Potential of The Biological Agent *Bacillus* sp. in Inhibiting Moler Disease and its Effects on The Growth and Production of Shallot (*Allium ascalonicum* L.)

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Abstract

Shallot (Allium ascalonicum L.) is one of the important commodities in Indonesia. The main obstacle that is often faced is moler disease caused by Fusarium sp., Bacillus sp. bacteria have the potential to control Fusarium sp. The purpose of study was to determine the ability of Bacillus sp. in controlling moler disease and its effect on the growth and production of onion plants. The study used a factorial completely randomized design with three replications and nine treatments, so there were 27 experimental units. The observation variables included incubation period, disease intensity, plant height, number of leaves, and tuber wet weight. The research data were analyzed using the ANOVA analysis of variance procedure to determine whether there was an effect of each treatment. If it is known that there is a significantly different effect from the treatment, it will be continued with the DMRT test at the 5 % level. The results showed that the combination of Bacillus sp. isolate bcz 16 and dosage 35 ml/polybag was the longest delaying the incubation period of 15 day and could suppress moler disease by 50 %. The treatment of Bacillus sp. isolate bcz 16 and dosage 35 ml also gave the highest results in plant length, number of leaves, and wet weight of shallot bulbs

Keywords: *Bacillus sp.; Dosage; Growth and Production; Moler Disease; Shallot*

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INTRODUCTION

Shallot (*Allium ascalonicum* L.) is one of important commodities in Indonesia. The increase in onion production continud occur from 2017 to 2021 at 2,004,590 tons, then decreasd in 2022 at 1,982,360 tons (BPS-Statistic Indonesia, 2023). One of the obstacles that often occurs in the process of cultivating shallot plants is the presence of pathogen attacks. One of the important diseases in shallot plants is moler disease caused by the fungus *Fusarium* sp. (Juwanda *et al*., 2016). Symptoms of moler disease are that the leaves grow twisted, withered, and pale (Agustin *et al*., 2023).

Moler disease caused by *Fusarium* sp. is an important disease and very detrimental to shallot farmers in Indonesia (Saputra et al., 2024). Shallot plants attacked by *Fusarium* sp. caused 10-15% of seedlings to be unable to grow completely, the shoots that grow chlorosis and fall to the ground the rot (Emeliawati *et al*., 2022). These problems result in decrease in the quality and quantity of shallot production which causes losses to farmers.

One of the biological agents can be used to suppress moler disease is *Bacillus* sp. According to Pratiwi et al., (2024); Flori et al., (2020) *Bacillus* sp. have the potential to be utilized as plant disease control agents. In addition to having the ability to suppress disease incidence, these biological agents are reported to also have the ability to spur plant growh and increase shallot production in single applications or in combination with others (Kamidi et al., 2022).

Bacillus sp. used are the three best isolates from *in vitro* test inhibition against *Fusarium* sp. on chili plants, namely isolates bcz 14, 16, and 20 from the results of previous research conducted by Wuryandari et al., (2022). *Bacillus* sp. showed its inhibitory power against *Fusarium* sp. from the beginning of growth and increasingly clear inhibition on day 7. The results of Wuryandari et al., (2022) stated that *Bacillus* sp. isolate bcz 14 has the ability to inhibit the growth of *Fusarium* sp. on chili plants with an inhibition zone diameter of 64 mm, isolate bcz 16 has an inhibition zone diameter of 63.67 mm, and isolate bcz 20 has an inhibition zone diameter of 65.33 mm.

This study aims to determine the potential of several *Bacillus* sp. namely isolates bcz 14, 16, and 20 in inhibiting moler disease in shallot plants caused by the fungus *Fusarium* sp. Based o the description above, this study will be conducted using different isolates of *Bacillus* sp. and different application doses in *in vivo* tests used the control moler disease in shallot plants.

