Journal of Innovation and Research in Agriculture
Vol. 03 No. 02 (2024)

Effect of Biofertilizer Dosage and Al Quran Chanting on the Growth and Yield of Red Spinach (Amaranthus tricolor L.)

Widi Wiratmoko[1], Tien Turmuktini[2*], Lia Amalia[2]

[1]Vegetable Crop Instrument Standard Testing Center (BPSI), / Jl. Tangkuban Parahu No. 517, Cikole, Lembang, West Bandung, West Java, 40391, Correspondence: widiwm78@gmail.com, agency email address: bsip.sayuran@pertanian.go.id

[2]Teaching Staff/S2 Agrotechnology Study Program/Faculty of Agriculture/Winaya Mukti University/ Jl. Raya Bandung – Sumedang Km. 29 Tanjungsari Sumedang 45362 Tel/Fax. (022) 7912585)

*Corresponding author : t.turmuktini@yahoo.com

ABSTRACT

This research was carried out from March to April 2023 at Pondok Tahfidz Generasi Robbani Qurani, Cileunyi, Bandung Regency, West Java. The aim of this research is to study the interaction between the dosage of biological fertilizer and the chanting of the Qur'an on the growth and yield of red spinach plants. The design used is a split plot design. Factor I: Chanting the Al-Quran, namely without chanting the Al-Qur'an and with chanting the Al-Qur'an. Factor II dosage of biofertilizer 0 kg ha^{-l}, 4 kg ha^{-l}, 8 kg ha^{-l}, 12 kg ha^{-l}, 16 kg ha^{-l} repeated 3 times. The research results showed that the application of a dose of biological fertilizer and chanting the Al-Quran had an effect on the growth and yield of red spinach plants as indicated by the results of plant height and number of leaves at the age of 30 DAP, and the application of a dose of bio-fertilizer and chanting of the Al-Quran had an effect on the growth and yield of red spinach plants. shown by the high yield of plants and the number of leaves at the age of 30 HST, in plots with Al-Quran chanting with biofertilizer doses of 8 and 16 kg ha^{-l}, so this biofertilizer dose is the best recommendation.

Keywords : Biofertilizer , chanting the Al-Quran, red spinach

INTRODUCTION

Red spinach (Amaranthus tricolor L.) originated in America and is now found all over the world, although not as popular as green spinach, red spinach is considered a national product because it offers promising market opportunities and good nutritional content (Ali et al., 2022).

According to the Central Statistics Agency (2021), it was noted that in 2018 spinach productivity in Indonesia increased by 162,277 t hectares on a land area of 39,725 hectares. In 2019 the productivity decreased to 160,306 t hectares on a land area of 39,405 hectares. In 2020, spinach productivity decreased to 157,024 t ha^{-l} on a land area of 41,128 ha^{-l}. Even so, in 2021 spinach productivity increased to 171,706 t hectares on a land area of 46,366 hectares. This number has increased by 9.36% compared to the previous year. According to Wijaya, (2006) in (Susanto, 2021) shows that the potential for spinach production can reach 20 t ha^{-l}, higher than the production potential throughout Indonesia, so this shows a great opportunity in the development of spinach production in the future.

Spinach is suitable for most soil types and can grow year-round at an altitude of 1000 m. The best time to plant spinach is at the beginning of the rainy season in October to November or the beginning of the dry season in March to April. Spinach should be planted in loose, fertile soil with a pH of 6-7. Spinach seeds should be planted in loose, fertile soil with a pH of 6-7. The need can reach 5-10 kg ha^{-l} or 0.5-1 g per m-2. The recommended varieties are Green Gitti, Red Giti Red, Green Snapper, Bangkok and Cimangkok (Ali et al., 2022).

