Journal of Agriculture (JoA)
Volume: 4 | Number 02 | July 2025
E-ISSN: 2829-2421
https://doi.org/10.47709/joa.v4i02.6442

Effectiveness of Eco-Enzyme for Increasing Growth and Production of Shallot from Vegetative Seeds

Novisrayani Kesmayanti[*1], Ruli Joko Purwanto[2], Edy Romza[3], Ummi Kalsum[4], Widya Irmawati[5], Kartika Putri[6]

Faculty of Agriculture, IBA University
Mayor Ruslan Street, Palembang 30164, South Sumatra, Indonesia

Author Corresponding email:
noviekesmayanti@yahoo.co.id

Received: 2025-07-09
Accepted: 2025-07-20
Publication: 2025-07-23

Abstract
The fluctuating and decreasing production of shallots impacts the national stock. Its cultivation using high inorganic fertilizers requires high costs, reduces soil fertility, and affects long-term production. Efforts are needed to increase production at a lower cost, reduce the use of inorganic fertilizers, and be more environmentally friendly. One of them is using eco-enzymes that can be used as fertilizers, soil conditioners, and as a source of plant nutrients. This study aims to evaluate and analyze the effectiveness and potential of eco-enzymes to increase the growth and production of shallots, while reducing the amount of inorganic fertilizer. The study used a Randomized Block Design, four replications. There were three levels of treatment: P1 eco-enzyme; P2 eco-enzyme + N, P, K fertilizer 50%; P3 N, P, K fertilizer 100%. Each treatment consisted of 8 experimental units, for a total of 96, with a dose of N= 150 kg urea.ha-1, P= 200 kg SP-36.ha-1 and K= 150 kg KCl.ha-1. Eco-enzyme was given every week with a concentration of 1 ml.l-1; half was given by spraying the plants and half by watering the media. The results showed that eco-enzyme is effective and can potentially increase the growth and production of shallots and reduce the use of inorganic fertilizers N, P, and K by up to 50%. The eco-enzyme + 50% N, P, K fertilizer produced shallot with the highest number of leaves per bulb and clump, number of bulbs per clump, circumference of bulbs, weight per bulb, and weight of bulbs per clump.

Keywords— Complement, Eco-Enzyme, Shallot, Soil-Conditioner, Substitution

Introduction

Shallots (*Allium cepa* L.) are an agricultural commodity with relatively high economic value and are categorized as a national priority horticultural commodity. Shallot consumption is high, but Indonesian shallot production is unstable and tends to decline, which has a significant impact on national stocks and the adequacy of community needs and causes fluctuations in buying and selling prices.

National productivity of shallots is not enough, so there is often a shortage of supply during the off-season. National productivity in the last 10 years has been in the range of 8.5 to 10.5 $t.ha^{-1}$. This indicates that there has been stagnation in commodity production (Adiyoga, 2020). Constraints in shallot production are the availability of seeds, agro-ecosystems and planting media, pest and disease attacks, and suitability of the planting season (Fernando et al., 2020; I. Firmansyah et al., 2015; Soverda et al., 2023).

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 4 | Number 02 | July 2025
E-ISSN: 2829-2421
https://doi.org/10.47709/joa.v4i02.6442

Shallots can be propagated with vegetative seeds in the form of bulbs and with botanical seeds. The use of vegetative seeds or bulbs is more often done, due to the limited availability of botanical seeds (Adiyoga, 2020; Triyono et al., 2024). Shallot cultivation carried out by farmers uses high inorganic fertilizer inputs to obtain high yields (Firmansyah et al., 2015; Suwandi et al., 2015, 2017). The dose of inorganic fertilizer for shallot cultivation is 200-250 kg of SP-36 given 2-3 days before planting, and 150-200 kg of urea and 100-200 kg of KCl, given twice, half in 10-15 and half 30 days after planting (Hidayat & Sumarni, 2005). The use of high inorganic fertilizers causes land hardening, depletion of micronutrients and groundwater pollution which ultimately has an impact on land damage, decreased growth and long-term production, and increased production costs. Efforts must be made to reduce the impact (Firmansyah, 2015; Suwandi et al., 2015, 2017). One effort that can be reduce these negative impacts is with environmentally friendly cultivation techniques with cheaper and more affordable production costs, but still providing optimal results. It can be by utilizing organic, natural and biological fertilizers and materials.

