indonesian territory, occurred in the early 17th century, by Chinese traders. The center of the spread of mung beans was initially centered on the islands of Java and Bali, but in the 1920s began to develop in Sulawesi, Kalimantan, and eastern Indonesia (Rukmana, 2002).

Mung bean plants include legume plants whose roots have root nodules which are a symbiosis between the roots and *Rhizobium japonicum* bacteria. Root nodules function to bind free nitrogen elements, besides that they can also fertilize the soil because they can save the use of NH<sub>3</sub> available in the soil and provide nitrogen elements to the soil.

In the cultivation of mung bean plants, quite a lot of N is needed so that many root nodules are expected on the roots of mung bean plants. As is known that leguminous plants have root nodules which are an indication of the symbiosis between

plant roots and root nodule bacteria that fix free nitrogen from the atmosphere (soil air cavity). The bacteria is *Rhizobium* SP. (Prijono, 2012).

*Rhizobium* is a genus of soil bacteria capable of symbiosis with plant roots, the type of *Rhizobium* bacteria is very much especially in soils with high organic matter content. Naturally, the *Rhizobium* population in soil that has been planted with legume plants such as *mucuna bracteata* is quite high. Not all soils have *Rhizobia* bacteria, so not every soybean plant can take N from the air. An easy sign to see if mung bean plants are actively taking N from the air is the nodules that develop on the red-colored roots when split (Litbang, 2010).

Soil that has been planted by *Mucuna bracteata* plants does not need to add *Rhizobium* because it already contains high *Rhizobium* bacteria that are able to symbiotize with plant roots. However, the type of *Rhizobium* in *Mucuna bracteata* plants is not yet known. The planting of green beans with the addition of RP and TSP fertilizers in *Mucuna bracteata* land is expected to produce good formation of green bean root nodules. To see the effectiveness of root nodule formation, plants must be harvested when the plants have not yet reached the generative phase. The plants are harvested at the age of 6 weeks after planting. In the process of nodulation formation and maximum nodule activity, P elements are needed which far exceed the needs of legume plants for growth. One source of phosphorus used to increase the availability of P in the soil is by applying P fertilizer in the form of phosphate.

Theoretically, *Rhizobium* is only found in the roots of legume plants and not in other plants. This is because *Rhizobium* can symbiotize with the roots of legume plants. *Mucunabracteata* is one of the legume plants that is symbiotic with *Rhizobium* in the soil. However, the type of *Rhizobium* is not yet known or is still *Rhizobium* sp. Thus, soil that has been planted by legume plants does not need to add *Rhizobium*, because the soil already contains *Rhizobium* bacteria.

Mung bean plants include legume plants whose root nodules are symbiotic with *Rhizobium*. Root nodules function to increase the growth and fertility of mung bean plants. It is necessary to conduct research to determine the compatibility between *Rhizobium* found in mung bean plants and *Rhizobium* SP planted in soil-covered fields of *Mucuna bracteata*.

## RESEARCH METHOD

The research was conducted in the oil palm plantation area of the Indonesian Institute of Palm Technology Medan. The research period began on December 29, 2021 and ended on February 8, 2022 for 6 weeks. The research used a factorial randomized group design (RAK) 1, namely with 4 plant treatments with 6 replications. The research data were analyzed by Experiment 1 (one) Factorial with Non-Factorial Randomized Group Design (RAK), the research data were analyzed by variance analysis (ANOVA) based on a linear model. The research stages consist of the following steps:

1. Area Clearing

The area used is the soil inside the *Mucuna bracteata*. Cleaning uses a hoe and the area that is cleaned is only the area that will be made into beds.

2. Bed Making

Making beds made with a size of 30 cm<sup>2</sup> with a depth of 15 cm. Then the soil in the hoe is loosened. The distance of each plant or bed is 1.5 meters-2 meters from each sample plant. look for *mucuna* locations that are thick or thriving.

3. Fencing

Fencing with paranet is made according to the width of the bed and 30 cm high, which aims to inhibit the creeping weeds of *Mucuna bracteata* and inhibit pests.

4. Seed Planting

Seedlings that have been soaked and selected good ones are then planted and then watered.

5. Watering

Watering is done in the morning and evening.

6. Maintenance

Performing plant maintenance such as weeding weeds that enter the beds, and spraying plants to deal with pests.

