The International Conference on Education, Social, Sciences and Technology (ICESST)
Vol.2, No. 1 January-June 2023
e-ISSN: 2964-2671; p-ISSN: 2964-2701, Pages 01-14

RESPONSE OF ECO ENZYME AND RHIZOBIUM ISOLATION ON GROWTH AND PRODUCTION RED ONION (*Allium ascolonicum* L)

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Abstract. *Response of Eco Enzyme Administration and Rhizobium Isolation on the Growth and Production of Shallots (Allium ascolonicum L). This study aims to determine the effectiveness of eco enzyme administration and rhizobium isolation as well as the interaction of eco enzyme and rhizobium isolation on the growth and production of shallots (Allium ascolonicum L). This study used a factorial randomized block design (RBD) consisting of 2 factors, 16 treatments, and 3 blocks. The results showed that the effectiveness of eco enzyme administration and rhizobium isolation had an effect on the parameters of plant height (cm), number of leaves (strands), number of tubers per sample (tubers), wet tuber production per sample (g), wet tuber production per plot (g), dry tuber production per sample (g), dry tuber production per plot (g). The interaction between the effectiveness of eco enzyme administration and rhizobium isolation had no effect on plant height (cm), number of leaves (strands), number of tubers per sample (tubers), wet tuber production per sample (g), wet tuber production per plot (g), dry tuber production per sample (g), dry tuber production per plot (g).*

Keywords*: Shallot, Eco-Enzymes, Rhizobium Insulation*

I. INTRODUCTION

Red onion (Allium ascolonicum L) is one of the raw materials for high-quality vegetables which has long been cultivated intensively by farmers. Commodities here make a big contribution to the development of a region because they have high economic value. In addition to being a source of income and creating jobs, shallot entrepreneurs are spread throughout Indonesia (Simangunsong, et. al, 2017).

The shallot production of North Sumatra province in 2020 is 29,222 tons while the demand for shallots reaches 46,064 tons. Based on these data, red onion production in

Received on Febuary 7th, 2023; Revised on March 2nd, 2023; April 22nd, 2023
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North Sumatra is still far below demand. To meet the demand for shallots, they import shallots (Central Bureau of Statistics for North Sumatra, 2020)

It is better to increase the fertility and production of shallots, one way that can be done is to fertilize using organic fertilizers. The benefits of organic fertilizers are to improve soil structure which makes the soil loose and makes it easier for plant roots to absorb nutrients (Budianto, et.al, 2015)

Eco enzymes contain several functional enzymes such as amylase, lipase, caseinate, protease, and cellulase, as well as secondary metabolites such as flavonoids, quinones, alkaloid saponins, and cardio glycosides (Vama and Cherekar, 2020)

Efforts to increase shallot production to achieve self-sufficiency can be carried out by carrying out proper planting and utilizing rhizobium inoculations (Sri and Arief, 2017)

II. LITERATURE REVIEW

1. Onion Plant Botany

Shallot (*Allium ascalonicum* L.) is one of the important household vegetables which is used as a daily cooking spice. Another use of shallots is as a traditional medicine whose benefits have been felt by the general public. Likewise, the rapid development of the food processing industry has recently tended to increase domestic demand for shallots (Firmansyah and Sumarni, 2013).

2. Terms of Growing Red Onion Plants

Shallot plants can grow well at temperatures of 250C – 300C, full sun intensity 14 hours/day, rainfall 300 – 2500 mm/year, suitable for planting in the rainy season or dry season and bulbs will grow well at an altitude of 0 – 500 m above sea level. Onion plants grow in dry climates. This plant requires maximum sunlight exposure (minimum 70%), air temperature of 250C - 320C, with a relative humidity of 50-70%. The best altitude for growing shallots is below 800 m above sea level. t. In addition, protected areas can cause the formation of shallot bulbs to be not optimal (Tarigan, 2015).

3. Eco Enzymes

In line with the increasing human awareness of environmental damage and the emergence of various diseases caused by the excessive use of chemicals in food, agriculture has emerged as a choice for many people. Organic farming can be said to be a farming system in harmony with nature, restoring the ecological cycle in an agricultural area to form a cyclic and balanced flow (Rochyani and Dahliana, 2020).

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4. Rhizobium isolation

Slowly but surely organic farming systems are starting to develop in various parts of the world, both in developed and developing countries. Given the large role of rhizobium bacteria, the presence of these bacteria needs to be converted and isolated in the form of a culture collection. Bacterial culture collections assure that the bacteria that have been described are stored safely and properly so that they are available at any time for the needs of present and future generations (Mochammad, 2012).