In shallot cultivation, the addition of organic materials such as manure must be done, because shallots will grow and produce well on land that is sufficiently oxygenated, loose, has good drainage and does not store water. The organic materials used must have been decomposed so that they are of good quality to support plant growth and production, as well as land improvement. The quality of the organic materials provided can be improved by adding eco-enzymes. Eco-enzyme solutions have many benefits, one of which can be used in agriculture as a fertilizer and soil conditioner, as well as a source of nutrients for plants. The use of eco-enzymes also provides other benefits because they are environmentally friendly and reduce production costs.

Eco-enzyme is a multi-purpose natural liquid that is the result of fermentation of fruit or vegetable waste, brown sugar or molasses and water in a ratio of 3:1:10. Eco-enzyme has many benefits including for health, sanitation, agriculture, fisheries and water purification. In agriculture, the application of eco-enzyme can replace fertilization and pesticides. The ratio of dissolving eco-enzyme in water is 1 ml: 1,000 ml (Poompanvong, 2020; Yong, 2023). In agriculture, eco-enzyme can be used as organic fertilizer, herbicide and natural pesticide (Hemalatha & Visantini, 2020). Eco-enzymes can be used as a substitute for organic fertilizers to improve soil fertility. The use of eco-enzyme for agriculture has been relatively widely carried out with a variety of effects and results. The concentrations applied also vary. This study aims to evaluate and analyze the effectiveness of eco-enzymes to increase the growth and production of shallots from vegetative seeds, and reduce the use of inorganic fertilizers.

Literature Review

The use of eco-enzymes for agriculture has been relatively widely carried out with a variety of effects and results. The concentrations applied also vary. Research on shallots shows that plant height, total bulb weight per plant, bulb weight, and number of bulbs per plant with eco-enzyme applications at doses of 0.5 $ml.l^{-1}$, 0.75 $ml.l^{-1}$, 1 $ml.l^{-1}$, 1.25 $ml.l^{-1}$, 1.5 $ml.l^{-1}$, and 1.75 $ml.l^{-1}$ are relatively similar and not significantly different. But, at a dose of 1.75 ml.l-1, plants had the highest number of leaves and the longest roots that significantly different from all other doses (Novianto, 2022). Eco-enzyme treatment at concentrations of 3%, 2% and 1% produced shallot plants with higher height, number of leaves, number of tillers, wet bulb weight and dry bulb weight per plot compared to control plants without eco-enzyme, but there was no significant difference between each concentration (Lubis et al., 2022). Several other research results show that eco-enzymes increase the weight of shallot bulbs (Jaya et al., 2021). Eco-enzyme application to shallots affects plant height, leaf number, and dry bulb weight per plant (Zuliati et al, 2025). The planting media compositions that added with eco-enzyme significantly affected plant height, leaf number, bulb weight per clump, and bulbs numbers per clump of the Bima Brebes variety of shallots. The highest growth and yield responses were achieved with the mixed medium: soil, goat manure, rice husk charcoal, and eco-enzyme (Soverda et al., 2023). This is because the enzyme

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 4 | Number 02 | July 2025
E-ISSN: 2829-2421
https://doi.org/10.47709/joa.v4i02.6442

and microbial content in it can encourage the decomposition of organic materials so that it will increase the release of nutrients to be absorbed by plants.

