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Application of Biofertilizers and Types of Planting Media on the Growth of Seedlings from True Shallot Seeds

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ABSTRACT

Superior seed quality is one of the keys to success in growing shallots. The purpose of this research was to analyze the effect of the concentration of biofertilizers and types of planting media on the growth of shallot seed origin of True Shallot Seeds (TSS) in the nursery. This research used a split-plot design consisting of two factors. The first factor is the concentration of biofertilizers, and the second factor is the type of planting medium. The results showed that the application of biofertilizers increased the growth of the shallot seed origin of TSS than without the application of biofertilizers. The application of biofertilizer at 1.5 $mL.L^{-1}$ water gave the best results regarding the number of leaves per seedling and fresh weight. However, treatment with different concentrations of biofertilizers made no significant difference; treatment with concentrations of 1 $mL.L^{-1}$ water was more efficient for the growth of shallot seeds. The type of planting media treatment did not significantly affect all parameters observed for the growth of shallot seed origin of TSS. There is an interaction between the concentration of biofertilizers and the type of planting media on the growth of shallot seed origin of TSS, namely the number of leaves aged 5 weeks after seedling, while for other parameters, there is no interaction between the concentration of biofertilizers and the type of planting medium on the growth of shallot seed origin of TSS.

Keywords: *Allium cepae;* Husk charcoal; Shallot bulb*;* True seed; Plant nutrients

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INTRODUCTION

The shallot (*Allium cepae* var. *ascalonicum* L.) is one of the most popular plants in the community. Shallots are used as a seasoning for cooking, have nutritious content, and are beneficial for health. Shallots can also be used as a natural growth regulator. The market demand for shallots is very high because the benefits are very large for people's lives. Shallot production in Indonesia in 2018 reached 1,503,438 tons, and shallot production in Banten reached 880.00 tons. In 2019, shallot production in Indonesia reached 1.580.247 tons, and shallot production in Banten reached 1,545 tons. In 2020, shallot production in Indonesia reached 1,815,445 tons, and shallot production in Banten reached 1.404 tons. In 2021, shallot production in Indonesia reached 2,004,590 tons, and shallot production in Banten reached 1.190 tons (Ministry of Agriculture 2022). According to data from (Ministry of Agriculture 2022), Indonesia's shallot production reached 2 million tons in 2021. This number increased by 10.42% from 2020, which amounted to 1.82 million tons. Shallot production in Indonesia seems to increase every year. However, shallot production in Banten has not been stable from year to year. Shallot production in Banten in 2018-2019 increased, and then in 2020-2021, it experienced a decrease in production.

Household consumption of shallots from 2002 to 2021 fluctuated relatively but tended to increase from year to year. In 2018, shallot consumption was around 2,764 kg $capita^{-1}$ per year, or an increase of 7.52% compared to the previous year (Manurung 2019). The increase in shallot production must be maintained and even increased again because, from year to year, the market demand is increasing in line with the increasing needs of the community and anticipating the increasing rate of population growth as well, shallot production that has increased steadily can overcome the community's need for shallot consumption. Setiawan and Hadianto (2014) state that the high consumption of shallot commodities to date still cannot be met by domestic production due to seasonal shallot production patterns. This condition often causes a scarcity of shallot supply in some areas, causing volatile price fluctuations and contributing to inflation in the agricultural sector.

One of the efforts to increase shallot production is the use of shallot seeds of TSS (True Shallot Seed) origin. According to Moeljani et al. (2020), TSS seeds are shallot seeds of seed origin as a solution to the problem of seed availability. The continuous use of bulbs as

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seeds by farmers can reduce the quality of seeds due to the accumulation of bulb-borne pathogens including viruses that will have an impact on reducing plant productivity. Shallot TSS seeds have several advantages, namely TSS seed storage is relatively easy and does not require extensive space, and is rarely contaminated with viruses and seed-borne diseases. TSS technology is worth developing because it can provide higher arming benefits compared to the use of shallot seeds in the form of bulbs, that the use of TSS seeds reduces variable costs by around 10-29 million per ha because of easier transport and cheaper production, and healthier plants free of disease pathogens, and also better tuber quality (Sumarni et al. 2012). The research results of Basuki (2009) show that the use of TSS is feasible technically because it can increase yields up to 2 times compared to the use of traditional tuber seeds and economically feasible because it can increase net income between 22 and 70 million rupiahs per ha compared to traditional seeds.

The Maserati shallot variety can be used as an alternative for TSS shallot cultivation because this variety yields large bulbs. According to the results of research by Karo and Manik (2020), the Maserati shallot variety has a longer bulb size of 3.07 cm, which is very significantly different from the other nine shallot varieties. The results of research by Rajiman et al. (2022) stated that the use of TSS varieties significantly affected the TSS plant height parameter 3-7 weeks after planting. In general, Maserati varieties produce the highest plant height. This is because Maserati is recommended for medium and high plains.

The use of seeds from TSS also has the disadvantage that the seeds must be sown first. Efforts to overcome this weakness by using seedling media that can support the growth of shallot seedlings in the nursery. According to Thoriqussalam and Damanhuri (2019), the use of TSS has several disadvantages, namely seeds must be sown first and have a longer harvest period in the field. Shallot production using TSS which is carried out by seeding first requires a seedling media composition that can support seed germination and growth. Therefore, a nursery media composition is needed that can support the germination and growth of shallot seeds and has the potential to produce good shallot growth and production. Sopha et al. (2015) added that the adaptability or growth capacity of seeds from TSS in the field is not influenced by seed age and seedbed method but is influenced by differences in seedling media that can have a different effect on the plant growth environment. Based on the results of research by Amanah et al. (2021), the composition of planting media soil + compost (1:1) and soil + husk charcoal + compost (1:1:1) with various concentrations of PGPR gave the best results on the growth and yield of shallot of TSS origin. In order to maximize the growth of shallot seedlings originating from TSS, the best type of planting media must be tested.