METHOD

This research was conducted from July to November 2024 at the plant health laboratory and screen house of the Faculty of Agriculture, UPN "Veteran" East Java. The tools and materials used were bacteria *Bacillus* sp. isolate code bcz 14, 16, and 20 collection of Dr. Ir. Yenny Wuryandari MP., then the pathogenic fungus *Fusarium* sp. came from the collection of Plant Health Laboratory Agrotechnology UPN "Veteran" East Java. The materials used in the study were *Bacillus* sp. isolate code bcz 14, 16, and 20 collection of Dr. Ir. Yenny Wuryandari MP., isolate of pathogen *Fusarium* sp. isolation results, shallot (*Allium ascalonicum* L.) seedlings of tajuk varieties from Nganjuk, soil, compost, water. The tools used in the research were hoes, shovels, label boards, analytical scales, meters, cameras, stationery.

Trial Design

This study used a factorial complete randomized design with two factors, the first factor was *Bacillus* sp. isolate code bcz 14 (B1), bcz 16 (B2), and bcz 20 (B3). The second factor is the dose, namely the dose of *Bacillus* sp. 15 ml/polybag (D1), the dose of *Bacillus* sp. 25 ml/polybag (D2), and *Bacillus* sp. 35 ml/polybag (D3). There were 9 treatments and repeated 3 times, the control used was a negative control using only *Fusarium* sp. then there were a total of 27 experimental units and arranged using a Completely Randomized Factorial Design. The research data were analyzed using ANOVA variance to determine whether there was an effect of each treatment. If it is known that there is a significantly different effect, it will be done with the DMRT (Duncan's Multiple Range Test) at the 5 % level.

Research Implementation

The population of *Bacillus* sp. bacteria used was 10^8 CFU/ml. the density of *Fusarium* sp. fungus used was 10^6 spores/ml. Both isolates were applied together 7 days before onion planting. This is done so that biological agents can adjust to the environment and colonize. The planting media used for in vivo testing were soil and compost. The ratio used between soil and compost used is 1: 1.

Treatment and Maintenance

Watering is done regularly every day except when it rains. Watering is done once a day in the morning more or less 300 ml/polybag. Pest control is carried out technically and observed every day by killing pests manually using hands on plants that are attacked by pests.

Observation Variable

Inhibition of *Bacillus* sp. against moler disease is done by calculating the incubation period and intensity of moler disease attack. The incubation period of moler disease caused by *Fusarium* sp. was observed starting from the planting of shallot plants until the first symptoms of moler disease appeared on shallot plants. Observation of disease intensity was carried out by observing the development of moler symptoms once every 1 week for 7 observations. Disease intensity was calculated using the formula used in research according to Ramadhan et al., (2023):

$$I = \frac{\sum(\mathrm{n \, x \, v})}{\mathrm{Z \, x \, N}} \, x \; 100\%$$

Description:
I = Disease intensity (%)
n = Number of leaves in each attack category
v = Scale value of each attack category
Z = Scale value of the highest attack category
N = Number of leaves observed

The calculation of the intensity of moler disease in red onion plants uses the scoring used in research according to Hekmawati et al., (2018), namely:
0 = no syptoms of attack,
1 = 0 < X ≤ 20% of leaves are infested,
2 = 20 < X ≤ 40% of leaves are infested,
3 = 40 < X ≤ 60% of leaves are infested,
4 = 60 < X ≤ 80% of leaves are infested,
5 = 80 < X ≤ 100% of leaves are infested.

Plant growth and production observation parameters included plant length, number of leaves, and tuber wet weight. Observations of plant length and number of leaves were made when the plants were 7 Days After Transplanting (DAT), 14 DAT, 21 DAT, 38 DAT, 45 DAT, 59 DAT, and 66 DAT. Measurement of plant length was carried out using a meter by measuring the length of the plant from the ground surface to the highest part of the plant. Observation of the number of leaves is done by counting the leaves that grow in each clump. Observations of the wet weight of tubers were made at harvest time, namely when the plants were 75 DAT and were carried out by weighing the tubers per clump using analytical scales.