Efforts to increase production include the provision of various types of fertilizers, both organic, inorganic, and mineral fertilizers (Nirmalayanti, et al. 2017 in Supadma et al., 2022). Regulation of the Minister of Agriculture Number 01 of 2019 concerning Organic Fertilizers has the potential to reduce the intensification of inorganic fertilizers. Biofertilizers are fertilizers that contain beneficial bacteria and carriers that improve fertilizer efficiency, nutrient availability, and soil health (Ministry of Agriculture, 2019). The application of organic fertilizers is beneficial for plants and bacteria because it increases the availability of nutrients for plants and provides organic matter for bacteria as a source of energy. (Raimi et al. 2021 in Syarifain et al., 2022). Examples of commonly used biofertilizer rhizobacteria are BPN (nitrogen-fixing bacteria) and BPF (phosphate solvent bacteria) to provide BPN preparations in the form

of Rhizobium and Azotobacter sp. soybean growth rate (Febriati and Rahayu, 2019 in Syarifain et al., 2022). Uses of Bacillus sp. and Pseudomonas sp. It is known to increase growth factors such as plant height and the number of leaves in gogo rice (Aryanto et al., 2015 in Syarifain et al., 2022).

The benefits of reading the Quran describe the meaning of Surah Al A'raf verse 58 of the Qur'an in which there are interesting scientific signs to be studied. (Munawaroh, I. N., et al. (2024). God has created plants on good soil. The scientific clues mentioned are always global, so more specific research is needed to find the specific meaning of the verse. (Marina, I., et al. 2023). The method used is a literature research method, namely the collection of data or documents from various scientific sources needed for this research material. (Dasipah, E. 2023). The Qur'an surah Al A'raf in verse 58, good soil is fertile soil. Plants can grow, one of the conditions is the presence of soil or planting media. A good (fertile) substrate will help the plant grow well. Soil fertility is affected by various factors such as minerals, pH, moisture, humus layer and biota content (Study et al., 2018).

MATERIALS AND METHODS

The method used in this study is quantitative verifier so that experiments are carried out in the field. The research activity was carried out at the Robbani Quran Generation Tahfidz Pondok for Male and Female Students, Villa Bandung Indah B5-17 Complex, Cileunyi Kulon Village, Cileunyi District, Bandung Regency, West Java. The altitude of the research site for Cileunyi District is 750 meters above sea level. The research was carried out from March to May 2023. The research was carried out using a split plot design. The first factor is a1 = without the chanting of the Qur'an and a2 = with the chanting of the Qur'an. The second factor of the dose of biofertilizer is h0 = 0 kg ha-l, h1 = 4 kg ha-l, h2 = 8 kg ha-l, h3 = 12 kg ha-l, h_4 = 16 kg ha-l is repeated 3 times so that there are 30 plots. The data collection method in this study consists of independent variables and bound variables. The independent variable is 2 levels of treatment of Al Quran chanting (A) and the bound variable consists of 5 levels of treatment of biofertilizer dosage (H). The data was obtained with the main observations, including plant height measurement, laboratory tests for soil media nutrient testing, crop yield testing including leaf area, number of leaf strands, biomass (wet weight + dry weight), N nutrient uptake, temperature and humidity.

RESULTS AND DISCUSSION

Result

1. Plant Height

The results of observation and statistical analysis of plant height at the age of 15 HST, 20 HST, 25 HST and 30 HST are found in Attachments 9, 10, 11 to 12.

The results of the Least Significant Difference (LSD) test analysis on the observation of plant height of 15 HST for the one-way table are presented in table 5, while the observation of plant height of 20 HST, 25 HST and 30 HST for the bidirectional table are presented in Table 1.

Table 1. One-Way High Analysis Results of Red Spinach Plants 15 HST

Treatment			Average	
Main Plot:	Al Quran			
a0	(without the chanting of the Quran)		1,34	a
a1	(with the chanting of the Quran)		1,34	a
Plot Child:	Vital			
H0	(0 kg a-fl)	1,24	1,24	a
H1	(4 kg ha-fl)	1,34	1,34	a
H2	(8 kg ha-fl)	1,41	1,41	a
H3	(12 kg ha-fl)	1,38	1,38	a
H4	(16 kg a-fl)	1,34	1,34	a

Description: The average number of treatments followed by the same letter in the direction of the column did not differ significantly according to the Least Significant Difference (LSD) test at a real level of 5%.

Based on Table 1, it can be seen that there is no interaction between the dose of biofertilizer and the chanting of the Quran. Independently, both the dose of biofertilizer and the chanting of the Qur'an did not affect the height of plants aged 15 HST.