The combination of biofertilizer treatment and planting media is an effort to increase the growth in TSS shallot plant seedlings. According to Jamilah and Novita (2015), efforts to increase shallot productivity cannot be separated from the role of fertilizer as a soil fertilizer. The results of research by Anti and Sinaini (2020) stated that the biofertilizer treatment with a concentration of 12 mL.10 L^{-1} of water, or equivalent to 1.2 $mL.L^{-1}$ of water, provided the best growth and production of shallots, with an average production reaching 5.13 $t.ha^{-1}$. Therefore, the combination of biofertilizer treatment with the type of planting media used in the shallot plant nursery is expected to produce maximum growth in TSS shallot plant seedlings.

MATERIALS AND METHODS

The materials used were shallot seeds of TSS origin of Maserati variety, soil, sand, husk charcoal, goat manure, NPK fertilizer (16-16-16), biofertilizer with ingredients 3 (three) Isolate bacterial, pesticides (insecticide and fungicide), water, labels, and newspaper. The tools used were a hoe, shovel, soil sifter, sprayer, meter, ruler, vernier, seedling tray size 38.8 cm x 10.5 cm, UV plastic, plastic mulch, stationery, mobile phone camera, needles, analytical scales, digital scales, syringe, hand sprayer, thermo-hygrometer, Soil Plant Analysis Development (SPAD) type 502 plus, soil analyzer 4 in 1 and oven.

This research used an experimental method. This research was conducted from September to December 2021 at the Integrated Agricultural System (Sitandu) with coordinate 6º12'04" S 106º07'37" E, Banten Province, and at Agroclimatic and Soil Laboratory, Faculty of Agriculture, University of Sultan Ageng Tirtayasa. The environmental design used was a factorial Split-Plot Design consisting of two factors. The first factor was the concentration of biofertilizer (K) consisting of 4 levels, namely K3 (No biofertilizer (control)), K2 (Biofertilizer concentration one $mL.L^{-1}$ of water), K3 (Biofertilizer concentration 1.5 $mL.L^{-1}$ of water), and K4 (Biofertilizer concentration 2 $mL.L^{-1}$ of water). The second factor was the type of planting media (M) consisting of 3 levels, namely M1 (soil: sand: goat manure), M2 (soil: burnt husk: goat manure), M3 (soil: goat manure : sand: husk charcoal). Each treatment was repeated three times. Analysis of variance (ANOVA) using Microsoft Excel and the results of variance that showed significant to very significant differences were further tested using Duncan's Multiple Range Test (DMRT) at the 5% level.

The combination of biofertilizer treatment and planting media as an effort to increase the growth of shallot seedlings from TSS in the nursery can be combined because each treatment provides mutual benefits. The biofertilizers used for this study function to help produce phytohormones that can increase plant growth and control several fungal and bacterial pathogens. The type of planting media used can support the growth of shallot seedlings based on the results of the analysis of planting media in the laboratory in accordance with the requirements for shallot growth. In addition to the provision of biological fertilizer treatment, NPK fertilizer (16-16-16) was also applied.

RESULTS AND DISCUSSION

Analysis of planting media

The planting medium that has been solarized is taken as a sample for analysis of nutrient levels carried out in the laboratory. Based on the overall results of testing the levels of nutrients in each planting medium, the nutrient content is relatively balanced. The results of the analysis of planting media in Table 1, namely the M1 media contains N 0.70% (high), P 7.58 ppm (low), C-Organic 2.49% (medium), K (medium), C/N ratio 3.52% (very low) and pH 6.70-6.98 (neutral). Media M2 contains N 1.15% (very high), P 12.79 ppm (medium), C-Organic 4.56% (high), K (high), C/N ratio 3.95% (very low) and pH 6.52-6.94 (neutral). Media M3 contains N 0.44% (medium), P 7.90 ppm (low), C-Organic 3.87% (high), medium K, 8.76% C/N ratio (low) and pH 6.96-7.57 (slightly alkaline). Based on the overall results of testing the nutrient content of each planting media, the nutrient content is relatively balanced.

Table 1. Data on nutrient content in growing media

Nutrient		Planting Media		
		M1	M2	M3
N-Total (%) (Kjeldahl)		0.70	1.15	0.44
P (ppm) (*Olsen*)		7.58	12.79	7.90
C-Organic (%) (*Walkley and Black*)		2.49	4.56	3.87
K (PUTK)		Medium	High	Medium
C/N Ratio (%)		3.52	3.95	8.76
pH	**KCl**	6.70	6.52	6.96
	H_2O	6.98	6.94	7.57
	PUTK	Neutral	Neutral	Slightly Alkaline
Al-dd (me.100g^{-1})		0.00	0.00	0.00
H-dd (me.100g^{-1})		0.11	0.04	0.05

Remark: M1 (soil : sand : goat manure), M2 (soil : burnt husk : goat manure), M3 (soil : goat manure : sand : husk charcoal)

Based on the results of the analysis of planting media in Table 1, the treatment of various planting media is suitable as a planting medium for shallot seedlings from TSS. This is based on the growing requirements of shallot plants. According to Sugiartini et al. (2018), shallot plants are suitable for growing at low to high altitudes (> -1,000 masl) with an optimum altitude of 0-450 masl. Other growing requirements include a minimum of 70% sunlight, air temperature of 25-32 0C, relative humidity of 50-70%, crumbly soil structure, medium-high texture, good drainage, and aeration, containing sufficient organic matter and neutral soil pH (5.6-6.5). Bancin et al. (2016) stated that shallot plants need elements of Nitrogen (N), Phosphor (P), Potassium (K), and Sulfur (S). The results of the C/N ratio analysis showed low to very low results. These results state that the planting media can provide N for shallot seedlings and can increase the growth of TSS shallot seedlings. This is based on Bancin et al. (2016), which states that the lower the C/N ratio, the easier it is to provide N for plants and increase plant vegetative growth.

