

Nutrient Uptake and Chlorophyll of Long Bean Plants (*Vigna Sinensis L.*) Due to Liquid Waste Tofu and Planting Media

Serapan Hara Dan Klorofil Tanaman Kacang Panjang (*Vigna Sinensis L.*) Akibat Pemberian Limbah Cair Tahu Dan Media Tanam

M. Idris*, Rahmadina, Nindi Fauziah

Biology Study Program, Faculty of Science and Technology, State Islamic University of North Sumatra Medan

*Corresponding author: idris.juki1@gmail.com

ABSTRACT

Long bean is a plant that has the potential to develop its production results, one way is by utilizing liquid tofu waste and improving nutrient uptake in plants through appropriate planting media. This study aims to understand the absorption of nutrients N, P, total chlorophyll, and combination interactions due to the application of liquid tofu waste and growing media to long beans. The study used a factorial randomized block design (RBD) with 3 replications. The factor I of liquid tofu waste treatment (T) consisted of 3 levels, namely: T₀ (0 ml), T₁ (150 ml), T₂ (300 ml), and Factor II namely M₁ (compost of cow manure + rice husk charcoal), M₂ (compost of cow manure + cocopeat), and M₃ (compost of cow manure + chopped fern). The observed variables included nutrient uptake of N-Total, P, and total chlorophyll content. The results showed that the treatment of liquid tofu waste significantly affected on N-Total and P nutrient uptake, namely 150 ml (T₁) and the administration of 300 ml (T₂) significantly affected on total chlorophyll content. The growing media significantly affected nutrient uptake of N, P, and total chlorophyll content in the M₃ treatment, cow manure compost + chopped fern). There was no interaction between liquid tofu waste and planting media for all observed variables.

Keywords: *Liquid tofu waste, growing media, nutrient uptake, chlorophyll total uptake*

ABSTRAK

Kacang panjang merupakan tanaman yang memiliki potensi untuk dikembangkan hasil produksinya, salah satu cara dengan memanfaatkan limbah cair tahu dan memperbaiki serapan hara pada tanaman melalui media tanam yang sesuai. Penelitian ini bertujuan untuk mengetahui serapan hara N, P, klorofil total, dan interaksi kombinasi akibat pemberian limbah cair tahu dan media tanam pada kacang panjang. Penelitian menggunakan Rancangan Acak Kelompok (RAK) faktorial dengan 3 ulangan, Faktor I perlakuan limbah cair tahu (T) terdiri atas 3 taraf, yaitu : T₀ (0 ml), T₁ (150 ml), T₂ (300 ml), dan Faktor II yaitu M₁ (kompos kotoran sapi + arang sekam padi), M₂ (kompos kotoran sapi + cocopeat), dan M₃ (kompos kotoran sapi + pakis cacah). Peubah amatan meliputi serapan hara N-Total, P, dan kandungan klorofil total. Hasil penelitian menunjukkan perlakuan limbah cair tahu berpengaruh sangat nyata terhadap serapan hara N-Total dan P yaitu 150 ml (T₁) dan pemberian 300 ml (T₂) berpengaruh sangat nyata terhadap kandungan klorofil total.

Media tanam berpengaruh sangat nyata terhadap serapan hara N, P, dan kandungan klorofil total yaitu pada perlakuan M₃ (kompos kotoran sapi + pakis cacah). Tidak terdapat interaksi pemberian limbah cair tahu dan media tanam terhadap semua peubah amatan.

Kata kunci: limbah cair tahu, media tanam, serapan hara, klorofil total

INTRODUCTION

The long bean plant, which belongs to the *Papilionaceae*, is a seasonal plant in the form of twisted shrubs. Long beans are very popular with everyone because they taste delicious. Long beans have many nutrients, such as protein, vitamin A, vitamin B, and vitamin C (Sunarjono, 2013).

One of the efforts made to increase production yields is by applying organic fertilizer and planting media an example of using organic fertilizer, namely liquid tofu waste. In contrast, the planting medium consist of a combination of composted cow manure + rice husk charcoal (Marian, 2019).

Liquid tofu waste is water from tofu residue obtained during tofu processing (Marian, 2019). One of the contents of liquid tofu waste is the nutrients N and P. Nitrogen functions to produce protein, stimulate hormones for the vegetative phase of plants, and increase production yields (Sugiharti, 2022). The element P plays a role in photosynthetic reactions, transfers, respiration, energy storage, division, and cell enlargement (Asmuliani, 2021).

