



Article

The Effect of Weeding Frequency on The Growth and Yield of Upright Beans on Ultisol Soil

Obel^{1*}, Meisilva Erona Sitepu², Fahrul Zaqi³, Imelinda⁴¹⁻⁴Department of Agronomy, Agriculture Faculty, Universitas Andalas, IndonesiaDOI: <https://doi.org/10.25077/aijans.v6.i01.1-6.2025>

Submission Track

Received: April 29, 2025
 Final Revision: June 14, 2025
 Accepted: June 16, 2025
 Available Online: June 25, 2025

Keywords

beans, weeds, frequency, weeding, frequency,
 competition

Correspondence

*E-mail: owbel@agr.unand.ac.id

ABSTRACT

Upright Beans (*Phaseolus vulgaris*. L) are one type of horticultural commodity that has great potential to be developed, but recently bean production has decreased. One of the causes is the presence of weeds that can cause competition in fighting for life's necessities. Therefore, control measures need to be taken by weeding. The purpose of this study was to determine the right weeding frequency to increase the growth and yield of upright bean plants. The study was arranged in a Randomized Block Design which was repeated 3 times. The research data were analyzed using the F test method at 5% level and followed by DMRT at 5% level. The results showed that the frequency of weeding at 21 HST gave the best results for plant height of 212.59 cm and the frequency of weeding carried out at 14 HST gave the best results for the parameters of the number of pods per plant of 14.90 and the weight of pods per plant of 129.63 g.

INTRODUCTION

Upright Beans (*Phaseolus vulgaris*. L) is a type of horticultural commodity that has great potential to be developed due to its high nutritional content in meeting food and health needs [1]. In Indonesia, beans are preferred because they are rich in vegetable protein and vitamins A, B, and C. In 100 g of beans there is a protein content of around 35.1%, with 31 kcal of calories [2]. Dewanti [3] added that in addition to being a plant that produces vegetable protein, beans have a high carbohydrate content compared to other legumes. Even so, bean production fluctuates. Based on BPS data (2024), bean production in 2021 reached 320,774 tons and increased in 2022 to 325,602 tons, but in 2023 it decreased to 305,049 tons.

The decline in crop production can be caused by various factors, both internal factors originating from the plant itself or external factors originating from the environment such as the presence of weeds. According to [2] weeds are plant-disturbing organisms whose presence is very detrimental to the production of cultivated plants and [4] added that weeds that grow around cultivated plants act as nuisance plants because there can be competition between cultivated plants and weeds and can interfere with cultivated plants by competing and releasing allelopathic compounds [5]. Weeds and cultivated plants compete because they have the same needs, namely sunlight, nutrients, water and oxygen. In addition, competition can occur if the materials or substances needed by cultivated plants and weeds are in very limited quantities, close distances and at the same time [6]. The presence of weeds on cultivated land can cause significant losses if not controlled immediately [7].

The presence of uncontrolled weeds on cultivated land will cause a gradual decline in production. According to [8], competition between cultivated plants and weeds can reduce yields by up to 65%.

Therefore, the presence of these weeds requires control measures to prevent competition so that the growth and development of cultivated plants can be maximized. According to [9], there are various ways to control weeds such as preventive measures, manually, technical culture or by using herbicides [10].

One way to control weeds in bean plants is by weeding. Weeding is a control by destroying weeds and releasing them from the soil where the cultivated plants grow and is carried out before the weed canopy stops the absorption of nutrients from the roots [11]. In weed control activities, the right time is when there is no competition. If competition has occurred and control has not been carried out, it can reduce plant growth and yields [12]. In addition, according to [11], the frequency of weed control can also have an impact on the growth and yield of a plant [13].

RESEARCH METHODS

Time and Place of Research

This research was conducted at the experimental garden of the Faculty of Agriculture, Universitas Andalas in August – November 2024.

Tools and materials

The tools used are hoes, stakes, watering cans, raffia ropes, sticks, labels, meters, plastic bags and stationery. Meanwhile, the materials used are bean seeds, pearl NPK, manure, and insecticides.

Research design

The study used a Randomized Block Design (RAK) with weeding frequency as a treatment consisting of five levels, namely No Weeding (K1), Weeding at 7 HST (K2), Weeding at 14 HST (K3), Weeding at 21 HST (K4) and Weeding at 35 HST (K5) and each was repeated 3 times. The research data were analyzed using the F test method at 5% level and followed by DMRT at 5% level.