Similar to its effects on shallots, the application of eco-enzymes to a number of other plants also had good effects and the effects vary at different concentrations. Some of these include: The application of eco-enzyme to soybean plants variety of Anjasmoro had a significant effect on plant height, number of primary branches, number of pods per plant, number of filled pods, weight of 100 seeds and production per hectare. The effect of eco-enzyme concentration of 20 $ml.l^{-1}$ was the highest and relatively the same as 25 $ml.l^{-1}$ compared to 10 $ml.l^{-1}$ and 15 $ml.l^{-1}$ (Soverda et al., 2023). The application of eco-enzyme to mustard greens (*Brassica juncea* L.) showed that the fresh weight of the crown and the wet weight of the shoots at an eco-enzyme concentration of 1.5 $ml.l^{-1}$ were higher than the concentrations of 1 $ml.l^{-1}$, 2 $ml.l^{-1}$, 2.5 $ml.l^{-1}$, 3 $ml.l^{-1}$ and 3.5 $ml.l^{-1}$ (Novianto & Bahri, 2023). The application of eco-enzyme to sweet corn showed that the growth and production response at a concentration of 1 $ml.l^{-1}$ was the highest compared to the control (0 $ml.l^{-1}$), 0.2 l^{-1}, 0.4 l^{-1}, 0.6 l^{-1} and 0.8 l^{-1} (Diyanti et al., 2023). Several research results show that eco-enzymes provide the best results in kale plants (Sidqi, 2022), increase the growth and yield of radish plants (Mandal & Verma, 2024). In the history of the manufacture of eco-enzymes, it is stated that eco-enzymes were first discovered by Dr. Rosukon Poompanvong who is the founder of the Organic Agriculture Association of Thailand as an effort to help local farmers obtain better yields (Megah Suswanto, et al, 2018). Germination of seeds applied with eco-enzymes germinates faster and plants are more resistant to pests and diseases (Vama & Cherekar, 2020).

Eco-enzymes also play a very important role as soil conditioners and fertilizers. Arid and barren soil and agricultural land can be improved in fertility with eco-enzymes so that they can be planted. The concentration of eco-enzymes that can be used is 1-10 ml.l-1 of water by watering and mixing it into the soil. The concentration of eco-enzymes of 1 ml.l-1 given periodically and continuously every week has had a good effect on plant growth and production (Poompanvong, 2020; Yong, 2023). Eco-enzymes can be used as a substitute for organic fertilizers to improve soil fertility. The content of enzymes and microorganisms helps decompose organic matter, increases the availability of plant nutrients and stimulates the growth of beneficial soil microorganisms, therefore the provision of eco-enzymes to the soil can be done to improve less fertile soil.

Research Method

The research was conducted at the Experimental Garden and Laboratory of Plant Physiology, Faculty of Agriculture, IBA University in Palembang. The research period was from October 2023 to January 2024.

Materials

The materials used are bulbs of shallot Bima variety, eco-enzyme, fertilizer: urea, SP-36 and KCl, top soil, chicken manure, rice husk charcoal, insecticide/nematicide with active ingredient carbofuran 3% and polybags. The tools used are 15 kg scales, measuring cups, liters of water, watering cans, analytical scales and hand sprayers.

Experimental Design and Research Procedures

The study used a Randomized Block Design with four replications. The treatments tested were three levels, namely P1 = eco-enzyme; P2 = eco-enzyme + 50% N, P, K fertilizer; P3 = 100% N, P, K fertilizer. Each treatment consisted of 8 experimental units, so there were 96 experimental units. The dose of N fertilizer = 150 kg $urea.ha^{-1}$, P fertilizer = 200 kg $SP\text{-}36.ha^{-1}$ and K fertilizer = 150 kg $KCl.ha^{-1}$. SP-36 fertilizer was given 3 days before planting. Urea and KCl fertilizers were given twice: half of the dose at 7 days after planting (dap) and half at 30 dap. Eco-enzyme

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 4 | Number 02 | July 2025
E-ISSN: 2829-2421
https://doi.org/10.47709/joa.v4i02.6442

was given every week with a concentration of 1 ml.l^{-1}. For each application, plants received 500 ml of eco-enzyme solution given by spraying using a hand sprayer and 500 ml through watering into the media. The provision of eco-enzymes to the media begins 7 days before planting.

