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Study of Coconut Dregs Fertilizer on the Growth and Yield of Mung Bean Plants (*Vigna radiata* L)

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Abstract:
The decline in mung bean (Vigna radiata L.) production in Indonesia is partly due to the unbalanced use of inorganic fertilizers. This study aims to determine the effect of coconut pulp waste fertilizer on the growth and yield of mung bean production. The study was conducted in Kesilir Village, Wuluhan District, Jember Regency, East Java, in September–November 2024 using a non-factorial Randomized Block Design (RBD) with one treatment factor (coconut pulp fertilizer doses: 0, 100, 200, 300, 400, and 500 g/plot) and four replications. The parameters observed included plant height, number of pods, dry seed weight, and biomass. The results of the ANOVA analysis showed that coconut pulp fertilizer significantly affected the dry seed weight per sample and dry seed weight per plot. The best treatment was shown at a dose of 500 g/plot with an average dry seed weight of 27.10 g/sample and 547.5 g/plot. Coconut dregs fertilizer has the potential to be an environmentally friendly alternative fertilizer to increase green bean yields.

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INTRODUCTION

Mung bean (Vigna radiata L.) is a significant legume crop widely cultivated in Indonesia due to its high nutritional value and its role as a source of plant-based protein. It is used in various food products and serves as an affordable protein alternative for the population. However, mung bean production in Indonesia has declined significantly in recent years (BPS, 2023). One of the main contributing factors to this decline is the excessive and continuous use of inorganic fertilizers, which negatively affects soil fertility and sustainability (Aminah et al., 2023). Overreliance on inorganic fertilizers can lead to soil degradation, loss of organic matter, and disruption of soil microbial balance, ultimately reducing productivity.

To address these challenges, innovations in the use of organic fertilizers have become increasingly important. Organic fertilizers not only provide essential nutrients to plants but also improve soil structure, increase water retention capacity, and enhance the activity of beneficial soil microorganisms. One promising source of organic fertilizer is coconut dregs, a by-product of coconut milk production that is often discarded as industrial or household waste. Utilization of this material not only helps reduce environmental waste but also contributes to sustainable agricultural practices.

Coconut dregs contain essential macronutrients, including nitrogen (N), phosphorus (P), and potassium (K), which are vital for plant growth and development (Farhan et al., 2018; Winarti & Warsiyah, 2018). These nutrients play critical roles in root formation, leaf development, and the

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reproductive phase of plants. Moreover, the organic matter from coconut dregs can improve soil porosity and aeration, creating favorable conditions for plant roots to absorb nutrients effectively. Research by Sari et al. (2019) also demonstrated that fertilizers derived from coconut waste can enhance plant growth parameters, even in the absence of synthetic fertilizers such as NPK.

Therefore, the application of coconut dregs as an organic fertilizer is expected to serve as an effective and sustainable alternative to inorganic fertilizers. This practice not only improves soil health but also supports the growth and yield of mung bean plants. This study aims to determine the effect of coconut dregs fertilizer on the growth and yield of mung bean plants (Vigna radiata L.).

METHOD

This research was conducted in Tegal land, Demangan Village, Kesilir Village, Wuluhan District, Jember Regency, East Java, 68162, (coordinate point (8020'47.9" S and 113034'56.2" E). With an altitude of 87 meters above sea level. Air humidity 79%. The average rainfall level ranges from 99mm to 233mm, and the temperature range reaches 24 °C to 33 °C.

Design study which used Design Random Group (RACK) with six treatments, namely (control), 100 gr/plot, 200 gr/plot, 300 gr/plot, 400 gr/plot, and 500 gr/plot, each of which was repeated as many as four times. Seed peanut green Vima 5 planted with distance planting 40 × 20 cm on the plot. The plots measure 1.4 x 1 meter, using a dip planting system, with two seeds per planting hole. Coconut pulp is applied three times: 14 days, 21 days, and 28 days after planting (DAP), by sprinkling it onto the soil near the plants in the morning.

Maintenance is performed in an intensive manner, covering tasks such as stitching, weeding, loosening, watering, and fertilization. Fertilization is applied twice, using urea, SP-36, and KCl, specifically at 7 days after planting (DAP) at 75% of the total dose, and the remainder at 30 days after planting.