III. RESEARCH METHOD(S)

This study used a factorial randomized block design (RBD). Consists of 2 factors, 16 treatments, 2 replications, so there are 32 treatment plots. The first factor is the provision of eco enzyme given the symbol "T" which consists of 4 levels of treatment namely;

T0 = 0 ml/liter of water/plot

T1 = 75 ml/liter of water/plot

T2 = 150 ml/liter of water/plot

T3 = 225 ml/liter of water/plot

The second factor is the provision of rhizobium isolation given the symbol "K" which consists of 4 levels of treatment namely;

S0 = 0 g/planting hole

S1 = 50 g/planting hole

S2 = 100 g/planting hole

S3 = 150 g/planting hole

IV. FINDINGS AND DUSCUSSION

1. Plant Height (cm)

The interaction of the effectiveness of eco enzyme administration and rhizobium isolation does not affect the height of onion plants aged 2, 3, 4, and 5 weeks after planting. The effectiveness of eco enzyme administration and rhizobium isolation against onion plant height aged 2, 3, 4, and 5 weeks after planting after statistical testing using the Duncan distance test can be seen in Table 1.

Table 1. Average Plant Height (cm) Shallots Effectiveness of Eco Enzyme (T) and Rhizobium Isolation (S) Age 2, 3, 4, and 5 Weeks After Planting

Treatment	Plant Height (cm)							
	2 MST		3 MST		4 MST		5 MST	
Eco Enzyme (T)								
T0 = 0 ml/liter of water/plot	17.5	aA	24.1	aA	29.8	aA	38.6	bA
T1 = 75 ml/liter of water/plot	20.1	aA	25.8	aA	32.2	aA	39.5	bA
T2 = 150 ml/liter of water/plot	20.1	aA	28.9	aA	33.6	aA	40.3	abA
T3 = 225 ml/liter of water/plot	20.8	aA	28.3	aA	37.4	aA	45.8	aA
Isolasi Rhizobium (S)								
S0 = 0 g/ planting pit	18.8	aA	23.5	aA	31.8	aA	38.7	bA
S1 = 50 g/ planting pit	19.1	aA	25.8	aA	32.4	aA	39.3	bA
S2 = 100 g/ planting pit	20.1	aA	28.8	aA	33.6	aA	39.8	bA
S3 = 150 g/ planting pit	20.4	aA	29.0	aA	35.1	aA	46.5	aA

Description: The numbers in the same column followed by unequal letters mean that they are significantly different at the 5% level (lowercase) and differ very noticeably at the 1% level (uppercase)

Table 1 can be explained the effectiveness of eco enzyme administration which has an effect on the height of onion plants aged 5 weeks after planting, where the highest plant height is found in the T3 treatment = 225 ml/liter of water/plot which is 45.8 cm which is not different from the treatment T2 = 150 ml/liter of water/plot which is 40.3 cm, but it is significantly different from the treatment T1 = 75 ml/liter of water/plot which is 39.5 cm and the treatment T0 = 0 ml/liter of water/plot which is 38.6 cm. T2 treatment = 150 ml/liter of water/plot which is 40.3 cm, with not real difference from T1 treatment = 75 ml/liter of water/plot which is 39.5 cm, and T0 treatment = 0 ml/liter of water/plot which is 38.6 cm. with T1 treatment = 75 ml/liter of water/plot i.e. 39.5 cm intangible difference from T0 treatment = 0 ml/liter of water/plot i.e. 38.6 cm

2. Number of Leaves (strands)

The response of eco enzyme administration and rhizobium isolation on the number of shallot leaves aged 2, 3, 4, and 5 weeks after planting after statistical tests were carried out using Duncan's distance test can be seen in Table 2.

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Table 2. Average Number of Leaves (strands) of Shallot Plants Response to Eco Enzime (T) and Rhizobium Isolation (S) Age 2, 3, 4, and 5 Weeks After Planting

Treatment	Number of Leaves (strands)							
	2 MST		3 MST		4 MST		5 MST	
Eco Enzyme (T)								
T0 = 0 ml/liter of water/plot	5.7	aA	11.4	aA	16.6	aA	19.0	bB
T1 = 75 ml/liter of water/plot	5.8	aA	12.1	aA	16.8	aA	23.3	abAB
T2 = 150 ml/liter of water/plot	5.9	aA	12.3	aA	17.3	aA	23.6	aA
T3 = 225 ml/liter of water/plot	6.5	aA	14.5	aA	17.9	aA	26.4	aA
Rhizobium Isolation (S)								
S0 = 0 g/planting hole	5.8	aA	11.8	aA	15.8	aA	20.3	bB
S1 = 50 g/plating hole	6.0	aA	12.7	aA	17.0	aA	21.3	bAB
S2 = 100 g/planting hole	6.0	aA	12.7	aA	17.8	aA	22.9	abAB
S3 = 150 g/planting hole	6.1	aA	13.0	aA	18.0	aA	27.8	aA

