

Research Article

Enhanced morpho agronomic appraisal of chili by the application of compost NPK and Eco-enzyme

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RTICLE INFO	ABSTRACT
Article History Received: 20 August 2025 Revised: 24 June 2026 Accepted: 30 June 2026 Keywords: <i>Regenerative Agriculture, pH, EC, Soil Penetration Resistance (SPR)</i>	Plant height correlates strongly with the number of leaves and fruit. Leaf number correlates strongly with fruit number and biomass dry weight. Soil pH correlates strongly with mycorrhizal colonization on chili roots. Soil Penetration resistance and EC correlates strongly with biomass dry weight. Fruit number correlates strongly with fruit weight and biomass dry weight, but negatively with soil EC. Fruit weight correlates strongly with biomass dry weight, but negatively with EC. Biomass dry weight correlates negatively with EC. Compost, NPK and eco-enzyme increase soil fertility of marginal soil and the yield of chili. The correlation between soil fertility and morpho agronomic parameters of chili plants can be a guideline for agronomic actions in chili cultivation.

Introduction

Global warming is impacting crop cultivation due to more frequent extreme climate events, disrupting planting and harvesting due to lack of rainfall (Nasrudin and Firmansyah, 2020; Surmaini et al., 2011). The impacts are more severe in unirrigated areas, such as a temperature increase reaching 37°C in Aceh in July 2024 (Anwar, 2017; Maulana et al., 2023; Rina et al., 2025). This occurs due to the impact of the inability to form water vapor due to the decrease in sea surface temperature in Sumatera which causes the intensity of sunlight used to warm the sea surface so that it does not reach the evaporation point to evaporate seawater to form clouds and rain (Ginting et al., 2015). In other areas in the eastern part of Indonesia, sea surface temperatures increase, so that air pressure becomes low and brings water vapor to the eastern part of Indonesia. This causes the eastern part (Papua and Ternate) have rain more often, while

the western part (Sumatera) is hot and dry more often. This situation needs to be immediately anticipated by providing soil conditioner to help maintain soil moisture by absorbing dew at night with the organic material provided.

Providing organic material in the form of compost is carried out to reduce the increase in soil's pH in drought conditions (Ichsan et al., 2023a; Ahmed et al., 2023; Shen et al., 2024; Kamel, 2025). This is due to the ability of organic materials to chelate base ions, also increasing the solubility of fertilizer in conditions of water shortage (Jones *et al.* 2019; Edlinger et al., 2025). Nitrogen, phosphorus, kalium (NPK) fertilizer contains essential nutrients which are important for plant growth, that in turn supporting plant resistance to disease due to biotic and abiotic stresses. Providing eco-enzyme can also function as a pH buffer in drought conditions because

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eco-enzyme contain organic acids that not only dissolve NPK fertilizer, but can also keep the pH from getting too high in the dry season (Ichsan et al., 2023b; Chen et al., 2022). Providing compost, NPK and eco-enzyme can reduce the risk of planting and harvest failure in hot and dry seasons. This is in line with research by (Deru et al., 2023) which showed that crop yields increased by up to 30% in drought conditions with a combination of compost, NPK and eco-enzyme compared to using only inorganic fertilizers.

Chili plants (*Capsicum annuum* L.) are a horticultural commodity that has many benefits as a functional food. Chilies is not only be used as a cooking spice to add a spicy taste to food but also have many nutritional contents that are beneficial for health. The phytochemical content in chilies, such as capsaicin, functions as an antioxidant and anti-inflammatory to improve the immune system (Zimmer et al., 2012). Apart from that, consuming chilies can also help in gastrointestinal detoxification, namely the process of digestion and removing non-essential substances from the body (Wang et al., 2018). Cultivation of chili plants in global warming conditions can be developed by adding compost, NPK, eco-enzyme and mycorrhiza. This research aims to see the development of mycorrhiza in soil treated with compost, NPK and eco-enzyme which are sprayed on chili plants and soil, to increase soil fertility and chili yields under conditions of high temperature and drought.