The mixture of planting media affects the humidity of the planting media; in M2 media, the humidity is better maintained compared to M1 and M3. In M1 media, it is easier to dry because M1 media contains a mixture of sand, which has properties that are easy to dry, as well as M3 media, which contains sand, but in M3 media, there is still a mixture of firecrackers that can maintain the humidity of the planting media. Husk charcoal can maintain media moisture and goat manure as an addition to the organic matter in the planting media. According to Dewi et al. (2020), sand texture planting media is very easy to process, has good aeration (availability of air cavities) and drainage, but has a relatively small cumulative surface area, so the ability to store water is very low or the soil dries faster. The considerable weight of sand will make it easier to erect the stems. So far, sand is considered adequate and suitable when used as a growing medium, seedling growth, and plant rooting. Meanwhile, the advantages of husk burn are that it is easy to bind water, does not rot quickly, does not clump quickly, is not easily overgrown by fungi and bacteria, can absorb toxins or toxic compounds and release them again when watering, and is a source of potassium for plants. Husk charcoal makes the media more pivot and clean, and sterility is more guaranteed and freer from organisms that can interfere, such as fleas that usually live in the soil. According to Rahayu and Ali (2014), goat manure has a high volume of pore space, so it can increase soil porosity. If soil porosity is good, organic matter contained in the soil will be retained and can improve the physical, chemical, and biological properties of the soil for plant growth.

Seedling height

Plant height is very influenced by metabolic processes in the plant body itself. Plants need nutrients that can be obtained from fertilization. Plant height increase is an indicator of plant growth and development that determines the productivity of a plant (Putra and Ningsi 2019). Measurement of seedling height was carried out starting at 3 to 7 weeks after seedling (WAS) because at 1 WAS, the seeds had just germinated, and the application of biological fertilizer was only carried out at 2 WAS, but previously fertilization was also carried out 2 weeks before seedling as basic fertilization, so plant height measurements were taken at 3 WAS to determine the effect of biological fertilizer treatment and the type of planting media. The average results of shallot seedling height can be seen in Figure 1.

Based on the average results of seedling height in Figure 1, at 3 to 7 WAS there is no interaction between the treatment of biofertilizer concentration and the type of planting media on seedling height growth. Based on the results of statistical tests, it is stated that the treatment of biofertilizer concentration has a significant effect on seedling height, although the k_1, k_2, and k_3 treatments do not show significantly different average results. The k_3 treatment gave the best results at 3 to 7 WAS, at 7 WAS the average result of the best seedling height in the k_3 treatment, was 37.48 cm. Based on research by Anti and Sinaini (2020), the provision of various concentrations of biological fertilizers has a very significant effect on plant height, number of leaves, number of tillers, and production. Giving a concentration of 12 mL.10 L^{-1} of water shows the best results on shallot plant height.

The provision of biofertilizer treatment containing *Bacillus* sp. and *Bacillus amyloliquefaciens* can increase the high growth of shallot seedlings because the role of these bacteria is not only as a biofertilizer or soil improver, both bacteria are able to provide N and P elements that can increase the growth of shallot seedlings. According to Mrkovacki et al. (2016), Bacillus sp. can increase nitrogen availability by fixating N_2 in the atmosphere. Handayani et al. (2019) added that *Bacillus* sp. can increase the availability of nutrients with its ability to dissolve P so that the availability of nutrients in the soil increases. Putra (2018) stated that *Bacillus amyloliquefaciens* bacteria can break down P nutrients bound in the soil to become available to plants and increase the ability of plants to absorb nutrients and produce phosphatase enzymes that play an important role as P solvents from bound P compounds. Rosalina and Nirwanto (2021), added that phosphor (P) is an essential element for plants because it is one of the factors that affect plant growth and production. Phosphor (P) is an essential element for plants because it is a factor that affects plant growth and production.

The growth of plant seedlings really needs the element N which functions to accelerate the growth of seedling height. *Bacillus* sp. contained in biological fertilizer can provide the availability of N elements for shallot plants. According to Priyantono et al. (2016), plant height and number of leaves are strongly influenced by metabolic processes in the plant body itself. In carrying out these metabolic activities, plants need high N elements to assist in the process of growth and cell division. Kalay et al. (2020), stated that Bacillus sp. is a soil bacterium that lives in the soil, especially around plant roots. In the soil, bacteria can colonize the root surface, and produce phytohormones auxin, cytokinin, gibberellin, and ethylene which affect cell proliferation in the plant root system to form more lateral roots and root hairs to increase nutrient and water absorption.

The treatment of planting media did not significantly affect the height of the seedlings. The average results of the treatment of planting media are not significantly different but the three-planting media used in this study have given quite good results on the growth of shallot seedlings. The results that were not significantly different were also suspected because the control media treatment (soil) was not used as a comparison.