Table 2. Dual Direction of High Analysis Results of Red Spinach Plants 20 HST, 25 HST, and 30 HST

Side	20 HST a0 (without the chanting of the Quran)		a1 (with the chanting of the Quran)		25 HST a0 (without the chanting of the Quran)		a1 (with the chanting of the Quran)		30 HST a0 (without the chanting of the Quran)		a1 (with the chanting of the Quran)	
h0 (0 kg ha^{-1})	4,37	bc	3,22	a	3,99	abc	5,02	a	4,40	a	5,80	a
	A		A		A		A		A		B	
h1 (4 kg ha^{-1})	4,45	c	3,76	a	4,88	c	6,00	Off	5,62	a	8,53	b
	A		A		A		A		A		B	
h2 (8 kg ha^{-1})	3,09	a	3,85	a	3,79	Off	8,73	c	5,33	a	9,20	bc
	A		A		A		B		A		B	
h3 (12 kg ha^{-1})	3,68	Off	3,26	a	3,68	a	6,87	b	4,49	a	8,69	bc
	A		A		A		B		A		B	
h4 (16 kg ha^{-1})	4,18	bc	3,79	a	4,86	bc	9,96	d	5,49	a	10,00	c
	A		A		A		B		A		B	

Description: The average number of treatments marked with the same letter in each column (lowercase) and each row (uppercase letters) did not differ significantly according to the Least Significant Difference (LSD) test at a real level of 5%.

Based on Table 2, it can be seen that there is an interaction between the dose of biofertilizer and the chanting of the Quran. At the age of 20 hst, the highest treatment was obtained in the treatment of a biofertilizer dose of 16 kg ha-1dan without the chanting of the Quran. At the age of 25 HST and 30 HST, the highest height of shadow plants was obtained at the treatment of 16 kg ha-1 biofertilizer with the chanting of the Quran.

1. Number of Leaves

The results of observation and statistical analysis of the number of leaves at the age of 15 HST, 20 HST, 25 HST and 30 HST (contained in Attachments 13, 14, 15 to 16). The results of the Least Significant Difference (LSD) Test Analysis on the observation of the number of leaves of 15 HST, 20 HST, 25 HST and 30 HST are presented in Table 3.

Table 3. Results of Analysis of the Number of Leaves of Red Spinach Plants 15 HST, 20 HST, 25 HST, 30 HST

Side	15 HST Original Data		Data SQRT(X)		20 HST Original Data		Data SQRT(X)		25 HST Original Data		Data SQRT(X)		30 HST Original Data		Data SQRT(X)	
Main Plot:																
a0 (without the chanting of the Quran)	3,79	a	1,95	a	4,69	a	2,16	a	4,67	a	2,16	a	5,76	a	2,39	a
a1 (with the recitation of the Quran	3,79	a	1,95	a	5,02	a	2,24	a	5,23	b	2,29	b	5,27	a	2,29	a

Plot Child:																
h0 (0 kg ha^{-1})	3,84	a	1,96	a	4,70	a	2,17	a	4,76	a	2,18	a	4,89	a	2,21	a
h1 (4 kg ha^{-1})	3,82	a	1,95	a	5,28	b	2,29	b	5,37	b	2,31	b	5,88	bc	2,42	bc
h2 (8 kg ha^{-1})	3,69	a	1,92	a	4,88	Of	2,21	Of	5,07	Of	2,24	Of	6,04	c	2,45	c
h3 (12 kg ha^{-1})	3,69	a	1,92	a	4,49	a	2,12	a	4,61	a	2,15	a	5,33	Of	2,31	Of
h4 (16 kg ha^{-1})	3,91	a	1,98	a	4,93	Of	2,22	Of	4,99	Of	2,23	Of	5,43	ab	2,33	ab

Description: The average number of treatments marked with the same letter in each column (lowercase) and each row (uppercase letters) did not differ significantly according to the Least Significant Difference (LSD) test at a real level of 5%.

Based on Table 7, there was no interaction between the dose of biofertilizer and the chanting of the Qur'an on the number of leaves. At the age of 15 HST, 20 HST and 30 HST, there is no difference in the chanting of the Qur'an on the number of leaves, but at the age of 25 HST, the chanting of the Qur'an has more influence on the number of leaves compared to the one without the chanting of the Quran. The use of h1 (4 kg ha-1) biofertilizer treatment at the age of 15, 20, and 25 HST gave a higher number of leaves than the treatment of h0 (0 kg ha-1) and h3 (12 kg ha-1). At the age of 30 HST, the treatment of h2 biofertilizer (8 kg ha-1) resulted in a higher number of leaves than the treatment of h0 (0 kg ha-1) and h3 (12 kg ha-1).