The planting medium uses a mixture of topsoil, chicken manure and rice husk charcoal with a ratio based on volume (2:1:1). Before use, the media mixture is dried, sieved and stirred until evenly mixed to obtain a homogeneous medium. One week before use, the media is given eco-enzyme with a concentration of 1 ml.l-1 by spraying it evenly on the media. Then, the media is put into polybags, each polybag containing 10 kg of media. As a preventive and protective measure against soil pest attacks, before use the media is applied with Furadan 3G on the bottom layer and surface of the media.

Planting using vegetative seed or bulb planting material. The variety used is the small-sized Bima variety with a weight per bulb of 7-9 g. The bulbs used are 2-3 months old after harvest. Bulbs that are ready to plant are shredded, cutting the ends of the bulbs is only done when the shallot bulbs are ready to be planted. Each polybag is planted with one bulb. The purpose of cutting the bulbs is to break the dormancy period of the bulbs and accelerate shoot growth.

Observations of variables were carried out on plant height, harvest age, number of leaves per bulb and per clump, number of bulb per clump, bulb circumference, weight of each bulb, weight of bulb per clump. Data were analyzed using analysis of variance at 0.05. If there is a significant effect of treatment, further testing is carried out with the Honestly Significant Difference (HSD) test of 0.05.

Results and Discussion

The results of the analysis of variance showed that the treatments tested had a significant effect on the variables of plant height, number of leaves per bulb, number of leaves per clump, number of bulb per clump, bulb circumference, weight per bulb, bulb weight per clump, but had no significant effect on harvest age (Table 1).

Table 1. Results of analysis of variance for all variables

Variables	F-count
Plant height	140,22^{n}
Harvest age	0,13^{tn}
Number of leaves per bulb	24,35^{n}
Number of leaves per clump	36,00^{n}
Number of bulbs per clump	7,03^{n}
Bulb circumference	8,08 ^{n}
Bulb weight	24,65^{n}
Bulbs weight per clump	10,99^{n}
F-count 0,05	6,59

Note: n = significantly influential; tn = not significantly influential

Plant height and harvest age

Analysis of variance showed that the treatment was significantly influential on plant height, but not significantly influential on harvest age (Table 1). The average plant height with 100% N, P, K fertilizer (25.77 cm) was the highest and significantly different from the eco-enzyme + 50% N, P, K fertilizer treatment (8.94 cm), and the eco-enzyme treatment (14.53 cm). The harvest age of plants in all treatments was relatively the same and did not differ significantly, the range of harvest age was 65.00 - 65.25 days after planting (Table 2). The results of the study also showed that the agronomic appearance of plants given eco-enzyme treatment was firmer and more upright than plants not given eco-enzyme treatment.

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 4 | Number 02 | July 2025
E-ISSN: 2829-2421
https://doi.org/10.47709/joa.v4i02.6442

Table 2. Plant height (cm) and harvest age (dap) of shallot in the eco-enzyme and N, P, K fertilizer treatments

Treatment	Plant Height	Harvest Age
Eco-enzymes (P1)	14,53 b	65,00
Eco-enzyme + Fertilizer N,P,K 50% (P2)	8,94 a	65,00
Fertilizer N,P,K 100% (P3)	25,77 c	65,25
HSD 0,05	3,55	

Note: Numbers in the same column followed by the same letter are not significantly different in the 0.05 HSD test