Materials and Methods

Place and Experimental Design

Experiment was executed in Greenhouse #2 and Plant Physiology Laboratory, Agriculture Faculty, Syiah Kuala University, Banda Aceh, Indonesia with an altitude of 0.8 meters above the sea level. It was conducted during December 2023 to April 2024. The surrounding temperature and humidity

were ranged from 27.29 °C to 36.21°C and 76.15% to 84.13%, respectively.

The design of the experiment was randomized complete block (RCBD) with a 3 x 2 x 2 split split plot factorial pattern consisting of 3 factors with 3 replications. The first factor was compost dosages (C) which consists of three levels, C_0 = without compost, C_1 = 10 t ha⁻¹ and C_2 = 20 t ha⁻¹. The second factor was the dosages of NPK fertilizer (N) which consists of two levels, N_1 = 600 kg ha⁻¹ and N_2 = 900 kg ha⁻¹. The third factor was the concentration of eco-enzyme (E) which consists of two levels, E_1 = 10 ml L⁻¹ and E_2 = 30 ml L⁻¹.

The eco-enzyme was made from ripe fruit peels, consisting of sapodilla, banana, mango and papaya, with a ratio of 1-part brown sugar: 4 parts fruit peels: 10 parts waters. The mixture was stored in a closed container, protected from sunlight, for 3 months. Data were analyzed using analysis of variance (ANOVA) based on a 3 × 2 × 2 factorial Randomized Complete Block Design (RCBD). Mean comparisons were performed using Duncan's Multiple Range Test (DMRT) at the 5% significance level. ANOVA and DMRT were performed using IBM SPSS Statistics 26. Treatment effects were considered significant at $p < 0.05$.

Research Procedure

The chili seeds used in this research were the Lado F1 variety, which were placed in wet paper and then rolled up to germinate for 48 hours. The seedling medium consists of Entisol soil and compost in a ratio of 3:1 (3 parts soil and 1 part compost). Germinated seeds are then grown in a seedling tray for 30 days and then the seedlings are transferred into pots, 1 seedling in 1 pot. The addition of compost is carried out before the chili seedlings are transplanted based on the level of treatment given: soil without compost (C_0), 10 t ha⁻¹ compost equivalent to 50 g for 10 kg soil (C_1) and 20 t ha⁻¹ compost equivalent to 100 g for 10 kg

of soil (C_2). Transplanting chili seedlings was carried out when the chili seedlings were 30 days old and had 4 leaves. The roots of the chili seedlings are coated with mycorrhiza in the form of mycorrhizal zeolite, then planted and around the planting hole spread 20 g of mycorrhiza. NPK fertilization were carried out at 7, 30 and 60 days after planting (DAP), based on the level of treatment given, 600 kg ha⁻¹ is equivalent to 3 g for 10 kg of soil (N_1) and 900 kg ha⁻¹ is equivalent to 4.5 g for 10 kg of soil (N_2). NPK fertilizer was given 3 times with 1/3 of the dose, 1 g (N_1) and 1.5 g (N_2) each time. Eco-enzyme was obtained from the fermentation of fruit peel waste and vegetable waste, brown sugar and water in a ratio of 3:1:10 which were fermented for 3 months. Eco-enzyme 10 ml L⁻¹ water (E_1) and 30 ml L⁻¹ water (E_2) is sprayed on all parts of the plant (leaves and stems). Irrigation was carried out in the morning and evening. Installation of stakes was carried out at 15 DAP. Removal of water shoots was done mechanically using scissors at the base of the leaf stalk at 20-30 DAP. Removal of water shoots was carried out once a week to stimulate the growth of chili plants. Harvesting was carried out when the chili plants enter the harvest criteria, i.e. red, 90% ripe and the stalks are dark green (Habibi and Wijayanto, 2019). The parameters observed were the percentage of mycorrhizal colonization (%), SPAD value, soil pH, soil electrical conductivity (EC) ($\mu\text{S cm}^{-1}$), soil penetration resistance (kg cm⁻²) and weight of chili fruit (g).

Results

Table 1 presents the results of the ANOVA test used to analyze the mean differences among the research groups.

Global climate change increasingly aggravating agricultural conditions through more frequent extreme weather events such as drought and heatwaves, directly impacting crop productivity.