Research Implementation

The land for planting upright beans is processed first and made into beds measuring 2 m x 1 m. Each bed is given manure and left for a week. Planting is done by inserting 2 green bean seeds into the planting hole with a planting distance of 60 cm x 40 cm. The care carried out includes watering, installing stakes, additional fertilization and controlling pests and diseases. Green beans begin to be harvested in the 8th week after planting.

Observation Parameters

The observation parameters measured included plant height (cm), number of leaves (blades), leaf width (cm), number of pods (pods) and pod weight (g).

RESULTS AND DISCUSSION

Growth Parameters

Based on the results of observations on the growth parameters of upright beans on ultisol soil in several weeding frequency treatments, they can be seen in Table 1 below.

Based on the data in the Table 1, it can be seen that the weeding frequency at 21 HST is the best weeding frequency for plant height compared to other treatments. This is thought to be because during that period the weeds were already in the stage of competing with the plants so that the weeding given was the right time and the plants could maximize their growth. In the number of leaves there was no difference between treatments, but in leaf width, weeding carried out at 7 HST gave better results of around 10.02 cm. This is because earlier weeding can maximize the plants' use of photosynthesis results to all parts of the plant.

Table 1. Effect of weeding frequency treatment on several growth parameters of upright beans.

Treatment	Growth parameters		
	Plant Height (cm)	Number of leaves (blades)	Leaf Width (cm)
Without weeding	46.47 c	16.17 tn	8.27 b
Weeding at 7 HST	179 b	16.73 tn	10.02 a
Weeding at 14 HST	37.23 c	18.83 tn	9.93 a
Weeding on 21 HST	212.59 a	16.96 tn	5.89 c
Weeding at 35 HST	46.85 c	18.03 tn	9.01 a
Diversity Coefficient (%)	12.22%	19.64%	17.10%

Description: Numbers followed by the same letter are not significantly different based on the 5% DMRT test. tn = not significantly different in the 5% F test.

The results of Sitorus's research [14] reported that weeding carried out at the age of 15 and 30 HST is an effective and efficient weed control in bean plants that can reduce the dry weight of weeds with an efficiency of 94.45% and can increase production up to 2.71 tons/ha. Paiman [15] added that the emergence of weeds can occur due to soil restructuring and control measures taken. If the environmental conditions are very favorable for certain types of weeds, the weeds will more easily produce more seeds and can dominate the place. According to [3], weeding at the 21 HST phase will provide a significant boost to vegetative growth. Weeding carried out at too old an age can cause damage to plant roots, especially if the weeds grow very large and their roots merge with the plant roots so that they can inhibit the absorption of nutrients and water.

The high diversity of bean plants at the beginning of vegetative growth occurs because of the competition between bean plants and weeds that have started to occur at the beginning of planting in the form of competition for light, water and nutrients. When in a critical period, bean plants need to be controlled by weeds. According to [5], if weeding is not carried out, it can reduce yields because there is competition with weeds which results in a decrease in the supply of nutrients to the plants. The more and more varied the weeds that are around the cultivated plants, the greater the competition with the plants so that the height of the plants will be different. Conversely, if the weeds that live around the plot are in small numbers, competition with the plants will be low and the plants will still grow optimally. In addition, [16] added that weeding with the right period allows plants to maximize the use of available nutrients, light and water so that plant growth is more optimal. Weeding has been proven to be able to reduce the weed population. By knowing the critical period of the plant, weed control becomes efficient because it is only limited to the beginning of the critical period, not necessarily throughout the entire life cycle of the plant [15].

The number of leaves can be associated with an increase in light reception used in the process of photosynthesis. However, if there are leaves that are no longer actively receiving light, then the leaves are only recipients of photosynthate results. According to [17], the difference in weed control time shows a difference in the number of leaves because weeds compete with plants when taking light, water, and nutrients. Based on the results of research [5] that weed control at the age of 20-40 hst showed no significant effect at the beginning of vegetative. Weeds begin to inhibit the number of leaves when not controlled for 60 hst. This is in accordance with the results of the study that in this study weed control was carried out before 60 hst so there was no different number of leaves.

Result Parameters

Based on observations on the parameters of the yield of upright beans s on ultisol soil in several weeding frequency treatments, this can be seen in Table 2 below.

Table 2. Effect of weeding frequency treatment on several yield parameters of upright beans.