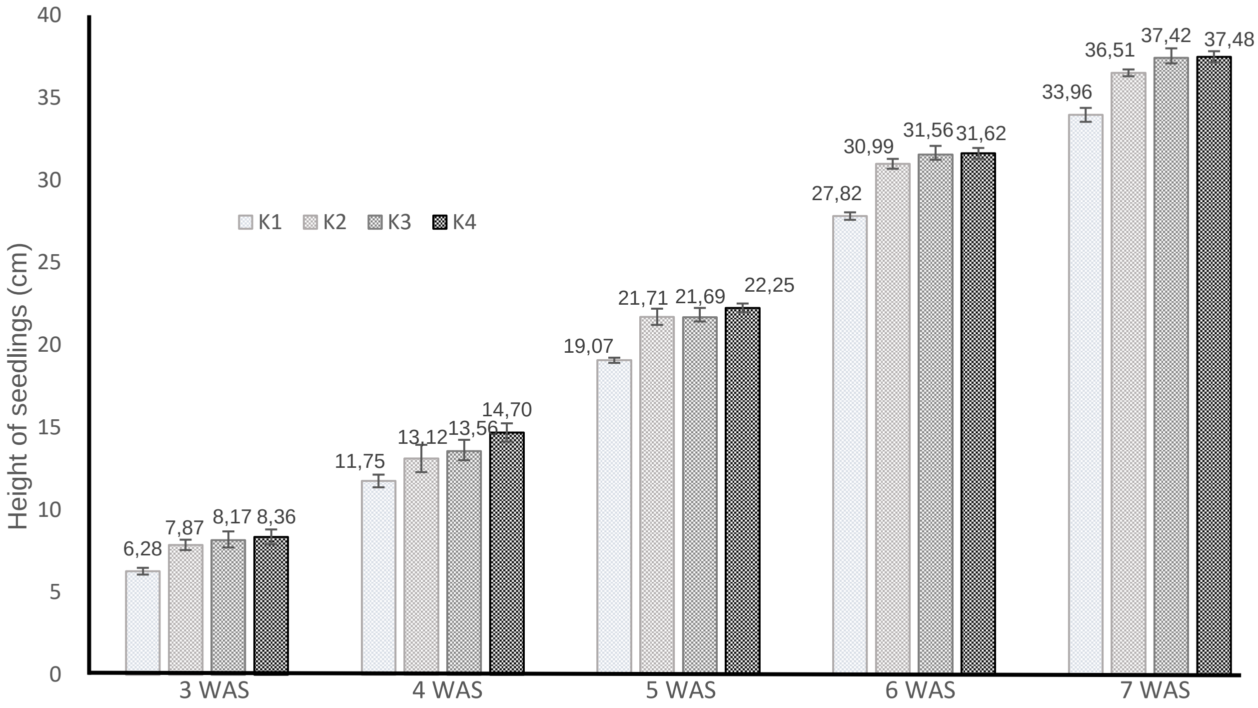
According to Mahdalena (2016), the planting media has no significant effect on plant length because the planting media only acts as a place for plant roots and is unable to supply the nutrient needs needed by shallot plants. Batubara et al. (2021) added to the results of their research that the composition of planting media did not have a significant effect on plant height, presumably because the composition used in the media was not precise enough to be carried out in verticulture. But the results visually show a good response in shallot plants.

Number of leaves

Leaves are a place for absorption and conversion of sunlight energy through the photosynthesis process as a food-producing source used for plant growth (Girsang et al. 2019). Leaves on shallots have only one surface, small round, elongated, and hollow like a pipe. The tip of the leaf is tapered, and the bottom widens like a petal and swells. In shallots there are also those whose leaves form a semicircle in the cross-section of the leaves, the color of the leaves is light green (Rahayu and Ali 2014). According to Fatmawaty et al. (2015), the number of plant leaves is a component that can show plant growth. Leaf formation itself is influenced by the genetic properties of plants and a good environment. The number of leaves is calculated per shallot seedling, and the number of leaves is calculated from 3 MSS to 7 MSS. The average number of leaves can be seen in Figure 2.

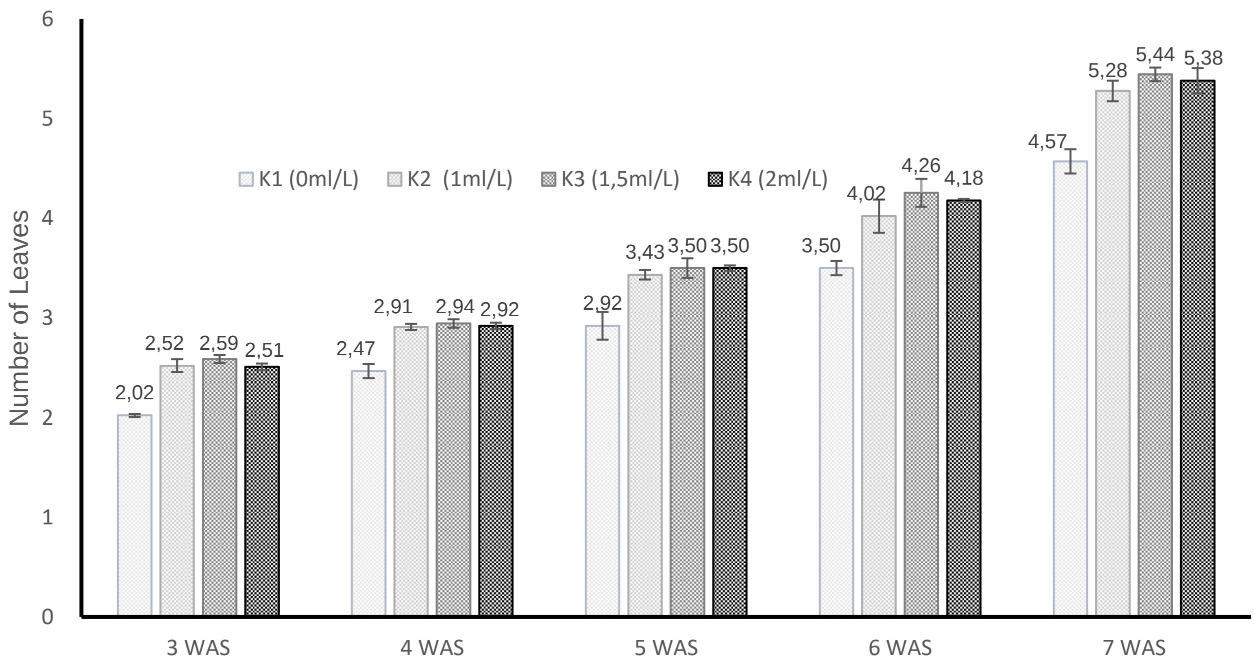
Based on the average number of leaves at 3 to 7 WAS, it shows that the best average results are found in the number of leaves of biofertilizer concentration treatment k_2, at 7 WAS which is 5.44 strands. The provision of biofertilizer is able to increase the growth of the number of leaves compared to without the provision of biofertilizer (control) because the biofertilizer used in this study contains *Bacillus* sp. and *Bacillus amyloliquefaciens* which can provide N and P elements that can be absorbed by plants. According to Borriss (2015), one of the *Bacillus* species that can increase the availability of nitrogen and phosphate nutrients in the soil are *Bacillus subtilis, Bacillus amyloliquefaciens,* and *Bacillus pumilus*. According to Rianti et al. (2021), the growth and increase in the number of leaves are influenced by the availability of nitrogen nutrients. The more nitrogen absorbed by plants, the wider the leaves will grow so that the photosynthesis process runs smoothly and the total plant biomass becomes more.