Studies have shown that elevated temperatures accelerate evaporation, drying out soils more quickly and reducing the availability of essential nutrient for plant growth (Cavagnaro, 2014; Lagos et al., 2021; Shen et al., 2024). Regions with erratic rainfall patterns experience significant yield declines due to recurring environmental stress (Gao et al., 2023; Ginting et al., 2015). Horticultural crops like chili (*Capsicum annum* L.) are especially vulnerable to such climate fluctuations, emphasizing the urgent need for adaptive strategies. One effective approach is the use of organic amendments and agroecological practices to enhance crop resilience under hot and dry conditions.

Numerous studies support the application of compost, NPK fertilizers and eco-enzyme as agronomic strategies to sustain land productivity during drought. Compost improves soil structure, enhances water retention and stabilizes soil pH under water stress (Deru et al., 2023; Jones et al., 2019; Ichsan et al., 2025). Meanwhile, eco-enzyme, which contain organic acids, act as pH buffers and help solubilize essential nutrients like NPK (Chen et al., 2022; Ortiz Salgado et al., 2021; Simamora et al., 2024). This integrated treatment has been shown to significantly increase crop yields, such as in sweet potato and potato, under drought conditions (Hernández et al., 2020; Tarashkar et al., 2023). Furthermore, the co-application of organic compost and micronutrients mitigates the adverse effects of salinity while enhancing fertilizer efficiency, thereby strengthening the overall resilience of the cropping system (Su et al., 2022; Niu et al., 2023; Sarminingsih et al., 2023; Khan and Muhammad, 2024).

Table 1. Analysis of variances (ANOVA) for the effects of compost, NPK fertilizer, eco-enzyme and their interactions on the observed variables.

Parameter	Interaction				Coefficient of Variants (%)		
	C x N (Fcal)	C x E (Fcal)	N x E (Fcal)	C x N x E (Fcal)	CVc	CVn	CVe
PH 21 DAP	1.56	1.18	0.59	0.57	2.57	3.87	2.09
PH 28 DAP	2.39	1.40	1.55	0.97	1.93	3.82	2.04
PH 35 DAP	3.20	2.59	0.44	0.92	1.83	3.41	1.92
PH 42 DAP	3.01	2.66	0.04	0.72	2.08	7.30	2.10
PH 49 DAP	3.48	2.53	0.17	1.47	2.18	7.66	1.83
NL 21 DAP	2.73	0.30	0.42	1.30	1.96	6.69	6.31
NL 28 DAP	2.40	0.55	0.25	2.12	3.12	6.69	5.04
NL 35 DAP	1.70	0.75	1.28	3.98*	2.68	7.11	5.04
NL 42 DAP	2.79	0.57	1.00	1.48	3.61	5.77	5.31
NL 49 DAP	3.43	0.39	0.55	1.00	4.37	5.34	5.44
SPAD 21 DAP	0.17	1.31	0.63	0.22	0.89	2.46	2.36
SPAD 28 DAP	0.69	1.35	0.00	0.79	1.44	2.18	2.00
SPAD 35 DAP	3.20	0.73	1.17	0.85	1.38	1.11	2.10
SPAD 42 DAP	0.14	4.37*	0.36	4.10*	1.29	1.14	1.50
SPAD 49 DAP	0.07	3.80	0.60	3.62	1.89	3.27	1.41
pH 21 DAP	1.50	0.15	0.01	0.27	0.44	0.41	0.50
pH 49 DAP	0.49	0.49	5.19*	2.70	0.94	0.36	0.32
SPR 21 DAP	0.39	0.30	4.00	4.52*	1.60	2.21	1.57
WF	0.36	0.65	3.65	1.74	2.86	1.85	1.85
NF	10.76*	1.80	0.29	1.35	6.19	3.78	3.10
FWH1	1.45	0.47	0.18	0.90	7.31	6.16	5.54
FWH2	9.76*	1.39	0.02	1.82	3.27	3.91	3.67
FWH3	5.96*	0.15	0.01	0.02	5.89	6.39	6.18
FWH4	4.88	0.44	0.16	3.79	9.88	6.72	3.56
FWP	11.11**	0.48	0.04	1.39	6.09	3.70	3.02
BDW	1.15	1.07	0.45	0.14	6.18	7.61	4.74
EC 21 DAP	1.11	1.66	0.22	1.15	7.15	5.39	4.83
EC 49 DAP	1.70	1.53	1.53	0.05	4.08	4.74	3.37
RC	164.6**	413.4**	647.6**	69.54**	0.43	0.33	0.35

Information: ** = significant at $P \leq 0.01$; * = significant at $P \leq 0.05$; K x N = compost x NPK interaction; C x E = compost x eco-enzyme interaction; C x E = NPK x eco-enzyme interaction; C x N x E = compost x NPK x eco-enzyme interaction; CV = coefficient of variation (%) and Fcal=Fisher calculated.