Observations were made on growth and yield variables, including plant height at 2 to 5 weeks post-planting, number of pods per sample, fresh pod weight per sample, dry seed weight per sample, dry seed weight per plot, 100 seed weight, and flower emergence time. All observation data were analyzed using analysis of variance (ANOVA). If there were significant differences between treatments, the BNJ test was continued at a 5% significance level to compare the treatment with the control.

RESULTS

Plant Height

Observations on plant height were taken four times, at 14 days, 21 days, 28 days, and 35 days after planting. From the beginning of the vegetative phase until the end of the generative phase of the plant. Observations of plants in the application of P3 300 g/plot showed that coconut dregs fertilizer resulted in a significant increase in plant height. It can be seen that the administration of coconut dregs fertilizer based on laboratory test results has an N value of 0.52% which is relatively low (Atsari et al, 2016). This can affect plant growth, especially plant height, because nitrogen (N) is a very important macronutrient for increasing vegetative plant development and is required by plants in large quantities (Izzati and Haryanti, 2015).

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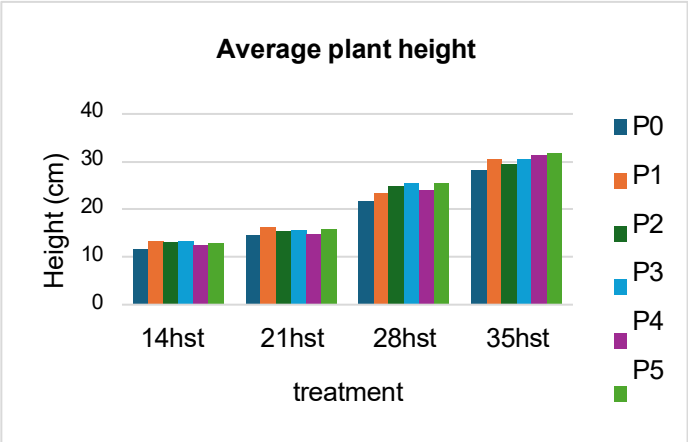

Figure 1. Plant Height

Dry seed weight per sample

The average showed a significant difference in dry seed weight per sample. The results of the dry seed weight per sample showed the highest value for P5 at 27.10 grams, achieved with a dose of 500 g/plot. Meanwhile, the P1 treatment with a dose of 100 g/plot produced a sample weight of 24.90 g and was not significantly different from the P5 treatment. For the lowest treatment level, the P0 control was 16.85 grams.

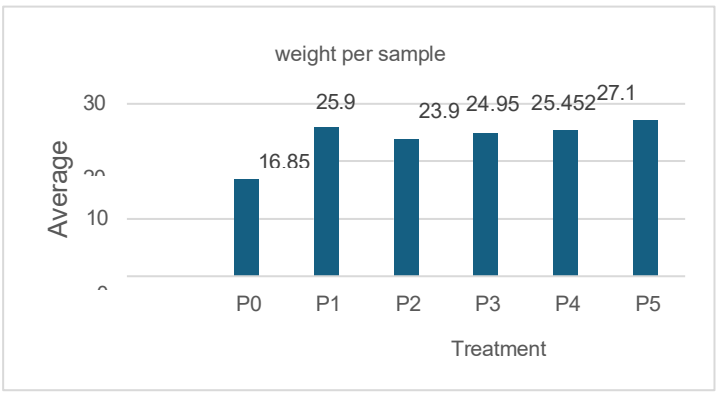

Figure 2. dry seed weight per sample

Dry seed weight per plot

The average showed a significant difference in dry seed weight per plot. The results of dry seed weight per plot showed the highest value for P5 at 547.5 g, achieved with a dose of 500 g/plot. However, this treatment was not significantly different from the P1 treatment, which had a dose of 100 g/plot, at 529.8 g. The lowest treatment level was the P0 control at 356.8 g.