RESULT AND DISCUSSION

Incubation Period

Incubation period observation is carried out to see the time required for the pathogen to produce symptoms on the plant. Observations were made from the beginning of onion planting until the first symptoms of moler disease appeared on each onion plant. Symptoms of moler disease that occur are wilted plants, pale, plants do not grow upright, and leaves dry out. If the plant experiences further infection, it will cause symptoms of rotting bulbs, the plant dries completely, making the plant die and be easily uprooted (Figure 1.). This is in accordance with the opinion of Prakoso et al., (2016) which states that the visual symptoms of moler disease on the leaves do not grow upright but twisted, pale green or yellowish leaf color and slightly withered.

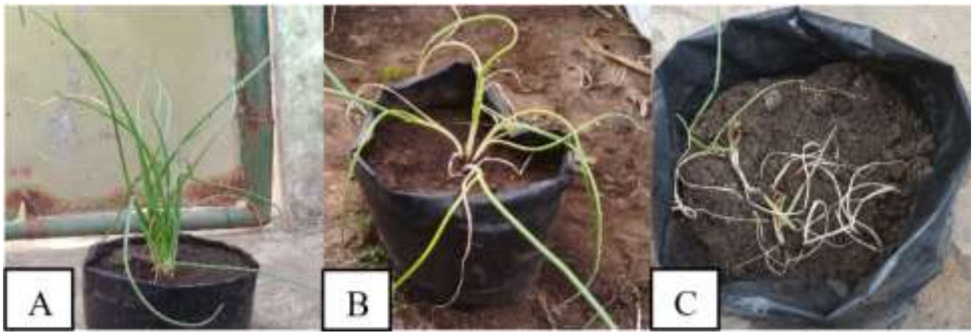

Figure 1. Symptoms of Moler Disease A) Healty plants; B) Plants wilt, turn pale, and do not grow upright; C) Plants die

Based on the results of the analysis of variance, the treatment of biological agents from the three *Bacillus* sp. isolates and dosing had a significant effect on the incubation period of moler disease. All treatment combinations of *Bacillus* sp. bacteria and doses gave a significant effect on the control (only *Fusarium* sp.) (Table 1.). This indicates that *Bacillus* sp. isolates bcz 14, 16, and 20 can delay the incubation period. The treatment that took the longest to show symptoms of moler disease was isolate bcz 16 at a dose of 35 ml/polybag or code B2D3 which showed symptoms of moler disease when the plants were 21 HST and could delay symptoms for 15 days compared to the control treatment. While the fastest treatment to show moler disease was shown by the treatment of isolate bcz 14 at a dose of 15 ml/polybag or code B1D1 with a delay in the incubation period of 6 days.

According to Wijayanti et al., (2019) *Bacillus* sp. bacteria have a mechanism to induce plants by increasing levels of peroxidase, salicylic acid, and phenol. The mechanism in inducing plant defense is carried out by colonizing plant tissue so that plants will be stimulated to increase plant defense. *Bacillus* sp. also acts as a fungistatic. According to Flori et al., (2020) stated that the ability of *Bacillus* sp. bacteria as antagonistic agents releases several compounds such as bacillin, basitrasin, bacillomycin, difficidin, oxidificidin, lechithinase, subtilisin, and fengycin in inhibiting the growth of pathogenic fungi.

Table 1. Incubation period of Moler disease

Treatment	Average Incubation Period (DAT)
B_0D_0	6.17a
B_1D_1	12.44b
B_1D_2	14.28bc
B_1D_3	16.50d
B_2D_1	14.28bc
B_2D_2	17.67de
B_2D_3	20.78f
B_3D_1	13.39bc
B_3D_2	14.55c
B_3D_3	18.52e

Description: The same letter in the same column indicates not significantly the different in 5% DMRT test.