Note: Numbers in the same column followed by letters that are not the same mean significantly different at the 5% level (lowercase letters) and very significantly different at the 1% level (uppercase letters)

Table 2 can explain the response of eco enzyme giving effect on the number of shallot leaves aged 5 weeks after planting, where the highest number of plant leaves was found in treatment T3 = 225 ml/liter water/plot, namely 26.4 strands which was not significantly different from treatment T2 = 150 ml/liter water/plot, namely 23.6 strands, and treatment T1 = 75 ml/liter water/plot, namely 23.3 strands, but it was very significantly different from the treatment T0 = 0 ml/liter water/plot, namely 19.0 strands. Treatment T2 = 150 ml/liter water/plot, namely 23.6 strands, was not significantly different from treatment T1 = 75 ml/liter water/plot, namely 23.3 strands, but was very significantly different from treatment T0 = 0 ml/liter water/plot, namely 19.0 strands. Treatment T1 = 75 ml/liter water/plot, namely 23.3 strands, was not significantly different from treatment T0 = 0 ml/liter water/plot, namely 19.0 strands.

3. Number of Wet Bulbs Per Sample (tubers)

The response of eco enzyme administration and rhizobium isolation to the number of wet bulbs per shallot plant sample was tested using a statistical test using Duncan's distance test which can be seen in Table 3.

Table 3. Average Number of Wet Bulbs per Sample (Umb) of Shallot Plants in Response to Eco-Enzime (T) and Rhizobium Isolation (S)

Teratment	Number of Wet Bulbs per Sample (tubers)	
Eco Enzyme (T)		
T0 = 0 ml/liter of water/plot	4.3	bB
T1 = 75 ml/liter of water/plot	4.6	bB
T2 = 150 ml/liter of water/plot	4.9	bB
T3 = 225 ml/liter of water/plot	6.8	aA
Rhizobium Isolation (S)		
S0 = 0 g/planting hole	4.7	bA
S1 = 50 g/planting hole	4.7	bA
S2 = 100 g/planting hole	5.0	bA
S3 = 150 g/planting hole	6.3	aA

Note: Numbers in the same column followed by letters that are not the same mean significantly different at the 5% level (lowercase letters) and very significantly different at the 1% level (uppercase letters)

Table 3 can be explained that the response to eco enzyme administration had an effect on the number of wet bulbs per sample of shallot plants, where the highest number of wet tubers per plant sample was found in the T3 treatment = 225 ml/liter of water/plot, namely 6.8 bulbs which was very significantly different from the T2 treatment = 150 ml/liter of water/plot, namely 4.9 tubers, and the T1 treatment = 75 ml/liter of water/plot, namely 4.6 tubers, and the T0 treatment = 0 ml/liter of water/plot, namely 4.3 tubers. The T2 treatment = 150 ml/liter water/plot, namely 4.9 tubers, was not significantly different from the T1 treatment = 75 ml/liter water/plot, namely 4.6 tubers, and the T0 treatment = 0 ml/liter water/plot, namely 4.3 tubers. Treatment T1 = 75 ml/liter water/plot, namely 4.6 tubers, was not significantly different from treatment T0 = 0 ml/liter water/plot, namely 4.3 tubers.

4. Production of Wet Bulbs per Sample (g)

The response of eco enzyme administration and rhizobium isolation to wet bulb production per shallot plant sample was tested using Duncan's distance test, which can be seen in Table 4.

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Table 4. Average Production of Fresh Bulbs per Sample (g) of Shallot Plants in Response to Eco Enzime (T) and Rhizobium Isolation (S)

Treatment	Average Production of Fresh Bulbs per Sample (g)	
Eco Enzyme (T)		
T0 = 0 ml/liter of water/plot	34.17	bB
T1 = 75 ml/liter of water/plot	35.83	bB
T2 = 150 ml/liter of water/plot	35.83	bB
T3 = 225 ml/liter of water/plot	44.17	aA
Rhizobium Isolation (S)		
S0 = 0 g/planting hole	34.79	bB
S1 = 50 g/planting hole	35.42	bAB
S2 = 100 g/planting hole	36.25	bA
S3 = 150 g/planting hole	43.54	aA