Number of leaves per bulb and number of leaves per clump

The treatment was significantly influential on the number of leaves per bulb and per clump (Table 1). The average number of leaves per bulb in the eco-enzyme + 50% N,P,K fertilizer treatment (3.36 leaves) was the highest and was not significantly different with 100% N,P,K (2.96 leaves), but was significantly different from the eco-enzyme treatment (1.63 leaves). The average number of leaves per clump in the eco-enzyme + 50% N,P,K fertilizer treatment (22.83 leaves) was the highest and was not significantly different from the average number of leaves per clump in the 100% N,P,K fertilizer treatment (16.50 leaves), but was significantly different from the eco-enzyme treatment (6.25 leaves) (Table 3). The research also showed that the leaves of plants given eco-enzyme treatment were wider and straighter, did not droop, and had a shinier and brighter color than plants not given eco-enzyme.

Table 3. Number of leaves per bulb and number of leaves per clump (leaf blade) of shallot in the eco-enzyme and N, P, K fertilizer treatments.

Treatment	Number of Leaves per Bulb	Number of Leaves per Clump
Eco-enzymes (P1)	1,76 a	6,75 a
Eco-enzyme + Fertilizer N,P,K 50% (P2)	3,36 b	22,83 b
Fertilizer N,P,K 100% (P3)	2,96 b	16,50 b
HSD 0,05	0,83	6,62

Note: Numbers in the same column followed by the same letter are not significantly different in the 0.05 HSD test

Number of bulbs per clump and bulb circumference

Analysis of variance showed that the treatments given was significantly influent on the number of bulbs per clump and the circumference of the bulbs (Table 1). The average number of bulbs per clump in the eco-enzyme + 50% N,P,K fertilizer treatment (6.83 bulbs) was the largest, which was not significantly different from the 100% N,P,K fertilizer treatment (5.58 bulbs), but significantly different from the eco-enzyme treatment (3.93 bulbs). The average circumference of the shallot bulbs in the eco-enzyme + 50% N,P,K fertilizer treatment was the largest (10.76 cm) which was not significantly different from the 100% N,P,K fertilizer treatment (10.66 cm), but significantly different from the eco-enzyme treatment (6.76 cm) (Table 4).

Table 4. Number of bulbs per clump (bulb) and bulb circumference (cm) of shallot in the eco-enzyme and N, P, K fertilizer treatments.

Treatment	Number of Bulbs per Clump	Bulb Circumference
Eco-enzymes (P1)	3,92 a	6,76 a
Eco-enzyme + Fertilizer N,P,K 50% (P2)	6,83 b	10,76 b
Fertilizer N,P,K 100% (P3)	5,58 ab	10,66 b
HSD 0,05	2,26	3,28

Note: Numbers in the same column followed by the same letter are not significantly different in

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 4 | Number 02 | July 2025
E-ISSN: 2829-2421
https://doi.org/10.47709/joa.v4i02.6442

the 0.05 HSD test

Weight per bulb and weight of bulbs per clump

Analysis of variance showed that the treatments given was significantly influent on the weight per bulb and the weight of bulbs per clump (Table 1). The average data showed that the weight per bulb of shallots in the eco-enzyme + 50% N,P,K fertilizer treatment (13.67 g) was the highest, which was not significantly different from the 100% N,P,K fertilizer (12.83 g), but significantly different from the eco-enzyme treatment (6.43 g). The average weight of bulbs per clump of shallots in the eco-enzyme + 50% N,P,K fertilizer treatment (95.42 g) was the highest, which was not significantly different from the 100% N,P,K fertilizer (77.08 g), but significantly different from the eco-enzyme treatment (25.35 g) (Table 5).