Abbreviations: PH = plant height measured at 21, 28, 35, 42 and 49 days after planting (DAP); NL = number of leaves measured at 21, 28, 35, 42 and 49 DAP; Soil Plant Analysis Development (SPAD) = SPAD chlorophyll index measured at 21, 28, 35, 42 and 49 DAP; SpH = soil pH measured at 21 and 49 DAP; SPR = soil penetration resistance measured at 21 DAP; NF = number of fruits per plant; WF = fruit weight; FWH1 = fruit weight at the first harvest; FWH2 = fruit weight at the second harvest; FWH3 = fruit weight at the third harvest; FWH4 = fruit weight at the fourth harvest; FWP = total fruit weight per plant; BDW = biomass dry weight; EC = soil electrical conductivity measured at 21 and 49 DAP; RC = root colonization.

The effect of interaction between compost application, NPK and eco-enzyme has a significant effect on mycorrhizal colonization, SPAD value, soil pH, soil electrical conductivity (EC), soil penetration resistance (SPR) and fruit weight [Fig. 1 (a, b, c, d, e and f)].

2023). AMF also reduces stress hormone levels such as ABA and boosts the expression of antioxidant genes, positively influencing plant growth and productivity. When combined with compost or organic fertilizers, AMF applications consistently yield better results than synthetic fertilizers alone.