The application of biofertilizers applied directly to the leaves by spraying can spur leaf growth because the nutrients are directly absorbed by the leaves. According to Triana et al. (2022), fertilization through the leaves is faster in the absorption of nutrients when compared to fertilization through the roots. Fertilizer application through leaves is more effective and can be absorbed directly by plants. Plant leaf tissue can absorb 90% more fertilizer than roots which can only absorb about 10% fertilizer. Plants can grow well if nutrients are given in balanced amounts and in accordance with the phase of plant development. In the research results of Anti and Sinaini (2020), the provision of various concentrations of biofertilizers also had a very significant effect on the number of leaves. Giving a concentration of 12 mL.10 L^{-1} of water shows the best results on the number of leaves of shallot plants. Based on the results of research by Widiastutik et al. (2018), the concentration of liquid organic fertilizer 3 mL.L^{-1} of water equivalent to 15 L.ha^{-1} can increase the number of leaves on shallot plants.



Remark: K1= (No biofertilizer (control)), K2= (Biofertilizer concentration one mL.L^{-1} of water), K3= (Biofertilizer concentration 1.5 mL.L^{-1} of water), and K4= (Biofertilizer concentration 2 mL.L^{-1} of water), WAS= week after planting.

Figure 1. Average height of shallot seedlings origin of true shallot seed with different concentrations of biofertilizer and planting media



Remark: K1= (No biofertilizer (control)), K2= (Biofertilizer concentration one mL.L^{-1} of water), K3= (Biofertilizer concentration 1.5 mL.L^{-1} of water), and K4= (Biofertilizer concentration 2 mL.L^{-1} of water), WAS= week after planting.

Figure 2. Average number of leaves of shallot seedlings origin of True Shallot Seed with different concentrations of biofertilizer and planting media

The treatment of planting media did not significantly affect the growth of the number of leaves from 3 to 7 WAS, although the planting media mixture contained nutrients needed by plants. However, the application of biofertilizers has a real to very real effect on the number of leaves because biofertilizers can be absorbed by plants due to the application of biofertilizers through the leaves. According to Sopha et al. (2015), seedling media cannot affect the number of seed leaves from TSS, but the seedling media treatment of soil with manure fertilizer and cocopeat has the highest value of the number of seed leaves. Meanwhile, during transplanting, the highest number of leaves was found in the soil treatment with husk charcoal. Girsang et al. (2019), added that in their research the planting media had no significant effect on the number of leaves because the media used was too dense.

There is an interaction at 5 WAS, a very real effect is shown in the biofertilizer treatment which shows that without the provision of biofertilizer does not give a real effect and with the provision of biofertilizer gives a real effect but in each concentration, treatment gives results that are not significantly different. In the ANOVA results of the number of leaves 5 WAS the treatment of planting media had no significant effect. According to Tenaya (2015), the interaction effect can also be said to be the difference or difference in the response of a factor to the level of other factors or the interaction effect is the average difference from a single effect or simple effect. If the single effect of a factor is significantly different, then this difference is due to the interaction effect between two factors that are not mentioned.

Percentage of bulbs formed

Good seedlings are seedlings that do not form bulbs, because seedlings that have formed bulbs will cause plant productivity to decrease after transplanting (plant growth becomes stunted and reduces the yield of shallot bulbs because the bulb tillers do not increase). The difference between seedlings that bulbs formed and those that did not bulbs formed can be seen in Figure 3. Based on the observation of the number of seedlings that formed bulbs and seedlings that did not form bulbs, the average percentage of formed bulbs can be stated in Table 2.

Based on the average results of the percentage of tuber formation in Table 2, the combination of biofertilizer concentration treatment and the type of planting media does not significantly affect the percentage of bulbs formed. The treatment of giving a higher concentration of biofertilizer gives the average percentage of bulbs formed is also higher. The lower the percentage of bulbs formed, the better the quality of shallot seedlings. Conversely, if the percentage of bulbs formed is higher, the quality of shallot seedlings is also lower. According to Bejo Zaden Bv ([unknown]), the stages of transplanting for good TSS shallot seedlings are transplanting when the seedlings are 30-45 days after sowing or have 3-4 leaves, healthy seedlings and have not experienced bulbs formed, roots and leaves are cut to reduce plant stress when transplanted. The best time to have a transplant is in the morning or afternoon. It uses a planting distance of 10x15 cm (as needed) and a tighter planting distance so that the tubers are broken or exaggerated so that the tubers are large with a planting distance of 12x12 cm.