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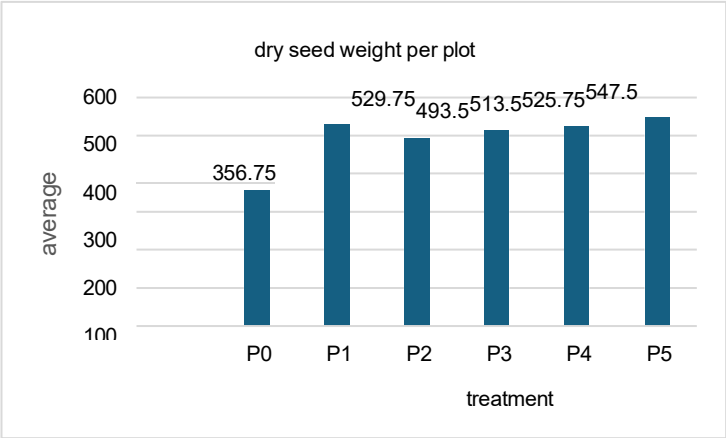

Figure 3. Dry seed weight per plot

Weight 100 grains

At a weight of 100 grains, there is an average yield of 6.33 grams, equivalent to the variety description of 6.57 grams. The weight of 100 seeds in the coconut pulp fertilizer treatment did not produce a significant difference. This resulted in a disruption in the pod filling process, known as "pod chipo." Similarly, the number of pods formed was also hindered by an insufficient phosphate content, which inhibited the formation of mung bean pods and prevented seed enlargement in mung beans, despite the high potassium content (Haidlir, 2018).

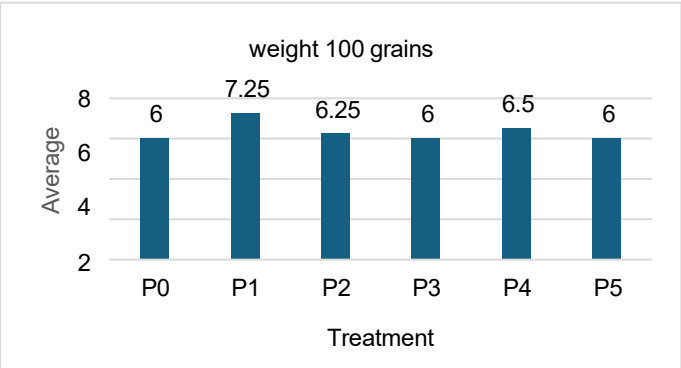

Figure 4. Weight of 100 grains

DISCUSSION

Based on the results, it is evident that the parameters of dry seed weight per sample and per plot regarding the provision of coconut dregs fertilizer yield significantly different results (*). In the treatment of coconut dregs fertilizer, the dose P1 (100 g/plot) has the highest efficiency, with an average weight of 24.90 g for the sample and a dry weight of 529.8 g for the plot. The filling that occurs in mung bean seeds under dry conditions is the accumulation of all nutrients and the results of photosynthesis that take place. Research conducted by Mahayana et al. (2024) on the analysis of organic fertilizer quality tests from immature coconut dregs waste indicates that coconut dregs have an average high potassium content of 5.148%. In leguminous plants, potassium nutrients significantly influence the formation and content of pods (Alfy and Handoyo 2022). Wahyudin et al.

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(2017) also added that providing sufficient potassium nutrients can increase the formation and filling of the resulting pods.

These findings also support previous research, which indicates that the highest dose of coconut pulp fertilizer, 225 grams, had no significant effect on plant height, leaf number, or fruit number. However, the second treatment, 150 grams, had a significant effect. The novelty of this study lies in the use of coconut pulp fertilizer as a sustainable and environmentally friendly solution. These results provide a practical contribution to cultivation, especially the management of coconut pulp for decomposition into compost. However, this study was limited to one location and a specific dosage range. To obtain the best results, further research is needed, such as field application with different dosage variations and combining it with other fertilizers to achieve more optimal results.

CONCLUSION

The use of coconut dregs fertilizer showed a significant effect on the dry seed weight per sample (g) and dry seed weight per plot (g). Meanwhile, observations of plant height, the number of fresh pods per sample, the weight of fresh pods per sample, the weight of 100 seeds per sample, and dry biomass were not found to be significantly different. The treatment had a significant effect on the provision of coconut dregs fertilizer on the parameters of dry seed weight per sample, with an average of 27.10 grams, and dry seed weight per plot, with an average of 547.5 grams.

The filling that occurs in dry mung bean seeds is the accumulation of all nutrients and the resulting photosynthesis. Research conducted by Mahayana et al. (2024) on the analysis of organic fertilizer quality test results from unripe coconut pulp waste revealed that coconut pulp has an average high potassium content of 5.148%. In legume plants, potassium significantly influences pod formation and fill (Alfy and Handoyo 2022). Wahyudin et al. (2017) also added that providing sufficient potassium can increase pod formation and fill.

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