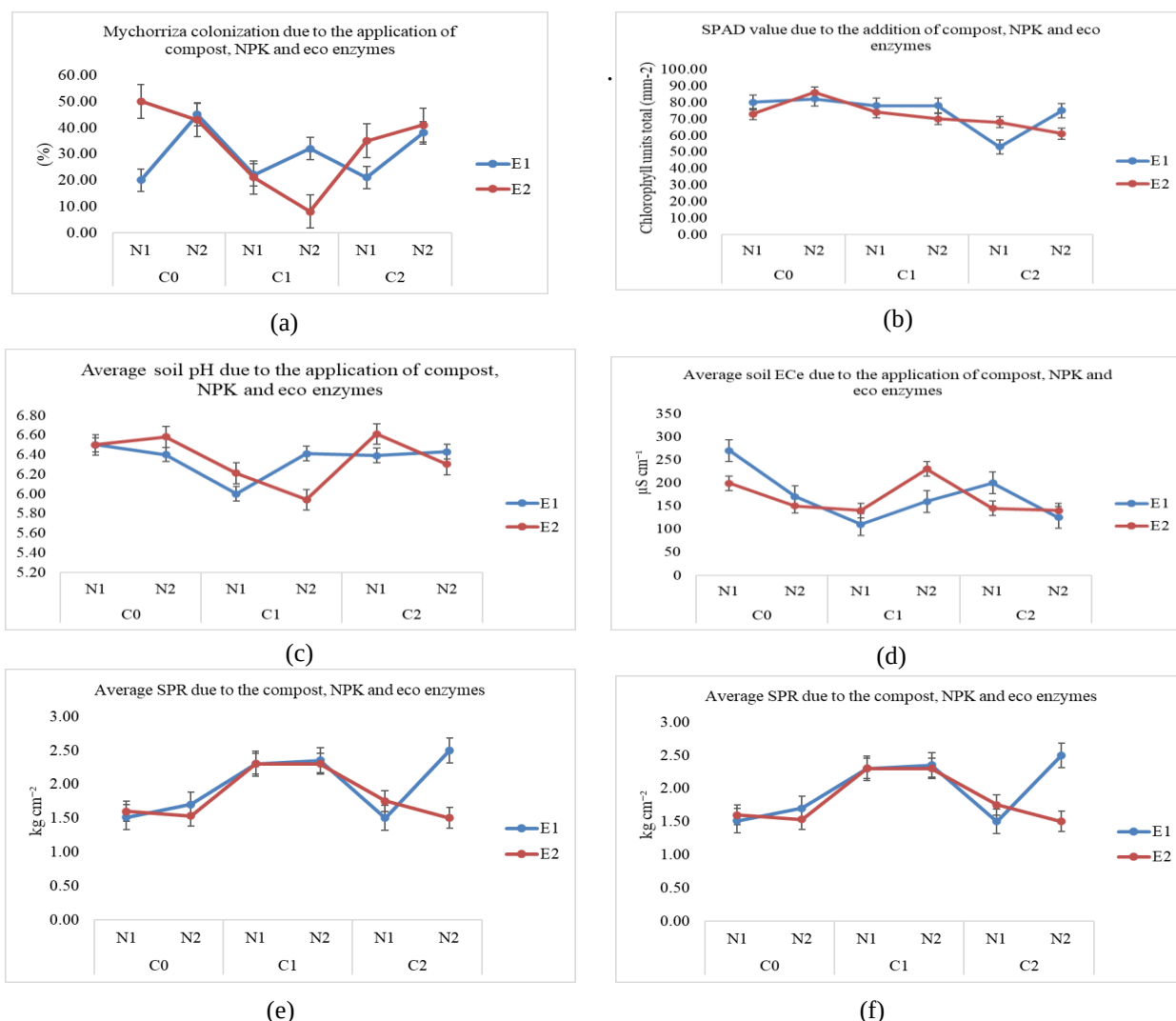


Fig. 1. Figs. (a), (b), (c), (d), (e) and (f) show changes in soil properties and chili plant yields due to the application of compost, NPK and eco-enzyme.

Strengthening the plant-soil-microbe relationship is also a key component of climate adaptation (Ashraf et al., 2021; Lu et al., 2023; Wulan et al., 2024). Inoculation with arbuscular mycorrhizal fungi (AMF) significantly improves water and nutrient uptake in chili and tomato crops grown under drought stress (George and Ray,

These findings suggest that integrating biological strategies like AMF with environmentally friendly nutrient management practices is a sustainable solution for mitigating crop failure risks due to climate change, while also improving the yield and quality of chili (Borzyszkowska, 2024; Ichsan et al., 2025).

The highest mycorrhizal colonization was found by the application of 30 ml L⁻¹ eco-enzyme along with 600 kg ha⁻¹ NPK dosage without compost treatment, while the lowest was found in the application of 30 ml L⁻¹ eco-enzyme with 900 kg ha⁻¹ NPK dosage and 10 t ha⁻¹ compost application. The application of 10 ml L⁻¹ eco-enzyme resulted in a relatively stable mycorrhizal colonization level across various NPK and compost dosages. Additionally, the SPAD value was also relatively stable by the application of 10 ml L⁻¹ eco-enzyme across various NPK and compost dosages. The average soil pH was increased by the application of 30 ml L⁻¹ eco-enzyme across various NPK and compost dosages. However, the average EC value differed for each eco-enzyme concentration across various compost and NPK dosages, with the highest EC value found in the application of 10 ml L⁻¹ eco-enzyme with 600 kg ha⁻¹ NPK dosage without compost and the lowest in the application of 10 ml L⁻¹ eco-enzyme with 600 kg ha⁻¹ NPK dosage and 10 t ha⁻¹ compost. The average soil penetration resistance was lower by the application of 30 ml L⁻¹ eco-enzyme across various NPK and compost dosages, except for the application of 10 ml L⁻¹ eco-enzyme with 600 kg ha⁻¹ NPK dosage and 20 t ha⁻¹ compost, which resulted in a lower SPR value compared to other treatments. The average fruit weight per plant was higher by the application of 30 ml L⁻¹ eco-enzyme across various NPK and compost dosages, except for the application of 30 ml L⁻¹ eco-enzyme with 600 kg ha⁻¹ NPK dosage and 20 t ha⁻¹ compost.