2. Wet Weight

The results of observation and statistical analysis of the wet weight of 30 HST (found in Appendix 17). The results of the Least Significant Difference (LSD) Test Analysis on wet weight observation are presented in Table 4.

Table 4. Results of Wet Weight Analysis of Red Spinach Plants 30 HST

SIDE	a0		a1	
h0 (0 kg ha^{-1})	28,44	a	21,06	a
	A		A	
h1 (4 kg ha^{-1})	37,18	a	48,29	b
	A		A	
h2 (8 kg ha^{-1})	32,47	a	48,10	b
	A		A	
h3 (12 kg ha^{-1})	30,12	a	45,70	b
	A		A	
h4 (16 kg ha^{-1})	35,36	a	58,93	b
	A		B	

Description: The average number of treatments marked with the same letter in each column (lowercase) and each row (uppercase letters) did not differ significantly according to *the Least Significant Difference* (LSD) test at a real level of 5%.

Based on Table 4, there was an interaction between the dose of biofertilizer and the chanting of the Qur'an on the wet weight character of red spinach plants at the age of 30 HST. In the treatment of the dose level of h4 biofertilizer (16 kg ha-1), the treatment of the Qur'an chanting had a better effect compared to the treatment without the Qur'an chanting on wet weight. Treatment without the chanting of the Quran at all levels of biofertilizer dosage gave the same results. Treatment with the chanting of the Qur'an at all levels of biofertilizer dosing factors gave better results compared to control

3. Dry Weight

The results of observation and statistical analysis of the dry weight of 30 HST (found in Appendix 18). The results of the Least Significant Difference (LSD) Test Analysis on the observation of dry weight of 30 HST are presented in Table 5.

Table 5. Results of Dry Weight Analysis of Red Spinach Plants 30 HST

Treatment		Average	
Main Plot:	Quran		
a0	(without the chanting of the Quran)	0,7120	a
a1	(with the chanting of the Quran)	0,7060	a
Plot Child:	Vital		
H0	(0 kg $^{ha-1}$)	0,5067	a
H1	(4 kg $^{ha-1}$)	0,8050	bc
H2	(8 kg $^{ha-1}$)	0,7200	bc
H3	(12 kg $^{ha-1}$)	0,6383	Off
H4	(18 kg $^{ha-1}$)	0,8750	c

Description: The average number of treatments followed by the same letter in the direction of the column did not differ significantly according to the Least Significant Difference (LSD) test at a real level of 5%.

Based on Table 5, it shows that there is no interaction between the dose of biofertilizer and the chanting of the Qur'an so that the decision taken does not have a significant effect on dry weight. The highest treatment value of biofertilizer dose and Al Quran chanting on dry weight was found in the h4 treatment (biofertilizer dose of 16 kg ha-1 and with Al Quran chanting) compared to other treatments.

4. Root Extinction Ratio

The results of observation and statistical analysis on the root extinction ratio of 30 years old HST (found in Appendix 19). The results of the Least Significant Difference (LSD) test analysis on the observation of the root extinction ratio at 30 HST are presented in Table 6.

Table 6. Results of Analysis of Root Extinction Ratio of Red Spinach Plants 30 HST

SIDE	a0 (without the recitation of the Qur'an		a1 (with the chanting of the Quran)	
h0 (0 kg ha^{-1})	2,78	a	2,22	a
	A		A	
h1 (4 kg ha^{-1})	2,20	a	3,83	b
	A		B	
h2 (8 kg ha^{-1})	2,29	a	3,73	b
	A		B	
h3 (12 kg ha^{-1})	2,85	a	4,07	b
	A		A	
h4 (16 kg ha^{-1})	2,52	a	4,05	b
	A		B	

Description: The average number of treatments marked with the same letter in each column (lowercase) and each row (uppercase letters) did not differ significantly according to the Least Significant Difference (LSD) test at a real level of 5%.

Based on Table 6, there is an interaction between the dose of biofertilizer and the chanting of the Quran on the character of the Root Extinction Ratio. At the level of biological fertilizers h1 (4 kg ha-1), h2 (8 kg ha-1) and h4 (16 kg ha-1) accompanied by the chanting of the Quran, the absorption of N was higher than other treatments.