Table 5. Weight per bulb and weight of bulbs per clump (g) of shallot in the eco-enzyme and N, P, K fertilizer treatment

Treatment	Weight per Bulb	Weight of Bulbs per Clump
Eco-enzymes (P1)	6,43 a	25,35 a
Eco-enzyme + Fertilizer N,P,K 50% (P2)	13,67 b	95,42 b
Fertilizer N,P,K 100% (P3)	12,83 b	77,08 b
HSD 0,05	3,91	53,70

Note: Numbers in the same column followed by the same letter are not significantly different in the 0.05 HSD test

The research data shows that eco-enzyme is effective and potential to increase the growth and production of shallots, as well as reduce the use of inorganic fertilizers in the cultivation of shallots from vegetative seeds. It can be seen in the treatment of eco-enzyme + 50% N, P, K, which produces plants with the highest number of leaves per bulb and per clump (Table 3), the highest number of bulbs per clump and the largest bulb circumference (Table 4), the highest weight per bulb and per clump (Table 5). Regarding its effectiveness in reducing the use of N,P,K fertilizers, the data also show that 50% reduction in N,P,K fertilizer accompanied by given of 1 $ml.l^{-1}$ eco-enzyme every week, produces shallot with higher growth and production that was not significantly different with 100% N,P,K. It is suspected that the provision of eco-enzyme every week on plants and watering the planting medium, which has a good effect on the media and promote nutrient release from inorganic fertilizers. Watering eco-enzyme into the media has a positive impact on the accumulation of eco-enzyme in the planting medium which is a mixture of top soil, chicken manure and rice husk charcoal. Providing eco-enzyme by spraying on plants has a direct effect on the plants and increases the amount of eco-enzyme accumulation in the media because the water droplets spray onto the media. This is because eco-enzymes act as soil conditioners, which contain enzymes and microorganisms can encourage the decomposition and release nutrients in the media which will increases soil fertility and nutrient availability for plants. In its function as a soil conditioner, eco-enzyme will also improve soil quality, increase biological activity and soil microorganisms and release nutrients in the soil so that they can be absorbed by plant roots.

The results of research by (Jaya et al., 2021) showed that the use of eco-enzymes provided the best results of plant height and bulb weight per clump of shallots compared to plants that were not given eco-enzymes. According to (Alfalah et al., 2024), the 10 $ml.plot^{-1}$ eco-enzyme treatment produced the tallest shallot plants with the most leaves. The 30 $ml.plot^{-1}$ eco-enzyme treatment resulted in the highest wet bulb weight per plant and per plot, as well as the highest bulb diameter. According to (Soverda et al., 2023), the use of eco-enzymes can improve the physical and biological properties of the soil. Eco-enzymes help improve soil structure to make it looser so that nutrients can be absorbed optimally by plant. (Narang et al., 2024) stated that the addition of eco-enzymes improves the nutritional quality and final yield of the resulting compost. The application of compost and eco-enzymes to green bean plants increases their growth and production.

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 4 | Number 02 | July 2025
E-ISSN: 2829-2421
https://doi.org/10.47709/joa.v4i02.6442

The physiological mechanisms of eco-enzymes in influencing plant growth and production are still being studied, but in this study, in addition to their positive effects on growth and production, the agronomic appearance of shallot applied by eco-enzymes was stronger, straighter, with less drooping leaves, shinier leaves, and wider and larger leaves compared to plants that did not given eco-enzymes. This is suspected to be related to the increased of plant cell turgor. Eco-enzymes contain beneficial microorganisms, organic acids, proteins, and mineral nutrients that can be utilized by plants for their metabolism and physiological processes such as photosynthesis and the synthesis of organic compounds.

Conclusion

Eco-enzyme is effective and potential to increase growth and yield of shallots from vegetative seeds, which can be seen in the variables of the number of leaves per bulb and per clump, the number of bulbs per clump, the circumference of the bulb, the weight per bulb and per clump, which are highest in the eco-enzyme + 50% N, P, K fertilizer treatment.

Eco-enzymes can reduce the use of N, P, and K up to 50%, which can be substituted by applying eco-enzymes through spraying on plants and watering the media. Eco-enzymes, when sprayed on the media, act as soil conditioners, improving soil quality, increasing biological activity and soil microorganisms, and releasing nutrients into the soil so they can be absorbed by plant roots.