Discussion

Interaction of compost, NPK and eco-enzyme on soil properties and plant yields

Fig. 1 (a), the interaction of compost, NPK and eco-enzyme on the percentage of mycorrhiza colonization shows that increasing the concentration of eco-enzyme causes an increase in mycorrhiza colonization at an NPK dose of 600 kg ha⁻¹, but colonization decreases with an increase in the NPK dose along with the addition of 10 t ha⁻¹ of compost. Colonization was increased again by increasing the application of compost dose to 20 t ha⁻¹. Because compost can

improve microbial life in the soil by increasing aggregation, which causes better soil aeration and compost also becomes food for mycorrhiza. In line with research (Jin et al., 2020; Kiheri et al., 2020; Santolin et al., 2024) showed that compost can increase soil aggregation and microbial community diversity in semi-arid agroecosystems. Increasing eco-enzyme concentrations can improve mycorrhiza proliferation as seen from increased colonization.

The interaction of compost, NPK and eco-enzyme on the SPAD value shows that giving eco-enzyme 10 ml L⁻¹ of water can increase the SPAD value at NPK doses (600 kg ha⁻¹) without giving compost and increase the value SPAD at an NPK dose of 900 kg ha⁻¹ with compost 20 t ha⁻¹ (Fig. 1 (b)). This shows that soil fertility has been corrected by adding 20 t ha⁻¹ of compost. This is because compost that has negative micelles can increase ion exchange from soil to plants and also increase the solubility of NPK fertilizer. So that more NPK is taken up by plants for the formation of chlorophyll and plant growth (ES-SAQY and Biswas, 2022; Ichsan et al., 2024a; Zi et al., 2025). In line with research results (Canellas et al., 2015; Ichsan et al., 2025) showed that humic and fulvic acids in compost increased NPK solubility and nutrient absorption by plants for growth and leaf chlorophyll formation.

Fig. 1 (c), the interaction of compost, NPK and eco-enzyme on soil pH shows that 30 ml L⁻¹ of eco-enzyme can increase soil pH at an NPK dose of 900 kg ha⁻¹ without compost. Soil pH increased further at an NPK dose of 600 kg ha⁻¹ with a compost dose of 20 t ha⁻¹. Compost plays a role in buffering soil pH because the organic acids in compost can decompose into positively charged COO⁺, with negatively charged OH⁻ which affects the pH or soil reaction and affects soil NPK. The OH⁻ ions produced from the degradation of organic acids are alkaline and can increase soil pH. If the soil tends to be acidic, while COO⁺ which dissolves in forms of carbonic acid, which can reduce soil pH if the soil tends to be alkaline (Kennedy, 2022; Wahid et al., 2022; Ichsan et al., 2025).