The small amount of chlorophyll results in no maximal photosynthetic reactions and

cannot produce maximum carbohydrate compounds (Ai and Yunia, 2011).

The success of vegetable cultivation must be assisted by the right cultivation technology, the seeds used, the media used, and proper care. Commonly used media are manure, charcoal, cocopeat, and chopped ferns (Sucipto, 2020).

Growing media that can absorb water in large volumes may not necessarily be categorized as the growing media. This is because planting media with a high holding capacity can cause the media to become saturated with water, causing low oxygen levels and hampering plant contact with oxygen (Sisriana, 2021).

Cow manure compost contains nutrients and high energy, which can be used for the production of biogas and organic fertilizer. The nutrient content in cow manure compost is 0.40% N, 0.20% P, and 0.10% K (Sucipto, 2020). The nutrients contained in rice husks are easily available to plants and are able to increase soil pH. The nutrient content of husk charcoal is 0.18% N, 0.08% P, and 0.3% K (Tarigan, et al. 2015). Cocopeat media has good aeration and contains pentose, cellulose, potassium, lignin, and Ca, which play a role in cell division and photosynthesis. Chopped fern media has good drainage, does not rot easily,

and provides good air availability for plants (Simamora, 2015).

This study aims to determine the total chlorophyll content and nutrient uptake due to the application of liquid tofu waste and various growing media to long beans (*Vigna sinensis* L.).

MATERIALS AND METHOD

This research was conducted in Huta I Bandar Siantar Village, Gunung Malela District, Simalungun Regency. The research was conducted in August-October 2022.

The tools used are polybags, label paper, digital scales, laptops, cameras, and stationery. The materials used were liquid tofu waste, and long bean seeds (*Vigna sinensis* L.) Cantonese tavi variety, cow manure compost, rice husk charcoal, cocopeat, chopped fern.

This study used a factorial randomized block design (RBD), with 3 treatments, 3 media, and 3 replications. Treatment of liquid tofu waste with 3 doses, namely T₀ (0 ml), T₁ (150 ml), T₂ (300 ml). Three types of planting media were used, namely cow manure compost + rice husk charcoal (M₁), cow manure compost + cocopeat (M₂), and cow manure compost + chopped ferns (M₃).

The observed parameters consisted of N-Total, P, and total chlorophyll absorption measured at 30 DAP.

Data were analyzed using the Univariate ANOVA (*Analysis Of Variance*) test with a level of 5%, if it had a significant effect, it was continued by using *Duncan* at a level of 5%.

RESULT AND DISCUSSION

1. Nutrient uptake of N-Total and P

Observational data on the results of the analysis of N-Total and P nutrient uptake due to the administration of liquid tofu waste and planting media are presented in table 1.

Table 1. Average N-Total and P nutrient uptake at 30 DAP

Parameters	Average	
	N-Total %	P %
Liquid tofu Waste		
0 ml (T ₀)	0.48a	0.30a
150 ml (T ₁)	0.64b	0.40b
300 ml (T ₂)	0.57ab	0.37ab
Media		
Cow Compost + Rice Husk Charcoal (M ₁)	0.31a	0.27a
Cow Compost + Cocopeat (M ₂)	0.59b	0.36b
Cow Compost + Chopped Fern (M ₃)	0.79c	0.45c
Interaction	0.53 (-)	0.43 (-)

From the results of the analysis of the variety of measurements of the nutrient content of N and P at 30 DAP, it shows that liquid tofu waste and planting media have a very significant effect. In terms of nutrients, the N-Total showed that adding T₁ (150 ml) of liquid tofu waste 0.64% and M₃ (Cow Manure Compost + chopped fern) 0.79% significantly affected. The P nutrient element of T₁ (150 ml) of liquid tofu waste 0.40%, and the M₃

(compost media Cow Manure + chopped fern) 0.45% significantly affected. Meanwhile, the interaction of liquid tofu waste and planting media did not significantly affect N-Total and P nutrient uptake.

N-total nutrient uptake values obtained were 0.64% and 0.79%. Based on SNI 19-7030-2004, the minimum standard for N in liquid fertilizer is 0.40%, so the N content obtained in this study is already high. Meanwhile, the value of P nutrient uptake was 0.40% and 0.45%. Based on SNI 19-7030-2004, the minimum standard for N in liquid fertilizer is 0.10%, so the N content obtained in this study is already high.

2. Chlorophyll Content

Observation data for total chlorophyll content analysis as a result of adding liquid tofu waste and planting media are presented in table 2.