The treatment of isolate bcz 16 with a dose of 35 ml or code B2D3 gave the longest results in showing symptoms of moler disease, namely when the plants were 21 DAT. The treatment of B2D3 caused a 15 day delay in the incubation period compared to the control treatmen. The treatment was the highest treatmen in delaying the incubation period. This is thought to because the isolate produces more or stronger inhibitory compounds than isolates bcz 14 and 20. According to Zakqy et al., (2024) the highest incubation period treatment is thought to be because *Bacillus* sp. isolates produce more inhibitory compounds. In addition, it is in line with *in vitro* tests that show *Bacillus* sp. isolate bcz 16 to be the best treatment in inhibiting the growth of *Fusarium* sp. the cause of moler disease in onion plants.

The lowest treatment was shown by the treatment of isolate bcz 14 isolate with dose 15 ml or code B1D1 with 6 day incubation period delay. The treatment of B1D1 showed the lowest incubation period delay, possibly the bcz 14 isolate produced fewer inhibitory compounds than the treatment of bcz 16 and 20. Referring to the research of Zakqy et al., (2024) which said that perhaps the bcz 14 isolate showed the lowest incubation period perhaps because it produced fewer inhibitory compounds than bcz 16 and 20 isolates in controlling fusarium wilt in chili plants.

The delay in the incubation period occurs because there may be competition between *Bacillus* sp. and *Fusarium* sp. isolates through the mechanism of nutrient competition. Nutrient competition can occur when the two isolates meet at the same place and time, resulting in competition for nutrients. The results of research by Saputra et al., (2015) showed that *Bacillus* sp. has a mechanism in the form of space and nutrient competition that occurs in inhibiting *Ralstonia solanacearum* on tomato plants. In addition to the nutrient competition mechanism, according to Lestari et al., (2021) *Bacillus* sp. secretes antibiosis to inhibit fungal growth and is able to secrete toxic enzymes that can destroy fungi (fungicides). *Bacillus* sp. bacteria also act as fungistatic. According to Flori et al., (2020) stated that the ability of *Bacillus* sp. bacteria as antagonistic agents releases several compounds such as bacillin, basitrasin, bacillomycin, difficidin, oxidificidin, lechithinase, subtilisin, and fengycin in inhibiting the growth of pathogenic fungi.

Bacillus sp. bacteria also have antibiotics that can suppress pathogen growth and can induce plant defenses. According to Wijayanti et al., (2019) *Bacillus* sp. bacteria have a mechanism of inducing plants by increasing levels of peroxidase, salicylic acid, and phenol. The mechanism in inducing plant defense is carried out by colonizing plant tissue so that plants will be stimulated to increase plant defenses.