Treatment without the chanting of the Quran at all levels of biofertilizer dosage gave the same results. Treatment with Al Quran chanting at all levels of biofertilizer dosing factors gave better results compared to control.

5. Nutrient Absorption N

The results of observation and statistical analysis of the absorption of N nutrients at 30 HST (found in Appendix 20). The results of the Least Significant Difference (LSD) test analysis on the observation of N nutrient uptake are presented in Table 7.

Table 7. Results of Nutrient Absorption Analysis of Red Spinach Plants 30 HST

Treatment		Average	
Main Plot:	Al Quran		
a0	(without the chanting of the Quran)	3,7958	a
a1	(with the chanting of the Quran)	4,7962	a
Plot Child:	Vital		
H0	(0 kg $^{ha-1}$)	4,0123	a
H1	(4 kg $^{ha-1}$)	4,3721	a
H2	(8 kg $^{ha-1}$)	4,2093	a
H3	(12 kg $^{ha-1}$)	4,4391	a
H4	(18 kg $^{ha-1}$)	4,4473	a

Description: The average number of treatments followed by the same letter in the direction of the column did not differ significantly according to the *Least Significant Difference* (LSD) test at a real level of 5%.

Based on Table 7, there was no interaction between the dose of biofertilizer and the chanting of the Qur'an so that the decision had no significant effect on the absorption of N nutrients at the age of 30 HST. The highest value in the dose of biofertilizer and the chanting of the Qur'an to the ratio of root extinction was in the treatment of h4 (16 kg $^{ha-1}$ of biofertilizer and with the chanting of the Quran) compared to other treatments.

Discussion

Based on the results of the study, it shows that the application of biological fertilizers and chanting of the Quran on red spinach plants according to statistical tests, there is an interaction between the dose of biological fertilizers and chanting of the Quran on plant height at 20-30 HST, plant wet weight and Root Pupil Ratio. There was no interaction between the dose of biofertilizer and the recitation of Al Quran on plant height and number of leaves at the age of 15 HST, plant dry weight and N uptake. Age 15 HST is still included in the early growth category so that the effect of slow-release biofertilizer doses is not yet clearly visible on the character of plant height and number of leaves. It is suspected that N uptake by plants does not vary and tends to be low. According to Okalia et al., (2021) that what is needed in the early vegetative phase of plant growth requires more nutrients N. According to Puja Santana et al., (2020) Nitrogen is also one of the factors that can affect the photosynthesis of a plant. Nitrogen can also inhibit chlorophyll formation and inhibit plant metabolic activity. The photosynthetic rate of the diversity of each plant varies depending on where the species comes from.

Likewise, the character of N uptake gives the same results in the treatment of applying biological fertilizers and chanting the Qur'an on red spinach plants. According to Hanafiah (2005) in (Okalia et al., 2021), N is very influential on the growth of the vegetative phase, which is characterized by the addition of plant cell volume (plant height and length) and other plant organs, such as leaves and new branches. During this phase, the role of N is very important, especially during cell division which is part of the metabolic process for plants.

Over time, at the age of 20 HST, the treatment without and with the recitation of Al

Quran gave the same results on the number of leaves; however, at the age of 25 HST and 30 HST, the treatment of the recitation of Al Quran gave more leaves than those without the recitation of Al Quran. At the age of 20 and 25 HST, the treatment of biofertilizer dosition h1 tends to have a greater number of leaves and at the age of 30 HST the h2 treatment tends to have a greater number of leaves although it is not significantly different from h1. The highest dry weight was obtained in the h4 treatment although it was not significantly different from h1 and h2. It is suspected that plants that are listened to the recitation of the Quran have a real influence on plant growth. According to Munar et al., (2020) plantation land sounded by Murottal Al-Quran 2 hours a day for 7 days increased the number of bacteria in the soil by 23.08% more than the soil without the sound of Murottal. Murottal produces sound consisting of waves or vibrations that move in the air. The number of vibrations or the number of waves produced every second makes the isolate development reaction and phosphate solubilizing bacterial activity between the soil applied to the murottal Al-Quran better.