Table 2. Average total chlorophyll content of 30 DAP of long bean plants

Parameters	Average
Liquid tofu Waste	
0 ml (T ₀)	4.65a
150 ml (T ₁)	5.39ab
300 ml (T ₂)	5.89b
Planting Media	
Cow Compost + Rice Husk Charcoal (M ₁)	4.15a
Cow Compost + Cocopeat (M ₂)	5.24a
Cow Compost + Chopped Fern (M ₃)	6.53b
Interaction	0.78 (-)

From analysis of variance of measurement of total chlorophyll content using the middle leaves of long bean plants at the age of 30 DAP, indicated that the implementation of 300 ml of liquid tofu waste (T₂) 5.89% and cow manure + chopped fern compost media (M₃) 6.53% significantly affected on the total chlorophyll content. Meanwhile, interaction of tofu wastewater and planting the media has no significant effect on the total chlorophyll.

The amount of chlorophyll in plants is different because various factors, such as genes, water, light, and age of plant influence it. The number of chlorophyll increases during the vegetative period and decreases during aging. The chlorophyll content is influenced by nitrogen and phosphorus nutrients. These two elements play an important role in the formation of new cells and are the main components of organic compounds in plants, such as amino acids, nucleic acids, chlorophyll, ADP, and ATP (Sigala, 2019).

CONCLUSION

The treatment of liquid tofu waste significantly affected on N-Total, and P nutrient uptake, namely 150 ml (T₁), and administration of 300 ml (T₂) significantly affected on total chlorophyll content. The growing media significantly affected on nutrient uptake of N, P, and chlorophyll content in the M₃ (cow manure compost + chopped fern). There was no interaction between liquid tofu waste and planting media for all observed variables. It is hoped that this research can

increase the reader's knowledge, especially long bean farmers to utilize liquid tofu waste and planting media to reduce environmental pollution.

REFERENCES

- Ai, NS, and Yunia, B. 2011. Leaf Chlorophyll Concentration as an Indicator of Water Deficiency in Plants. *Scientific Journal of Science*, 11(2). doi:10.35799/jis.11.2.2011.202
- Asmuliani R., and Megasari, R. 2021. Growth Responses of Lettuce (*Lactuca sativa* L.) Plants in Various Combinations of Growing Media and Utilization of Tofu Wastewater. *Plantklopedia*, 1(2).
- Marian, E., and Tuhuteru, S. 2019. Utilization of Liquid tofu Waste to Growth and Yield of Chicory (*Brasica pekinensi*). *Agritop*, 17(2). doi:10.32528/agritrop.v17i2.2663
- Sigala, C., Songke, NG, Tumoka, KP, Butarbutar, RR, and Ai, NS 2019. Total Chlorophyll Concentration in the Leaves of Puring (*Codiaeum variegatum* L.) Plants That Are Given the Shade. *Scientific Journal of Science*, 19(2)
- Simamora, RS, Ganeflanti, DW, and Barchia, MF 2015. Vegetative Growth of *Dendrobium Woon Leng* Orchid Seeding Using Various Planting Media. *Agrosia Deed*, 18(2).
- Sisriana, S., Suryani, and Sholihah, SM 2021. The Effect of Various Growing Media on the Growth and Pigment Levels of Lettuce Microgreens. *Respati Scientific Journal*, 12(2).
- Sucipto, E., Fanani, A., and Hendariyono, J. 2020. Design and build of a grading tool based on size in the manufacture of local micro-organism organic granule fertilizer (MOL). Community Service: Polije Proceedings Series.
- Sugiharti, IEP, Raksun, A., and Mertha, IG 2022. The Effect Of Liquid Organic Fertilizer From Tofu Industrial Waste And Em4 On The Growth Of Mustard Greens (*Brasicajuncea* L.). *J. Pijar MIPA*, 17(4), 554–559. doi:10.29303/jpm.v17i4.3412
- Sunarjono, Hendro. 2013. Planting 36 Types of Vegetables. Jakarta: Independent Spreader.
- Tarigan, Esther dan Hasanah, Y. 2015. Response of Growth and Production of Shallot (*Allium ascalonicum* L.) on the Application of Sinabung Volcanic Ash and Rice Husk. *Journal of Agroecotechnology Online*, 3(3). doi:10.32734/jaet.v3i3.10940
- YH Setyanti, S. Anwar, and W. Slamet. 2013. Photosynthetic Characteristics and Phosphorus Absorption of Alfalfa (*Medicago sativa*) Forages at Different Cutting Heights and Nitrogen Fertilization. *Animal Agriculture Journal*, 2(1).