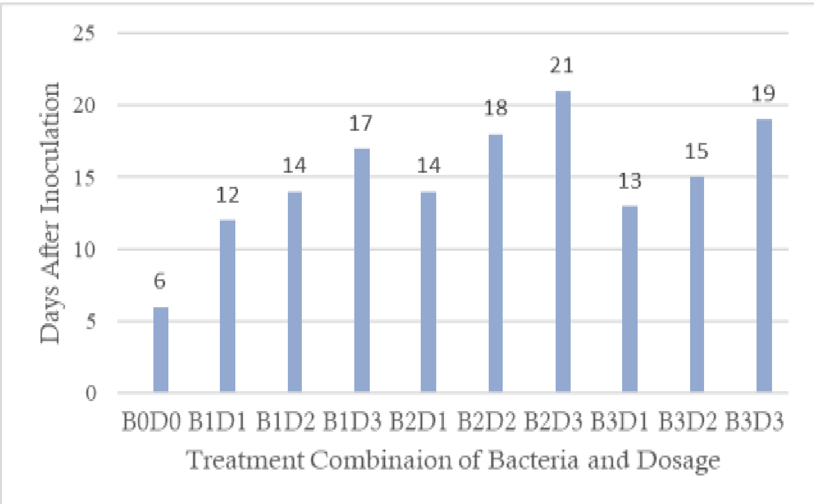

Figure 2. Incubation Period of *Fusarium* sp. in some treatments

Disease Intensity

The results of the analysis of variance showed that the treatment combination between *Bacillus* sp. bacteria and dosage had a significant effect in inhibiting moler disease in shallot plants. Observations were made once a week for seven observations. According to Bakti et al., (2022) moler disease or fusarium wilt is characterized by plants withering quickly, the roots become rotten, the plant droops like it will collapse.

Table 2. Intensity of Moler Disease in Onion Plants

Treatment	Week After Transplanting (%)						
	1	2	3	4	5	6	7
B0D0	17.78b	22.22b	40.00d	62.22f	82.22f	83.33d	87.78d
B1D1	00.00a	3.33a	21.11c	36.67e	53.33e	54.44c	55.56c
B1D2	00.00a	1.11a	14.44bc	32.22cde	51.11de	52.22c	53.33c
B1D3	00.00a	00.00a	6.67a	27.78bcd	40.00abc	41.11ab	46.67bc
B2D1	00.00a	1.11a	15.56bc	30.00bcde	45.56bcde	46.67bc	50.00c
B2D2	00.00a	00.00a	4.44a	24.44abc	43.33bcd	44.44abc	46.67bc
B2D3	00.00a	00.00a	2.22a	18.89a	33.33a	34.43a	37.78a
B3D1	00.00a	2.22a	17.78c	33.33de	50.00de	50.00bc	53.33c
B3D2	00.00a	00.00a	8.89ab	25.55abcd	48.89cde	50.00bc	50.00c
B3D3	00.00a	00.00a	3.33a	22.22ab	37.78ab	40.00ab	41.13ab

Description: The same letter in the same column indicates not significantly the different in 5% DMRT test

Disease intensity in the first week showed significantly different results compared to the control. Where the control treatment has an intensity of 17.78 % while in all treatments no symptoms have appeared, so the intensity of the disease has not been seen. In the second week of observation, the combination treatment of B1D3, B2D2, B2D3, B3D2 and B3D3 still had no visible symptoms, so the disease intensity was still not visible and began to appear in the third observation. In the seventh week of observation, it can be seen that the$_{B2D3}$ combination treatment has the smallest attack intensity of 37.78 %. The intensity of the control was 87.78 %, while the B2D3 treatment had an intensity of 37.78 %, which means that the B2D3 treatment was able to suppress the moler disease by 50 % compared to the control and other treatments.

The application treatment of *Bacillus* sp. isolate bcz 16 at a dose of 35 ml/polybag is the treatment that is most able to suppress the intensity of moler disease characterized by the lowest intensity compared to other treatments. Research by Wuryandari et al., (2022) stated that the results of measuring the diameter of the inhibition zone of *Bacillus* sp. isolate bcz 16 was 63.37 mm and included the best isolate compared to 15 other *Bacillus* sp. isolates in suppressing the development of *Fusarium* sp. fungi on chili plants. When given in the field, isolate bcz 16 is also the most able to suppress the intensity of moler attack so that it gets the best results compared to isolates bcz 14 and 20.

The dose of bacteria also affects the intensity of moler disease attack on onion plants. Observations of attack intensity showed that each isolate of *Bacillus* sp. bcz 14, 16, 20 with a dose of 35 ml/polybag had a lower intensity compared to isolates bcz 14, 16, 20 with doses of 15 and 25 ml/polybag. According to Benny et al., (2013) stated that the higher the dose of *Bacillus* sp. the higher the number of bacterial cells so that the number of abiotic control of white root fungal pathogens in rubber plants increases according to the increase in the dose of bacteria. Giving a dose of 35 ml/polybag of *Bacillus* sp. is the best treatment in inhibiting moler disease in onion plants. The low intensity of moler attack will affect the growth of shallot plants.