References

Adiyoga, W. (2020). Significance and potential production of shallots in indonesia (Shallot production in indonesia: importance, economic and prospects). https://www.binatani.or.id/wp-content/uploads/2025/01/Signifikansi-dan-Potensi-Produksi-Bawang-Merah-di-Indonesia.pdf

Alfalah, M. P., Sulardi, & Siregar, M. (2024). Growth response and production of shallots (*Allium ascalonicum* L.) due to feeding chicken manure and eco enzyme fertilizer . *Jurnal Pertanian Agros*, *26*(1), 5238–5244. http://dx.doi.org/10.37159/jpa.v26i1.3973

Diyanti, A. R., Thesiwati, A. S., Ermawati, E., & Mahnia, S. P. (2023). Study of the influence of eco-enzim towards the growth and results of sweet corn (*Zea Mays* var. sacharata sturt). *Agrivet*, *29*(1), 39–46. Https://Doi.Org/10.31315/Agrivet.V29i1.9728

Fernando, R., Indrawati, A., & Azwana, A. (2020). Response of the growth, production and the percentage of attack of disease in onion plants that give 3 types of fruits skin compost and liquid organic fertilizer cabbage. *Jurnal Ilmiah Pertanian (Jiperta)*, *2*(1), 44–54. Https://Doi.Org/10.31289/Jiperta.V2i1.91

Firmansyah, I., Liferdi, Khaririyatun, N., & Yufdi, M. (2015). The growth and yield of shallots with organic fertilizers and biofertilizers application in alluvial soil. *J. Hort*, *25*(2), 133–141.

Hemalatha, M., & Visantini, P. (2020). Potential Use Of Eco-Enzyme For The Treatment Of Metal Based Effluent. *Iop Conference Series: Materials Science And Engineering*, *716*(1). Https://Doi.Org/10.1088/1757-899x/716/1/012016.

Hidayat, A., & Sumarni, N. (2005). Poluttans Pada Tanah Andasol Magelang Isolation And Identification Of Degradation Microbial Persistent Organic Poluttan On Soil Andosol. Magelang Seminar Nasional Xi Pendidikan Biologi Fkip Uns Biologi , Sains , Lingkungan , Dan Pembelajarannya _. In *Jurnal Biologi* (Vol. 1, Issue 2).

Jaya, E. R., Yohanes Parlindungan Situmeang, & Anak Agung Sagung Putri Risa Andriani. (2021). Effect Of Biochar From Urban Waste And Eco-Enzymes On Growth And Yield Of Shallots (Allium Ascalonicum, L). *Seas (Sustainable Environment Agricultural Science)*,

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

5(2), 105–113. Https://Doi.Org/10.22225/Seas.5.2.3871.105-113.

Lubis, N., Wasito, M., Marlina, L., Girsang, R., & Wahyudi, H. (2022). Response of giving ekoenzims and liquid organic fertilizer to the growth and production of shallots (*Allium ascalonicum* L.). *Agrium*, *25*(2), 107–115.

Mandal, S., & Verma, D. (2024). Effect Of Eco-Enzyme On Growth, Yield And Quality Characters Of Different Cultivars Of Radish (Raphanus Sativus L.). *Asian Journal Of Microbiology, Biotechnology & Environmental Sciences*, *26*(01), 01–07. Https://Doi.Org/10.53550/Ajmbes.2024.V26i01.001.

Megah Suswanto, Dewi Desi, W. E. (2018). 1. The utilization of household waste used for medicine and cleanliness. Jurnal Pkm Minda Baharu Vol. 2 No.1 (2018). *Minda Baharu*, *2*.