7. Dismantling

Disassembly is carried out after 6 weeks after planting or after the plant releases flowers. Disassembly is carried out by watering the soil so that the soil becomes crumbly which aims to prevent the root nodules from separating from the roots.

## RESULT AND DISCUSSION

Based on observation data on plant height, it can be seen that there is no significant difference in the application of RP fertilizer with different doses or without RP fertilizer in the first 6 weeks. The application of RP and TSP fertilizers in the P1 and P2 treatments also did not show significant differences. P nutrient is a macronutrient for plants that is needed in large quantities after N and more than K (Nursyamsi, 2007). The availability of P in the soil is generally very high in soils that are still fertile and high in humus so that the provision of P fertilizer in young plants has not shown significant differences (Setyorini, 2005). For more details, the growth of plant height during the 6 MTs can be seen in the following chart.

The average plant height growth is about 10 cm per month. In the first week, the height of the plants only reached 8 cm, while in the next week, the growth of plant height reached 20 cm. This shows that the P element in the soil is still sufficient for the nutrient needs of plants that are still 1- 6 weeks old. At week 6, the highest plant height was 58 cm with treatments P0 and P2. This shows that there is no significant difference with the provision of P nutrients to the plants for plant height.

Based on the number of leaf blades, it can be seen that there is no significant difference in the growth of the number of leaves on mung bean plants as soil cover without the application of P fertilizer or P0 or with the application of P fertilizer using RP, TSP or both. This shows that as long as the nutrient element P in the soil is still fulfilled, it will provide the same growth in mung bean plants. The number of leaves in the first week was all 8 and the growth each week reached 10 even up to 13 leaves. This shows that the P element given to mung bean plants is not fully used for leaf growth of mung bean plants. According to Fauzi (2002) genetic factors and determine the number of leaves formed so that using the same seed will produce the same number of leaves even though given different amounts of P fertilizer.

Based on the root nodule data, it can be seen that the application of P fertilizer at the age of 1-6 weeks gives very real results on the treatment. The treatment without the provision of P fertilizer or P0 showed a result of 38.33a or showed a very significant difference in the treatment of P1, P2 and P3 or with the provision of P fertilizer. In the treatment of P fertilizer using RRP 5 grams or P1 showed no significant difference to the provision with TSP fertilizer 6 grams or with 50% RP fertilizer and 50% TSP. P0 as a control shows that without the provision of P fertilizer, the nodules will be smaller. This is in accordance with the research of Danu Syahputra (2015) which shows that soil

pH influences the growth of root nodules and N uptake. By giving P fertilizer to green bean plants, it will increase the number of root nodules they have. Root nodules can grow optimally in soil with pH 6.8 (Danu Syah Putra, 2015).

In the results of wet weight data, it can be seen that there is a very real difference between the P0 control and other treatments. The treatment with 5 grams of RP showed no significant difference in the absence of P fertilizer. Likewise, the treatment with 6 grams of TSP fertilizer showed no difference. However, in the P3 treatment, which is 50% using RP and 50% using TSP, it showed very significant results against other treatments. P3 showed that the wet weight of the plants reached 39 grams while the P2 and P3 treatments only reached 22 and 23 grams. The P3 treatment showed lower biomass data compared to P0. From the data above, it can be seen that the treatment by mixing the use of RP and TSP fertilizers can provide greater plant weight. The treatment using TSP showed the lowest plant wet weight.

After drying, the dry weight of the plants can be produced. The results of the dry weight of the plants above show the results of very significant differences in the P3 treatment or by using 50% RP fertilizer and 50% TSP. The lowest dry weight is with the P2 treatment. This shows data that is in accordance with the wet weight of the plant or directly proportional. The control treatment or P0 did not show a significant difference to the treatment with P1 and P2. Even the P0 treatment was higher than the P2 treatment.

## CONCLUSIONS

The nodulation of mung bean (*Vigna radiata* L) showed significant differences. P1, P2 and P3 treatments give different growth. P3 has the highest value with an average of 55.16. While P0 or without treatment has a value of 38.33. P fertilizer has a real influence on the growth of nodules or root nodules in mung bean plants. The treatment with 5 g RP fertilizer and 7 g TSP gave the best root nodule growth.

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