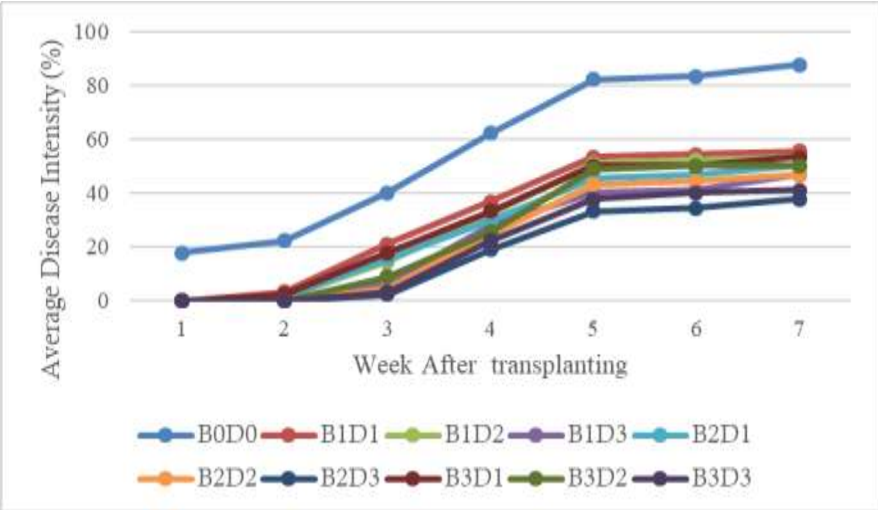

Figure 3. Graph of disease intensity

The high disease intensity in the control treatment was due to the absence of *Bacillus* sp. as a biological agent. The results also prove that the application of *Bacillus* sp. is very influential in suppressing moler disease in shallot plants. The 7 day application of *Bacillus* sp. is one of the factors that onion plants can survive the attack of moler disease. This is probably because *Bacillus* sp. can adjust the environment and colonize so that it is ready to suppress moler disease in onion plants. In accordance with the opinion of Syam et al., (2013) which says that the application of biological agents carried out 7 days before planting is more effective because biological agents can adapt to the environment and colonize.

Plant Length (cm)

The results of variance showed that the treatment of *Bacillus* sp. and dosing affected the length of shallot plants. The observation results showed that from day to day the length of the plant increased. It is known that the treatment of the three isolates of *Bacillus* sp. namely bcz 14, 16, and 20 and the doses tested were able to increase the length of onion plants (Table 3).

The control treatment had lower plant growth results than the *Bacillus* sp. treatment with dosage. This is because the control treatment did not use the addition of *Bacillus* sp. which in addition to acting as a biological agent also acts as *Plant Growth Promoting Rhizobacteria* (PGPR). According to Indrarosa (2021) *Bacillus* sp. can produce the hormone auxin so that it is known as PGPR and can provide or dissolve nutrients to be absorbed by plant roots. The hormone auxin plays a role in plant growth which is found with increased quality and yield.

Table 3. Plant Length of Shallot Plants

Treatment	Plant Length (cm)						
	7 DAT	**14 DAT**	**21 DAT**	**38 DAT**	**45 DAT**	**59 DAT**	**66 DAT**
B0D0	7.77 a	8.78a	11.11a	12.83a	15.33a	16.39a	19.28a
B1D1	14.45b	17.61b	21.11b	27.33bc	30.02b	30.06b	32.28b
B1D2	15.61b	19.33bcd	21.78b	28.22bc	31.61b	32.81bcd	33.39bc
B1D3	15.06b	18.61bc	20.22b	25.61b	29.01b	32.34bcd	37.11bc
B2D1	14.67b	20.00bcd	22.89b	28.33bc	32.03b	33.49cd	36.17bc
B2D2	17.50b	20.94cd	23.56b	29.83bc	31.61b	33.72cd	36.44bc
B2D3	17.22b	21.67d	24.11b	30.28c	33.00b	35.34d	39.11c
B3D1	16.67b	20.78cd	23.27b	28.72bc	30.28b	31.94bc	33.28bc
B3D2	15.39b	19.44bcd	21.28b	27.50bc	29.00b	33.05cd	35.11bc
B3D3	15.56b	19.11bcd	22.44b	27.50bc	30.28b	33.28cd	37.22bc