The treatment of the dose of biofertilizer and the recitation of Al Quran showed an interaction on plant height and number of leaves at the age of 30 HST. From Tables 5 and 6, at the age of 30 HST the use of h4 treatment (16 kg ha-1) showed a significant effect on plant height compared to other treatments at the age of 15, 20 and 25 HST. At the age of 30 HST, the use of h2 treatment (8 kg ha-1) showed a significant effect on the number of leaves compared to other treatments at the age of 15, 20 and 25 HST. It is suspected that the recitation of Al Quran stimulates the growth of roots, stems and leaves through stomata. This is reinforced by the statement of Krisnawan's research results, (2019) that murottal treatment has a significant effect on the wet weight parameter of roots per plot, it is suspected that sound waves at the time of flowering can stimulate root growth. This is because mustard planting media causes sound propagation due to flowering sound, so that the acoustic resonance of flowering sound reaches its maximum when it reaches the roots. In the observation of the number of stomata with the provision of Al Quran murottal gives significant results.

In line with the results of research by Amalia et al., (2021) POC independently affects plant height and number of leaves. Giving liquid fertilizer with the right concentration can increase crop yields. Liquid fertilizers used at inappropriate or excessive concentrations can inhibit growth and reduce yields. The same thing is also reinforced by the results of research by Hendrawan et al., (2020) that the frequency of PSWT through Javanese gamelan music played every morning and evening and the presence of organic media mixture treatments has a significant effect on wet weight, plant length, stomatal openings, plant height, leaf chlorophyll, leaf area and number of leaves. (Sopandi, H., et al. 2022).

(Marina, I. 2022) Both parameters have additional treatment before planting, the planting media is given NPK fertilizer at a dose of 200 kg ha-^{l} (14.71 g / plant) by means of a circular array with a distance of 3 cm from the edge of the polybag. According to Fitriatin et al., (2019) there is an interaction between organic fertilizer and NPK on plant height. At 75% and 100% NPK doses, the application of organic fertilizer significantly increased plant height. However, reducing the NPK dose to 25% has an impact on the efficiency of organic fertilizer use. The reason is because plants at the beginning of the growth period have absorbed many nutrients from the soil, thus affecting the growth and activity of microorganisms in organic fertilizers. The availability of NPK fertilizer is related to the use of energy and nutrients at the beginning of growth (Sitawati et al., 2020).

CONCLUSIONS

The conclusions that can be obtained from this research are:

1. There was an interaction between the dose of biofertilizer and the recitation of Al Qur'an on plant height at 20-30 HST, plant wet weight and Root Pupil Ratio. There was no interaction between the

dose of biofertilizer and the recitation of Al Qur'an on plant height and number of leaves at 15 HST, plant dry weight and N uptake.

2. The treatment of biofertilizer dose h4 (16 kg ha-1) accompanied by the recitation of Al Qur'an gave the highest plant height at 20-35 HST and the highest wet weight of red spinach.

REFERENCES

Ali, M., Pratiwi, Y. I., & Huda, N. (2022). Cultivation of Vegetable Plants. Rena Cipta Mandiri. https://books.google.co.id/books?id=JJegEAAAQBAJ

Amalia, L., Sondari, N., Supriatna, N., Nurhayatini, R., Mulya, A. S., & Permana, N. S. (2021). Growth Response and Yield of Peanut (Arachis hypogaea L.) due to Liquid Organic Fertilizer and Planting Distance. Paspalum: Scientific Journal of Agriculture, 9(2), 110. https://doi.org/10.35138/paspalum.v9i2.284

Central Bureau of Statistics. (2021, March 8). Horticulture Statistics 2021. Www.Bps.Go.Id.

Dasipah, E. (2023). The Effect of Innovation and Technology of Integrated Crop and Resource Management (Ptt) on the Success of Rice Paddy Farming (A Case in Bojongpicung District, Cianjur Regency). Orchidagri, 3(2), 1-14.

Fitriatin, B. N., Silpanus, R. N., Turmuktini, T. N., Sofyan, E. T., & Yuniarti, A. N. (2019). Growth of upland rice as affected by the Application of Biofertilizers and NPK Fertilizers on Andisols. SoilREns, 16(2). https://doi.org/10.24198/soilrens.v16i2.20853

Hendrawan, Y., Anniza, K. N., Prasetyo, J., Damayanti, R., & Djoyowasito, G. (2020). Effect of plant sound wave technology to increase productivity of mustard greens (Brassica juncea L.). IOP Conference Series: Earth and Environmental Science, 524(1). https://doi.org/10.1088/1755-1315/524/1/012012

Ministry of Agriculture. (2019). Regulation of the Minister of Agriculture Number 01 of 2019 concerning the registration of organic fertilizers, biological fertilizers, and soil conditioners.