Note: Numbers in the same column followed by letters that are not the same mean significantly different at the 5% level (lowercase letters) and very significantly different at the 1% level (uppercase letters)

Table 4 can be explained that the response to eco enzyme administration had an effect on wet bulb production per shallot plant sample, where the heaviest wet tuber production per plant sample was found in the T3 treatment = 225 ml/liter water/plot, namely 44.17 g which was very significantly different from the T2 treatment = 150 ml/liter of water/plot, namely 35.83 g, and the T1 treatment = 75 ml/liter of water/plot, namely 35.83 g, and the T0 treatment = 0 ml/liter of water/plot, which is 38.17 g. Treatment T2 = 150 ml/liter water/plot, namely 35.83 g, was not significantly different from treatment T1 = 75 ml/liter water/plot, namely 35.83 g, and treatment T0 = 0 ml/liter water/plot, namely 38.17 g. Treatment T1 = 75 ml/liter water/plot, namely 35.83 g, was not significantly different from treatment T0 = 0 ml/liter water/plot, namely 38.17 g.

5. Production of Wet Tuber per Plot (g)

The response of eco enzyme administration and rhizobium isolation to the production of wet tubers per shallot plant plot was carried out by statistical tests using Duncan's distance test which can be seen in Table 5.

Table 5. Average Production of Wet Tuber per Plot (g) of Shallot Plants Response to Eco Enzime (T) and Rhizobium Isolation (S)

Treatment	Production of Wet Tuber per Plot (g)	
Eco Enzyme (T)		
T0 = 0 ml/liter of water/plot	162.50	bB
T1 = 75 ml/liter of water/plot	170.00	bB
T2 = 150 ml/liter of water/plot	175.00	bAB
T3 = 225 ml/liter of water/plot	210.00	aA
Rhizobium Isolation (S)		
S0 = 0 g/planting hole	164.38	bB
S1 = 50 g/planting hole	171.25	bAB
S2 = 100 g/planting hole	177.50	bA
S3 = 150 g/planting hole	204.38	aA

Note: Numbers in the same column followed by letters that are not the same mean significantly different at the 5% level (lowercase letters) and very significantly different at the 1% level (uppercase letters)

Table 5 can explain the reponse of eco enzyme administration to influence the production of wet bulbs per shallot plant plot, where the heaviest production of wet bulbs per plant plot was found in treatment T3 = 225 ml/liter of water/plot, namely 210.00 g which was significantly different from treatment T2 = 150 ml/liter of water/plot is 175.00 g, but it is very significantly different with the T1 treatment = 75 ml/liter water/plot which is 170.00 g, and the T0 treatment = 0 ml/liter water/plot which is 162.50 g. Treatment T2 = 150 ml/liter water/plot, namely 175.00 g, was not significantly different from treatment T1 = 75 ml/liter water/plot, namely 170.00 g, and treatment T0 = 0 ml/liter water/plot, namely 162.50 g. Treatment T1 = 75 ml/liter water/plot, namely 170.00 g, was not significantly different from treatment T0 = 0 ml/liter water/plot, namely 162.50 g.

6. Production of Dried Tuber per Sample (g)

The response of eco enzyme administration and rhizobium isolation to dry tuber production per shallot plant sample was tested statistically using Duncan's distance test which can be seen in Table 6.

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Table 6. Average Dried Bulb Production per Sample (g) of Shallot Plants Response to Eco Enzime (T) and Rhizobium Isolation (S)

Treatment	Average Dried Bulb Production per Sample (g)	
Eco Enzyme (T)		
T0 = 0 ml/liter air/plot	5.88	bB
T1 = 75 ml/liter air/plot	6.08	bB
T2 = 150 ml/liter air/plot	6.13	bB
T3 = 225 ml/liter air/plot	8.38	aA
Isolasi Rhizobium (S)		
S0 = 0 g/lubang tanam	6.08	bB
S1 = 50 g/lubang tanam	6.21	bAB
S2 = 100 g/lubang tanam	6.21	bA
S3 = 150 g/lubang tanam	7.96	aA

Note: Numbers in the same column followed by letters that are not the same mean significantly different at the 5% level (lowercase letters) and very significantly different at the 1% level (uppercase letters)

Table 6 can be explained that the response to eco enzyme administration had an effect on dry tuber production per shallot plant sample, where the heaviest dry tuber production per plant sample was found in the T3 treatment = 225 ml/liter of water/plot, namely 8.38 g which was very significantly different from the T2 treatment = 150 ml/liter of water/plot which is 6.13 g, treatment T1 = 75 ml/liter water/plot which is 6.08 g, and treatment T0 = 0 ml/liter water/plot which is 5.88 g. Treatment T2 = 150 ml/liter water/plot, namely 6.13 g, was not significantly different from treatment T1 = 75 ml/liter water/plot, namely 6.08 g, and treatment T0 = 0 ml/liter water/plot, namely 5.88 g. Treatment T1 = 75 ml/liter water/plot, which is 6.08 g, is not significantly different from treatment T0 = 0 ml/liter water/plot, which is 5.88 g.