Treatment	Result parameters	
	Number of Pods/Plant	Pod Weight/Plant (g)
Without weeding	10.60 b	75.00 tn
Weeding at 7 HST	10.44 b	103.15 tn
Weeding at 14 HST	14.90 a	129.63 tn
Weeding on 21 HST	12.26 a	92.36 tn
Weeding at 35 HST	7.34 b	65.93 tn
Diversity Coefficient (%)	21.78%	28.27%

Description: Numbers followed by the same letter are not significantly different based on the 5% DMRT test. tn = not significantly different in the 5% F test.

Based on the table above, it can be seen that the weeding frequency of 14 hst and 21 hst gave the same and highest results compared to the others. This indicates that weeding carried out at that time is the right time to carry out control because the weeds are still small and easy to remove so that when weeding is carried out it does not interfere with the roots of the plants and at the same time accelerates the reduction of plant competition with weeds so that plants can be maximized for growth and yield. According to [3], weeding carried out for a long time will cause damage to the roots of cultivated plants, especially if the weeds have grown very large and their roots are united with the roots of the plants so that they can inhibit the growth and development of plants. Weeding is very important in plant cultivation because it will reduce weed growth so that it will eliminate competition in taking up nutrients and increase yields in plants [5].

Weed control activities carried out will control the competition between weeds and plants. This competition is in the form of a struggle to obtain nutrients, sunlight, and water which will reduce crop yields. Plants that are not weed controlled have lower production yields [18]. According to [16], the relationship between weeding and crop yields is very close. Weeds that grow around cultivated plants will compete for nutrients, water, and sunlight. If left alone, weeds will inhibit the growth of cultivated plants, thus impacting on a decrease in crop yields both in quantity and quality. By carrying out regular weeding, competition between cultivated plants and weeds can be minimized, so that cultivated plants can grow better and produce a more abundant harvest.

The presence of weeds often causes losses in production, both in quality and quantity, and some weeds can even become hosts for pests and plant diseases. Competition between weeds and plants occurs in terms of absorption of nutrients and water from the soil, acceptance of sunlight, and space to grow [19]. The presence of weeds in cultivated plants will cause very serious competition, so that plants produce suboptimal results. Weeding can suppress the growth of weeds that compete with cultivated plants in taking nutrients, water, light and growing space [4].

CONCLUSION

The frequency of weeding at 21 HST carried out on upright bean plants on ultisol soil gave the best results for plant height of 212.59 cm. However, for the yield parameters, the frequency of weeding carried out at 14 HST gave the best results for the number of pods per plant of 14.90 and the weight of pods per plant of 129.63 g.