Description: The same letter in the same column indicates not significantly the different in 5% DMRT test

The results showed that all treatments of the combination of *Bacillus* sp. bacteria with doses increased plant growth in the vegetative phase, especially in plant length parameters compared to the control treatment. The combination treatment of *Bacillus* sp. bacteria and dosage showed a better increase in plant height compared to the control treatment. In the last observation, treatment B2D3 isolate bcz 16 with a dose of 35 ml/polybag produced the best plant length compared to other treatments. This is because the treatment of *Bacillus* sp. isolate bcz 16 with a dose produces the lowest intensity compared to other treatments. The results of research by Zakqy et al., (2024) stated that the lower the intensity of fusarium wilt attack on chili plants, the better the plant growth. Giving *Bacillus* sp. isolate bcz 14 at a dose of 15 ml/plant showed the lowest plant length results because it had the greatest intensity of moler disease attack, so it could inhibit the growth of shallot plants.

Each isolate with a combination of 35 ml/polybag has the highest results of each isolate. The higher the dose given shows the growth of plant length with high numbers. This is in accordance with the research of Nugraheni et al., (2022) that the higher the dose of *Bacillus megaterium* given gives the best results for the variables of plant height, number of leaves, fresh weight, and dry weight in cayenne pepper plants.

Number of Leaves

The number of leaves parameter is used to assess plant development based on an increase or decrease in the number of leaves. The results of the analysis of variance showed that the highest value of the number of leaves per clump was 66 HST plants in the B2D3 treatment, namely bcz 16 isolate at a dose of 35 ml/polybag at 37 leaves. While the lowest value of the number of leaves compared to the control was the B1D1 treatment, namely isolate bcz 14 at a dose of 15 ml/polybag at 27 leaves. All treatments had a significant effect with the control treatment.

Table 4. Average Number of Leaves

Treatment	Number of Leaves						
	7 DAT	14 DAT	21 DAT	38 DAT	45 DAT	59 DAT	66 DAT
B0D0	4a	7a	8a	12a	14a	14a	18a
B1D1	5ab	8ab	10ab	21b	25bc	26b	27b
B1D2	5ab	9bc	11ab	21b	26bc	28b	29b
B1D3	5ab	8ab	10ab	21b	26bc	26b	30b
B2D1	6bc	10bc	12b	24b	30bc	32b	34b
B2D2	7c	11c	12b	24b	28bc	32b	36b
B2D3	6bc	11c	13b	25b	32c	32b	37b
B3D1	6bc	10bc	12b	23b	27bc	31b	30b
B3D2	6bc	10bc	11b	21b	25bc	31b	32b
B3D3	6bc	11c	11b	21b	23b	28b	33b

Description: The same letter in the same column indicates not significantly the different in 5% DMRT test

The results showed that every observation that has been done, the number of leaves has increased both the combination treatment of *Bacillus* sp. and the control. A good increase in leaves will result in efficient photosynthesis in plants. This is because the leaves themselves are where the processes of photosynthesis, respiration, and transpiration occur. So that it will affect the direction of plant growth and development. From the results of the study, the number of leaves will affect the number of tillers in shallot bulbs. The number of tillers will also affect the wet weight of shallot plants.