Narang, N., Hussain, A., & Madan, S. (2024). A Comparative Study On Compost Preparation Using Lab Prepared Eco-Enzyme And Its Effect On Growth Of Plant Species Phaseolus Vulgaris. *Environmental Science And Pollution Research*, *31*(25), 36230–36240. Https://Doi.Org/10.1007/S11356-023-27168-X.

Novianto, N. (2022). Response Of Liquid Organic Fertilizer Eco Enzyme (Ee) On Growth And Production Of Shallot (Allium Ascalonicum. L). *Jurnal Agronomi Tanaman Tropika (Juatika)*, *4*(1), 147–154. Https://Doi.Org/10.36378/Juatika.V4i1.1782.

Novianto, N., & Bahri, S. (2023). Respon Pertumbuhan Dan Produksi Tanaman Sawi (Brassica Juncea L) Terhadap Pemberian Pupuk Organik Cair Eco Enzim. *Jurnal Agrotek Tropika*, *10*(2), 1. Https://Doi.Org/10.23960/Jat.V11i1.5773.

Poompanvong, R. (2020). Eco-enzyme Making Learning. *Eco Enzyme Nusantara*, 1–62.

Sidqi, I. F. (2022). The Effect of Chicken Manure and Eco Enzyme on the Growth and Yield of Kailan (*Brassica Oleracea* var Alboglabra). *Muria Jurnal Agroteknologi (Mj-Agroteknologi)*, *1*(2), 13–21. Https://Doi.Org/10.24176/Mjagrotek.V1i2.9103.

Soverda, N., Jasminarni, J., Swari, E. I., & Sihombing, P. (2023).). Growth and yield of soybean plants given by concentrations of eco-enzymes *Jurnal Media Pertanian*, *8*(2), 169. Https://Doi.Org/10.33087/Jagro.V8i2.217.

Soverda, N., Swari, E.I. & Neliyati. (2023). The effect of planting media composition that added with eco-enzyme on the growth and yield of shallots (*Allium ascalonicum* L.). Jagro, Jurnal Media Pertanian, 8(1), 86-91. DOI 10.33087/jagro.v8i1.189

Suwandi, N., Sopha, G. A., Lukman, L., & Yufdy, M. P. (2017). Effectivities trial of national biofertilizers on growth and yield of shallot**.** *Jurnal Hortikultura*, *27*(1), 23. Https://Doi.Org/10.21082/Jhort.V27n1.2017.P23-34.

Suwandi, Sopha, G. A., & Yufdy, M. P. (2015). The Effectiveness Of Organic Fertilizer, Npk, And Biofertilizer Managements On Growth And Yields Of Shallots. *Hortikultura*, *25*(3), 208–221. Http://Ejurnal.Litbang.Pertanian.Go.Id/Index.Php/Jhort/Issue/View/662.

Triyono, K., Santosa, S. J., Asrori, A., & Mustofa, F. A. (2024). A study of npk fertilizer types and plant population on the growth and yield of shallots (*Allium ascalonicum*. L) from seed origin (true shallot seed). *Agrika*, *18*(1), 9–21. Https://Doi.Org/10.31328/Ja.V18i1.5146.

Vama, L., & Cherekar, M. N. (2020). Production, Extraction And Uses Of Eco-Enzyme Using Citrus Fruit Waste: Wealth From Waste. *J. Microbiol Biotech Env Sc*, *22*(2), 346–351.

Yong, T.Y. (2023). Eco Enzyme Saves The Earth. Enzyme Bakti Indonesia. 200 P.

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 4 | Number 02 | July 2025
E-ISSN: 2829-2421
https://doi.org/10.47709/joa.v4i02.6442

Zuliati Septriarini, Sitepu Cindy, Ismadi, Nasution Wahyu, Humaira Mira, Ramadhani Almuna, H. T. (2025). Agrotekma Application Of Eco-Enzyme And Biochar On The Growth And. *Jurnal Agroteknologi*, *9*(2), 52–60. Https://Doi.Org/10.31289/Agr.V9i2.13412

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License