REFERENCES

- [1] Rachmadhani, N. W., Koesriharti., Dan M. Santoso. 2014. Pengaruh Pupuk Organik Dan Pupuk Anorganik Terhadap Pertumbuhan Dan Hasil Tanaman Buncis Tegak (*Phaseolus vulgaris* L.). Jurnal Produksi Tanaman. 2(6): 443-452.
- [2] Prabowo SM, Dewi SA dan Hatmini D. 2023. Identifikasi Seed Bank Gulma Lokal Dan Pengaruh Frekuensi Penyiangan Terhadap Pertumbuhan Dan Hasil Cabai Rawit (*Capsicum Frutescens*). Agric 32 (2) : 121-128
- [3] Dewanti, O. P., & Sumarni, T. 2020. Pengaruh Sistem Tanam Dan Waktu Penyiangan Gulma Terhadap Pertumbuhan Dan Hasil Tanaman Kedelai (*Glycine max* L. Merrill) Edamame Var.Ryoko. Jurnal Produksi Tanaman, 8(6), 584–593.
- [4] Rahmawati NBA, Astiningrum M, Dan Iftitah SN. 2021. Pengaruh Frekuensi Penyiangan Dan Macam Pupuk Kandang Terhadap Hasil Tanaman Gandum (*Triticum aestivum* L) Varietas Dewata 162. Mediagro 17 (2) : 135 – 145
- [5] Khoiriyah S, Rusmana, Laila A. 2024. Pengaruh Waktu Penyiangan Dan Pemangkasan Terhadap Pertumbuhan Dan Hasil Tanaman Jagung Manis. Jurnal Ilmiah Membangun Desa Dan Pertanian (Jimdp) 9(4):359-368
- [6] Qi, S., Wang, J., Wan, L., Dai, Z., Da Silva Matos, D. M., Du, D., Egan, S., Bonser, S. P., Thomas, T., & Moles, A. T. 2022. Arbuscular Mycorrhizal Fungi Contribute To Phosphorous Uptake And Allocation Strategies Of *Solidago Canadensis* In A Phosphorous-Deficient Environment. *Frontiers In Plant Science*, 13(March), 1–11. <https://doi.org/10.3389/fpls.2022.831654>
- [7] Sembodo, DR.J. 2010. Gulma Dan Penge Lolaannya. Yogyakarta: Graha Ilmu.
- [8] Bahar, A. A., Faried, H. N., Razzaq, K., Ullah, S., Akhtar, G., Amin, M., Bashir, M., Ahmed, N., Wattoo, F. M., Ahmar, S., Javed, T., Siddiqui, M. H., Branca, F., & Dessoky, E. S. 2021. Potassium-Induced Drought Tolerance Of Potato By Improving Morpho-Physiological And Biochemical Attributes. *Agronomy*, 11(12), 1–14. <https://doi.org/10.3390/agronomy11122573>
- [9] Mbagatuzinde, Kalule, Makhan Singh Bhullar, Tarundeep Kaur, And Ajmer Singh Brar. 2022. “Weed Management In Maize Through Integration Of Drip Irrigation, Mulch And Herbicide.” *Proceedings Of The Indian National Science Academy Part B* 92(4):791–800. Doi: 10.1007/S40011-022-01376-W.
- [10] Landau, C. A., Hager, A. G., & Williams, M. M. 2021. Diminishing Weed Control Exacerbates Maize Yield Loss To Adverse Weather. *Global Change Biology*, 27(23), 6156–6165. <https://doi.org/10.1111/Gcb.15857>
- [11] Lailiyah, W. N., Widaryanto, E., & Wicaksono, K. P. 2014. Pengaruh Periode Penyiangan Gulma Terhadap Pertumbuhan Dan Hasil Tanaman Kacang Panjang (*Vigna sesquipedalis* L.). Jurnal Produksi Tanaman, 2(7), 606-612.
- [12] Adamič Zamljen, S., & Leskovšek, R. 2024. Critical Period Of Weed Control In Maize Influenced By Soil Tillage Practices And Glyphosate <https://doi.org/10.3390/agronomy14010093>
- [13] Andert, S. 2021. The Method And Timing Of Weed Control Affect The Productivity Of Intercropped Maize (*Zea mays* L.) And Bean (*Phaseolus vulgaris* L.). *Agriculture (Switzerland)*, 11(5). <https://doi.org/10.3390/agriculture11050380>
- [14] Sitorus H. 2018. Pengaruh Berbagai Cara Pengendalian Gulma Terhadap Pertumbuhan Dan Hasil Tanaman Kacang Hijau (*Vigna radiata* L.). [Skripsi] Universitas Brawijaya Malang.
- [15] Paiman. 2020. Gulma Tanaman Pangan. Upy Press. Yogyakarta.

- [16] Vera, D. Y. S., E. Turmudi., Dan E. Suprijono. 2020. Pengaruh Jarak Tanam Dan Frekuensi Penyiangan Terhadap Pertumbuhan, Hasil Kacang Tanah Dan Populasi Gulma. Jurnal Ilmu-Ilmu Pertanian Indonesia. 22(1):16-22.
- [17] Inanosa, C. M., & Ali, A. 2019. Pengaruh Waktu Penyiangan Gulma Terhadap Pertumbuhan Dan Produksi Tanaman Jagung Manis (*Zea mays* L. Saccharata). Median : Jurnal Ilmu Ilmu Eksakta, 11(2), 28–38. <https://doi.org/10.33506/Md.V11i2.587>
- [18] Prayitno, F. B., Nugroho, A., & Sebayang, T. 2017. Pengaruh Waktu Pengendalian Gulma Dan Dosis Pemupukan Nitrogen Terhadap Pertumbuhan Dan Hasil Tanaman Jagung (*Zea mays* L.). Jurnal Produksi Tanaman, 5(11), 1740–1745. <https://protan.studentjournal.ub.ac.id/index.php/protan/article/view/565>
- [19] Dinarto, W. & Astriani, D. 2012. Produktivitas Kacang Tanah Di Lahan Kering Pada Berbagai Intensitas Penyiangan. Jurnal Agri Sains Vol 3. No.4 2012. Hal 33 - 43.