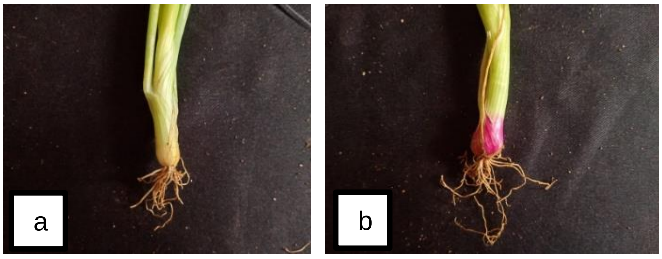


Figure 3. Differences in bulbs: (a) no bulbs formed (b) bulbs formed

Table 2. Average percentage of bulb formation of Shallot seedlings origin of True Shallot Seed with different concentrations of biofertilizer and different types of planting media

Biofertilizer (mL.L^{-1})	Planting Media			Average
	M1	M2	M3	
		%		
0 (K1)	0.00	10.00	19.52	9.84
1 (K2)	24.17	16.67	13.33	18.06
1.5 (K3)	16.67	10.00	26.67	24.76
2 (K4)	24.76	17.41	40.00	27.39
Average	16.40	13.52	24.88	

Remark: Numbers followed by the same lowercase letter in the row or column indicate significant differences based on the DMRT test at the 5% level

Biofertilizer treatment did not significantly affect the percentage of bulbs formed because the bulbs were not simultaneously formed in each tray of plants that had been treated. The concentration of biofertilizer 0 mL.L-1 of water gave the lowest average percentage of tubers, and the lower the percentage of tuber formation, the better the result. Although the treatment of biofertilizer gives the lowest results on the percentage of bulbs formed to support the growth of shallot seedlings, biofertilizer is still needed, which can help increase the growth of shallot seedlings. So, the provision of biofertilizer with a concentration of 1 mL.L-1 of water is more efficient for the growth of shallot seedlings. The provision of biofertilizers can increase the content of nutrients absorbed by plants, as well as the treatment of planting media which contains a mixture of planting media that also provides nutrients that can be absorbed by plants. However, the desired result is good quality seedlings that do not form bulbs because seedlings that form bulbs show poor quality for growth and yield after transplanting. Even so, nutrients are still needed to support seedling growth in the nursery. According to Supriadi et al. (2017), shallot plants require nitrogen (N), phosphor (P), and potassium (K) in large enough quantities.

The treatment of planting media does not have a significant effect on the percentage of bulbs formed presumably because there are other factors from the planting media environment that are less supportive. Planting media that is too humid can affect the formation of bulbs in TSS shallot seedlings. According to Wibowo (2005), shallots are not drought resistant because of their short root system, while the need for water, especially during growth and bulbs formed, is sufficient.

Fresh weight

Fresh weight is a growth indicator related to water and carbohydrates. Physiologically, fresh weight usually consists of two contents, namely water and carbohydrates. Water is the main component of green plants, constituting 70-90% of the fresh weight of the plant. Fresh weight is the weight obtained from all parts of the plant, including roots, stems, and leaves. Fresh weight is in line with vegetative growth, where the better the growth, the higher the fresh weight (Azmi and Handriatni 2018). The average results of fresh weight weighing can be seen in Table 3.

Table 3. Average fresh weight of shallot seedlings origin of True Shallot Seed with different concentrations of biofertilizer and different types of planting media

Biofertilizer (mL.L^{-1})	Planting Media			Average
	M1	M2	M3	
		g		
0 (K1)	2.24	2.27	2.60	2.37^{b}
1 (K2)	3.63	3.58	3.69	3.63^{a}
1,5 (K3)	3.89	4.27	3.98	4.05^{a}
2 (K4)	3.93	4.04	4.09	4.02^{a}
Average	3.42	3.54	3.59	

Note: Numbers followed by the same lowercase letter in the row or column indicate significant differences based on the DMRT test at the 5% level

Based on the results of the average fresh weight in Table 3, it shows that the treatment of biofertilizer concentration has a significant effect on the fresh weight of seedlings. The application of biofertilizers can provide better results than without the application of biofertilizers. The treatment of biofertilizer concentration 1.5 mL.L^{-1} of water showed the best average result, which was 4,05 g, although the result was not significantly different from the average of biofertilizer concentration 2 mL.L^{-1} of water, which was 4,02 g. The application of biofertilizer with a concentration of 1 mL.L^{-1} of water is more efficient for the growth of shallot seedlings. According to Astuti et al. (2016), fresh weight shows the level of accumulation of plant metabolism where fresh weight is influenced by water, nutrients, metabolic products, and media moisture. Haryadi et al. (2015) stated that the higher the value of plant growth, the higher the fresh weight of the plants produced. According to the results of research by Hendarto et al. (2021), the application of biofertilizer has a significant effect on the parameter of fresh weight per shallot plant. Microbes and growth regulators contained in biofertilizers are thought to be able to increase plant growth and development. Biofertilizers also colonize plant roots, which affects the extension of plant roots so that the absorption of nutrients can take place properly.

The treatment of planting media did not significantly affect the fresh weight of seedlings. The average results of each type of planting media are not significantly different. Based on the average results in each type of planting media treatment, the results are not significantly different, but the treatment of planting media provides quite good results for the growth of shallot seedlings. The results that are not significantly different are also suspected because the control treatment (soil) is not used as a comparison to see the difference in results with other planting media treatments. Based on the results of research by Batubara et al. (2021), the composition of planting media does not have a significant effect on the fresh weight of shallots, presumably because the composition used in the media is not quite right. But the results visually show a good response in shallot plants.