Krisnawan, R. (2019). The Effect of Murottal Al-Qur'an and Npk 16:16:16 Fertilizer on the Growth and Yield of Green Mustard Plants (Brasica juncea L.). Http://Repository.Umsu.Ac.Id/.

Marina, I. (2022). Effect of Interaction Between the Application of Biophosphate and the Use of Sweet Potato Local Cultivator on Yield Growth and Sugar Content of Sweet Potato Plants. Pro-Stek, 4(2), 128-135.

Marina, I., Andayani, S. A., Dinar, D., & Gimnastiar, A. A. (2023). Optimization of Red Onion Farming: A Study of the Influence of Production Factors. Journal of Sustainable Agribusiness, 2(2), 6-12.

Munar, A., Sembiring, M., Tantawi, A. R., & Sabrina, T. (2020). Effect of sound treatment on phosphate solubilizing microbial activity. IOP Conference Series: Earth and Environmental Science, 454(1). https://doi.org/10.1088/1755-1315/454/1/012145

Munawaroh, I. N., Dasipah, E., Nataliningsih, N., & Yohana, A. (2024). The Effect of SWOT Strategy on the Income of Water Girlfriend Flower Farmers (Impatiens Balsamina Linn). Orchidagri, 4(1), 13-20.

Okalia, D., Nopsagiarti, T., & Marlina, G. (2021). Effect of Biochar and Liquid Organic Fertilizer from Rice Washing Water on Growth and Production of Lettuce. JOURNAL OF AGRICULTURAL CULTIVATION, 17(1), 76-82. https://doi.org/10.30598/jbdp.2021.17.1.76

Puja Santana, F., Ghulamahdi, M., & Lubis, I. (2020). Response of Soybean Growth, Physiology, and Production to Nitrogen Fertilizer Application at Different Doses and Times. Indonesian Journal of Agricultural Sciences, 26(1), 24-31. https://doi.org/10.18343/jipi.26.1.24

Sitawati, R., Turmuktini, T., & Kurniawan, A. (2020). ORGANIC MATERIAL INNOVATION PACKAGE FOR EFFICIENCY OF ANORGANIC PUPILS (N P K) INCREASING GROWTH AND RESULTS OF SOME BLACK GLASS (Glycine max L. Merrill) GENOTIPES. Agroscience, 10(2), 160-168.

Sopandi, H., Sukmawati, D., Gantini, T., Dahtiar, A., & Apandi, N. (2022). FACTORS AFFECTING THE SUCCESS OF BROKOLI (Brassica Oleraceae) (Survey of Broccoli Farmers in Pacet District, Cianjur Regency, West Java Province). Journal of Agribusiness Minded Scientific Society, 8(2), 1239-1252.

Studi, P., Ilmu, T., Alam, P., Zuhaida, A., & Kurniawan, W. (2018). Thabiea: Journal of Natural Science Teaching (Vol. 01, Issue 02). http://journal.stainkudus.ac.id/index.php/Thabiea

SUPADMA, A. A. N., DANA, I. M., & ARTHAGAMA, I. D. M. (2022). Review of Organic, Inorganic and Biofertilizer Formulas to Improve Soil Chemical Properties and Yield of Spinach (Amaranthus Spp. L.) on Inceptisol. Agrotrop: Journal on Agriculture Science, 12(1), 167. https://doi.org/10.24843/ajoas.2022.v12.i01.p14

Susanto, H. S. Pd. , M. Kes. , Ph. D. , AIF. , M. G. A. S. P. (2021). Guidebook for Smart and Organic Spinach Farming Through Smart Technology and Integrated Organic Systems (Guepedia La, Ed.; 1st ed.). Guepedia Publisher.

Syarifain, R. I., Rashaun, M. R., Anggrainy, E. D., & Simarmata, T. (2022). Formulation of nitrogen-fixing and phosphate-solubilizing rhizobacterial carriers and their application in oil palm nurseries treated with different compositions and doses of ameliorants. Kultivasi, 21(2). https://doi.org/10.24198/kultivasi.v21i2.38053