7. Dried Tuber Production per Plot (g)

The response of eco enzyme administration and rhizobium isolation to dry tuber production per shallot plant plot was carried out by statistical tests using Duncan's distance test which can be seen in Table 7

Table 7. Average Dried Bulb Production per Plot (g) of Shallot Plants Response to Eco Enzime (T) and Rhizobium Isolation (S)

Treatmen	Dried Bulb Production per Plot (g)	
Eco Enzyme (T)		
T0 = 0 ml/liter air/plot	37.25	bB
T1 = 75 ml/liter air/plot	37.25	bB
T2 = 150 ml/liter air/plot	38.25	bB
T3 = 225 ml/liter air/plot	52.25	aA
Isolasi Rhizobium (S)		
S0 = 0 g/lubang tanam	37.63	bB
S1 = 50 g/lubang tanam	38.50	bB
S2 = 100 g/lubang tanam	38.50	bB
S3 = 150 g/lubang tanam	50.38	aA

Note: Numbers in the same column followed by letters that are not the same mean significantly different at the 5% level (lowercase letters) and very significantly different at the 1% level (uppercase letters)

Table 7 can be explained that the response to eco enzyme administration had an effect on the production of dry bulbs per shallot plant plot, where the heaviest production of dry tubers per plant plot was found in the T3 treatment = 225 ml/liter of water/plot, namely 52.25 g which was very significantly different from the T2 treatment = 150 ml/liter of water/plot which is 38.25 g, treatment T1 = 75 ml/liter water/plot which is 37.25 g, and treatment T0 = 0 ml/liter water/plot which is 37.25 g. The T2 treatment = 150 ml/liter water/plot, which is 38.25 g, is not significantly different from the T1 treatment = 75 ml/liter water/plot, which is 37.25 g, and the T0 treatment = 0 ml/liter water/plot, which is 37.25 g. Treatment T1 = 75 ml/liter water/plot, namely 37.25 g, was not significantly different from treatment T0 = 0 ml/liter water/plot, namely 37.25 g

Interaction of Effectiveness of Eco Enzyme Administration and Rhizobium Isolation against Onion Plant Growth and Production (Allium ascolonicum L)

From the results of research and statistical tests, the interaction of the effectiveness of eco enzyme administration and rhizobium isolation does not influence the parameters of plant height (cm), the number of leaves (strands), number of tubers per sample (tubers),

e-ISSN: 2964-2671; p-ISSN: 2964-2701, Pages 47-60

production of wet tubers per sample (g), production of wet tubers per plot (g), production of dry tubers per sample (g), production of dry tubers per plot (g).

There is no interaction or relationship between the effectiveness of eco enzyme administration and rhizobium isolation due to the respective properties of the eco enzyme and rhizobium isolation, although each of them influences the growth and production of onion crops. Eco enzymes are to improve the environment that has been damaged due to the use of chemical fertilizers. While rhizobium insulation serves in fertilizing and loosening the soil. According to Steel and Torie (2013), if the interaction of one treatment with another has no real effect, it can be concluded that these factors act freely with each other.

V. CONCLUSION AND RECOMMENDATION

Conclusion

From the results of the research and data processing and discussion, it can be concluded:

The response of eco enzyme and rhizobium isolation administration influences the parameters of plant height (cm), number of leaves (strands), number of tubers per sample (tubers), wet tuber production per sample (g), wet tuber production per plot (g), dry tuber production per sample (g), dry tuber production per plot (g).

The interaction between the effectiveness of eco enzyme administration and rhizobium isolation had no effect on plant height (cm), number of leaves (strands), number of tubers per sample (tubers), wet tuber production per sample (g), wet tuber production per plot (g) , dry tuber production per sample (g), dry tuber production per plot (g).

Suggestion

In order to be able to do the same research in order to obtain optimum concentrations and doses for shallot cultivation. It can be suggested to use eco enzyme with a concentration of 225 ml/liter of water/plot, for rhizobium isolation at a dose of 150 g/planting hole.

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