CONCLUSIONS AND SUGGESTIONS

Biofertilizer application can increase the growth of shallot seedlings from TSS compared to without biofertilizer application. Biofertilizer concentration of 1.5 mL.L^{-1} of water gives the best results on the number of leaves (3 to 7 WAS) and fresh weight (4.05 g). The type of planting media had no significant effect on all parameters observed. There is an interaction between the concentration of biofertilizer and the type of planting media on seedling growth, namely on the number of leaves at the age of 5 WAS, while in other parameters, there is no interaction between the concentration of biofertilizer and the type of planting media on the growth of TSS shallot seedlings.

A biofertilizer concentration of 1 mL.L^{-1} of water is a concentration that is considered efficient in this study for the growth of TSS shallot seedlings. Research related to the provision of biofertilizer concentration treatment and the type of planting media on shallots' origin of TSS needs to be carried out further to determine its effect on growth in the generative period until harvest.

REFERENCES

Amanah MS, Istiqomah N, Barunawati N. 2021. Effect of growing media composition and PGPR concentration on growth and yield of shallots (*Allium ascalonicum* L.) from true shallot seed. J Produksi Tanam. 9(4):243–250.

Anti WO, Sinaini L. 2020. Pertumbuhan dan produksi tanaman bawang merah (*Allium ascalonicum* L) pada berbagai konsentrasi pupuk hayati. J Agrokompleks. 9(2):08–15.

Astuti AF, Hardjoko D, Rahayu M. 2016. Combination of arenga wood fiber and merapi sand in hidroponic substrate kailan. Agrosains J Penelit Agron. 18(2):50–56. https://doi.org/10.20961/agsjpa.v18i2.18692.

Azmi R, Handriatni A. 2018. Effect of substance types of natural growth regulators on the growth of some robusta coffee clones cuttings (*Coffea canephora*). Biofarm J Ilm Pertan. 14(2):71–81. https://doi.org/10.31941/biofarm.v14i2.794.

Bancin RR, Murniati, Idwar. 2016. The growth and production of onion (*Allium ascalonicum* L.) in peat soil with giving the ameliorant and nitrogene fertilize. J Online Mhs Fak Pertan Univ Riau. 3(1):1–12.

Basuki RS. 2009. Analisis kelayakan teknis dan ekonomis teknologi budidaya bawang merah dengan benih biji botani dan benih umbi tradisional. J Hort. 19(2):214–227.

Batubara LR, Mawarni R, Pohan RRR. 2021. Respon pertumbuhan dan produksi bawang merah (*Allium cepa* L) terhadap berbagai jenis bokhasi sebagai media tanam. J Agrotek. 8(1):48–53. https://doi.org/10.35760/jpp.2021.v5i2.4565.

Bejo Zaden Bv. [unknown]. Panduan budidaya bawang merah dari biji dan benefit. Bejo Indones Mag. https://www.bejoindonesia.com/magazine/panduan-budidaya-bawang-merah-dari-biji-dan-benefit. [accessed 2023 Oct 20].

Borriss R. 2015. Bacillus, a plant-beneficial bacterium. In: Principles of Plant-Microbe Interactions. Cham (CH): Springer International Publishing. p. 379–391.

Dewi AF, Sari TM, Carolina HS. 2020. Pengaruh media tanam pasir, arang sekam, dan aplikasi pupuk LCN terhadap Jumlah Tunas Tanaman Tin (*Ficus carica* L.) sebagai sumber belajar biologi. Bioeducation. 7(1):1–7.

[Ministry of Agriculture] Direktorat Jenderal Hortikultura Kementerian Pertanian. 2022. Angka tetap hortikultura. Sulastri S, Sa'I N, Kurniawati D, Bardosono A, Triyono A, editors. Jakarta (ID): Direktorat Jenderal Hortikultura, Kementerian Pertanian.

Fatmawaty AA, Ritawati S, Said LN. 2015. Pengaruh pemotongan umbi dan pemberian beberapa dosis pupuk NPK majemuk terhadap pertumbuhan dan hasil tanaman bawang merah (*Allium ascolanicum* L.). Agrologia. 4(2):69–77. https://doi.org/10.30598/a.v4i2.201.

Girsang R, Luta DA, Hrp AS, Suriadi S. 2019. Peningkatan perkecambahan benih bawang merah (*Alliumascalonicum* L.) akibat interval perendaman H2SO4 dan beberapa media tanam. J Anim Sci Agron Panca Budi. 4(1):24–28.

Handayani S, Affandi MI, Susanti S. 2019. Analisis karakteristik mutu beras organik varietas mentik susu dan sintanur. J Food Syst Agribus. 2(2):75–82. https://doi.org/10.25181/jofsa.v2i2.1113.

Haryadi D, Yetti H, Yoseva S. 2015. Pengaruh pemberian beberapa jenis pupuk terhadap pertumbuhan dan produksi tanaman kailan (Brassica alboglabra L.). J Mhs Online Faperta. 2(2):1–10.

Hendarto K, Widagdo S, Ramadiana S, Meliana FS. 2021. Effect of NPK fertilizer dosage and bio-fertilizer types on growth and yield of shallot (*Allium ascalonicum* L.). J Agrotropika. 20(2):110–119. https://doi.org/10.23960/ja.v20i2.5086.

Jamilah J, Novita E. 2015. Pengaruh pupuk organik cair batang pisang terhadap produktivitas tanaman bawang merah (*Allium ascalonicum* L). J Ipteks Terap. 8(2):67–73.

Kalay AM, Kesaulya H, Talahaturuson A, Rehatta H, Hindersah R. 2020. Aplikasi pupuk hayati konsorsium strain *Bacillus* sp dengan berbeda konsentrasi dan cara pemberian terhadap pertumbuhan bibit pala (*Myristica fragrans* Houtt). Agrologia. 9(1):30–38. https://doi.org/10.30598/a.v9i1.1060.