The addition of the dose is also a factor in increasing the number of plant leaves. According to Suryatmana et al., (2024) stated that the addition of doses of *Bacillus* sp. and *Azotobacter* will spur the growth of soybean plants to be better. This is because the more doses given, the more colonies of *Bacillus* sp. and will stimulate plant growth. Isolates bcz 14, 16, and 20 with a dose of 35 ml/polybag produced a better number of leaves compared to the dose of 15 ml/polybag and 25 ml polybag. This also shows that the additional dose of *Bacillus* sp. on shallot plants affects plant growth because *Bacillus* sp. is also a PGPR bacterium. The increase in the number of leaves will have an impact on photosynthetic activity which will also increase.

Wet Weight of Bulbs

The results of variance showed that the treatment of a combination of *Bacillus* sp. bacteria and the addition of doses had a significant effect on the total wet weight of shallot bulbs. The treatment of *Bacillus* sp. isolate bcz 16 with a dose of 35 ml/polybag still gives the best results of the wet weight parameter of shallot bulbs with an average bulb weight of 25.39 grams per clump. The treatment of *Bacillus* sp. isolate bcz 14 with a dose of 15 ml/polybag showed the smallest results with an average bulb weight of 12.43 grams (Table 5.).

Table 5. Average wet weight of bulbs per clump

Treatment	Average wet weight of bulbs per clump (gram)
B0D0	00.00a
B1D1	12.43b
B1D2	16.85bc
B1D3	18.28bc
B2D1	18.45bc
B2D2	20.80bc
B2D3	25.39bc
B3D1	14.95b
B3D2	18.05bc
B3D3	21.10bc

Description: The same letter in the same column indicates not significantly the different in 5% DMRT test.

The treatment of giving bcz 16 isolate at a dose of 35 ml/polybag is the highest treatment in the wet weight of shallot bulbs, presumably bcz 16 isolate has a greater inhibitory compound than bcz 14 and 20 isolates in inhibiting the pathogen *Fusarium* sp. the cause of moler disease in shallot plants, so that plant growth in the generative phase becomes more optimal. The low intensity of moler attack has a positive effect on the yield of shallot wet weight parameters. In accordance with the research of Zakqy et al., (2024) that isolates bcz 16, bcz 20, and bcz 14 are fungistatic and fungicidal, so as to suppress the development of plant pathogens and maximize plant growth.

The addition of the highest number of doses of each *Bacillus* sp. isolate is still the best treatment at 35 ml/polybag compared to the doses of 15 ml/polybag and 25 ml/polybag. The more doses given, the more colonies of *Bacillus* sp. and will stimulate plant growth. In accordance with the research of Nugraheni et al., (2022) that the application of *Bacillus megaterium* with the highest dose of 25 ml/plant gave the best results on the wet weight of chili plants. Wet weight results also show that the addition of *Bacillus* sp. dose affects the yield of onion plants.

The negative control treatment B0D0 from the results of the study did not have bulb results or could not be harvested. This is because the control treatment was attacked by the pathogen *Fusarium* sp. the cause of moler disease, causing inhibition of shallot plant growth, which eventually the plant did not experience bulb formation and could not be harvested. Severe moler attacks cause rotten bulbs, damaged roots and plant death. Shallot plants affected by moler disease generally attack the root and stem systems and inhibit the absorption of water and nutrients, slow growth, and make plants susceptible to death. According to Juwanda et al., (2016) symptoms of wilting in plants due to rotting roots and bulbs will cause shallot plants to experience metabolic disorders. Fadhilah *et al*., (2014) Sometimes the development of moler symptoms is followed by the occurrence of dwarf symptoms in plants.

CONCLUSION

The treatment of *Bacillus* sp. isolate bcz 16 with dose 35 ml/polybag was the greates in delaying the incubation period of 21 days and can suppress moler disease by 50 %. The treatment of *Bacillus* sp. isolate bcz 16 with dose 35 ml/polybag gave the highest results on plant height, number of leaves, and gave the highest results on tubers wet weight.

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