Karo BB, Manik F. 2020. Observasi dan adaptasi 10 varietas bawang merah (*Allium cepa*) di berastagi dataran tinggi basah. J Agroteknosains. 4(2):1–9.

Mahdalena M. 2016. Respon pertumbuhan dan produksi bawang merah (*Allium ascalonicum* L) terhadap pengaruh berbagai media tanam dan pemberian mikro organisme lokal (MOL) keong mas. J Agrifor. 15(2):233–248.

Manurung M. 2019. Konsumsi dan neraca penyediaan - penggunaan bawang merah. In: Sumantra A, editor. Food consumption bulletin [Buletin konsumsi pangan]. Vol. 10 (No.1). Jakarta (ID): Pusat Data dan Sistem Informasi Pertanian Sekretariat Jenderal Kementerian Pertanian.

Moeljani IR, Suhardjono H, Djarwatiningsih D. 2020. Gamma 60Co ray irradiation on the diversity of two varieties of onion red (Allium ascalonicum L) TSS (True Shallot Seed). In: Seminar Nasional Magister Agroteknologi Fakultas Pertanian UPN "Veteran"; Tantangan dan Revolusi Perubahan Iklim untuk Ketahanan Pangan Global; December 20 2024; Surabaya, ID. Malang (ID): Nusantara Science and Technology Proceedings. p. 126–131.

Mrkovacki N, Djalovic I, Josic D, Bjelic D, Brdar-Jokanovic M. 2016. The effect of PGPR strains on microbial abundance in maize rhizosphere in field conditions. Ratar Povrt. 53(1):15–19. https://doi.org/10.5937/ratpov53-8224.

Priyantono E, Purwanto YA, Sobir S. 2016. Low temperature storage of shallot (*Allium ascalonicum* L.) variety of Bima Brebes, Tajuk, and Bali Karet. J Agro-based Ind. 33(1):32–38.

Putra A. 2018. Utilization of *Bacillus amyloliquefaciens* bacteria to increase phosphate fertilization efficiency in SRI method rice plants. Padang (ID): Faculty of Agriculture, Universitas Andalas.

Putra B, Ningsi S. 2019. Peranan pupuk kotoran kambing terhadap tinggi tanaman, jumlah daun, lebar dan luas daun total *Pennisitum purpureum* cv. Mott. Stock Peternak. 2(2):1–17.

Rahayu E, Ali NBV. 2014. Shallot [Bawang merah]. Jakarta (ID): Penebar Swadaya.

Rajiman R, Yekti A, Megawati S, Anshori A. 2022. Pengaruh dosis pupuk kandang terhadap karakter agronomi beberapa varietas *True Shallot Seed* di tanah vertisol. J Trit. 13(1):98–108. https://doi.org/10.47687/jt.v13i1.239.

Rianti M, Okalia D, Ezward C. 2021. Pengaruh berbagai varietas dan dosis urea terhadap tinggi dan jumlah daun bawang merah (*Allium ascalonicum.* L). J Green Swarnadwipa. 10(2):214–225.

Rosalina E, Nirwanto Y. 2021. The effect of phosphor (P) fertilizer measures on the growth and yield of some varieties rice plant (*Oryza sativa* L.). Media Pertan. 6(1):45–59. https://doi.org/10.37058/mp.v6i1.3015.

Setiawan AF, Hadianto A. 2014. Food prices fluctuation and its impact to inflation in Banten Province. JAREE J Agric Resour Environ Econ. 1(2):81–97.

Sopha G, Sumarni N, Setiawati W, Suwandi. 2015. Sowing technique of true shallot seed to produce seedling and set of shallot. J Hort. 25(4):318–330.

Sugiartini E, Mayasari K, Ikrarwati I. 2018. Petunjuk teknis: Budidaya bawang merah di lahan dan di dalam pot/polybag. Sastro Y, editor. Jakarta (ID): Balai Pengkajian teknologi Pertanian (BPTP).

Sumarni N, Rosliani R, Suwandi S. 2012. Optimasi jarak tanam dan dosis pupuk NPK untuk produksi bawang Merah dari benih umbi mini di dataran tinggi. J Hortik. 22(2):147–154. https://doi.org/10.21082/jhort.v22n2.2012.p148-155.

Supriadi S, Yetti H, Yoseva S. 2017. The influence of giving organic manure and N, P and K manure on the growth and production plant of onion (*Allium ascolanicum* L.). JOM Faperta. 4(1):1–12.

Tenaya IMN. 2015. Pengaruh interaksi dan nilai interaksi pada percobaan faktorial (review). Agrotrop. 5(1):9–20.

Thoriqussalam A, Damanhuri D. 2019. Effect of seedbed media composition to the growth and production onion from seed (True Shallot Seed). J Produksi Tanam. 7(7):1314–1321.

Triana F, Kastam K, Pribadi T. 2022. Perbaikan karakter agronomi tanaman seledri (*Apium graveolens* L.) melalui aplikasi POC pada budidaya tanpa tanah. Pros Semin Nas Univ Pgri Palangka Raya. 1:74–85. https://doi.org/10.54683/puppr.v1i0.11.

Wibowo S. 2005. Budidaya bawang: Bawang putih, bawang merah, bawang bombay. Jakarta (ID): Penebar Swadaya.

Widiastutik Y, Rianto H, Historiawati H. 2018. Pengaruh komposisi dosis pupuk urea, Sp-36, KCL dan pupuk organik cair nasa terhadap hasil tanaman bawang merah (*Allium cepa fa. ascalonicum* L.). Vigor J Ilmu Pertan Trop Subtrop. 3(2):61–65.