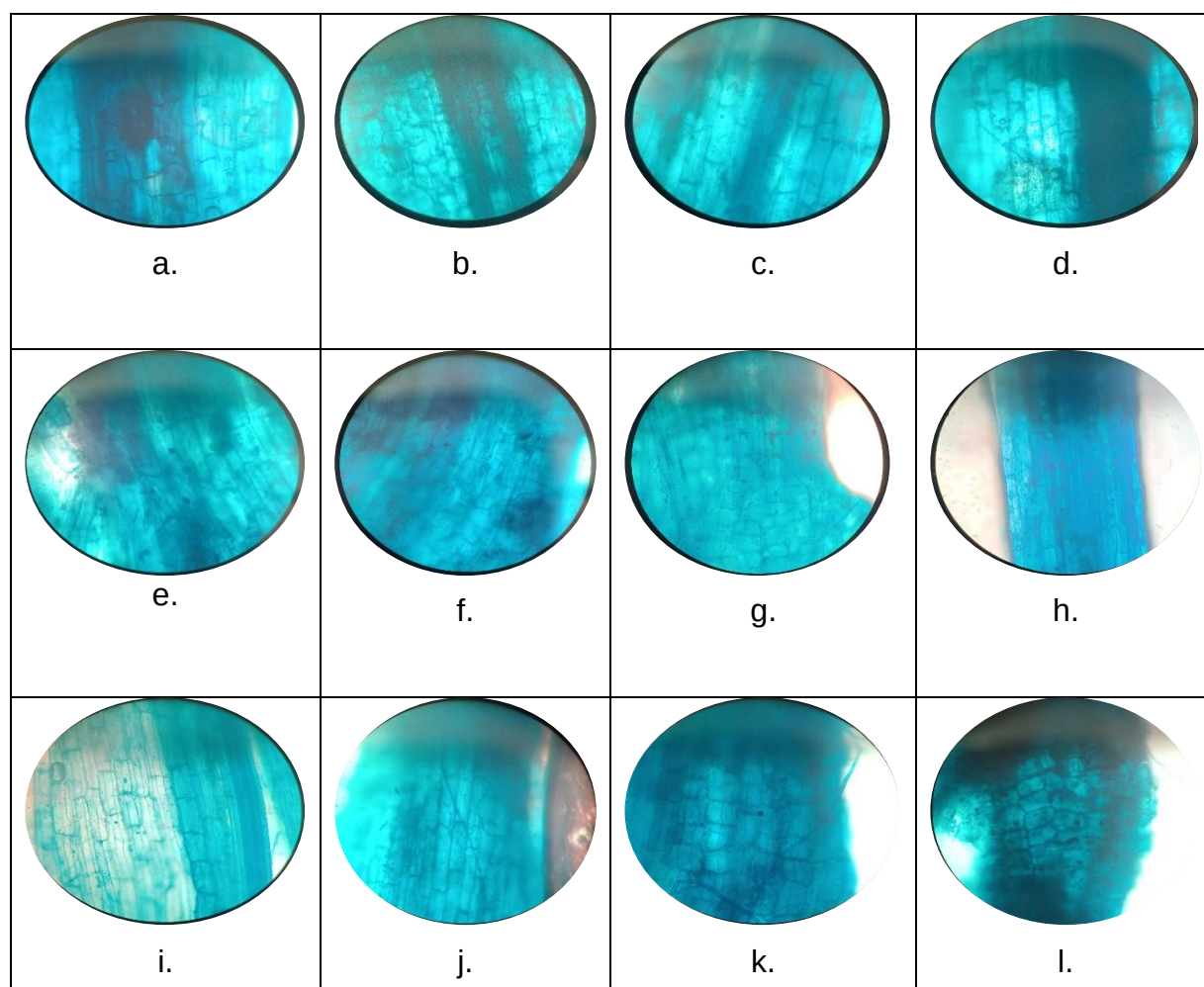


Fig. 2. Microscopic observations under a light microscope at 100× magnification (scale bar = 5,000 μm) for all treatment combinations: (a–l) $\text{C}_0\text{N}_1\text{E}_1$ to $\text{C}_2\text{N}_2\text{E}_2$, with percentage values ranging from 5% to 50%.

This carbonic acid can also bind calcium and magnesium ions, which play a role in buffering soil pH. shows the interaction of compost, NPK and eco-enzyme on soil EC values is different at different doses of NPK and compost at the same eco-enzyme concentration Fig. 1 (d). At an eco-enzyme concentration of 30 ml L^{-1} EC soil was lower at an NPK dose of 900 kg ha^{-1} without compost, however increasing eco-enzyme concentration and increasing compost dosage from 10 t ha^{-1} to 20 t ha^{-1} , even though the NPK dosage increases. The concentration of eco-enzyme affects soil penetration resistance at different doses of NPK and compost. Providing 30 ml L^{-1} of eco-enzyme with 20 t ha^{-1} of

compost can prevent an increase in soil penetration resistance by increasing the NPK dose. The soil penetration resistance decreases, causing the soil to become softer and the chili roots to develop well, which affects the growth and yield of chilies. In line with research (Solaiman et al., 2019; Aziez et al., 2021; Ichsan et al., 2025) showed that reducing soil penetration resistance through tillage and the use of organic materials can improve chili root development, which contributes to increased plant growth and yield.

The interaction of compost, NPK and eco-enzyme on fruit weight per plant shows that the concentration of eco-enzyme also affects the yield of chili plants at

different doses of NPK and compost Fig. 1 (f), In the treatment without compost, the yield was higher in the eco-enzyme 30 ml L⁻¹ water with an NPK dose of 900 kg ha⁻¹, however in the 10 t ha⁻¹ compost treatment the chili yield was higher at the NPK dose of 600 kg ha⁻¹ which was different from chili yield at a compost dose of 20 t ha⁻¹. This shows that the concentration of eco-enzyme also affects the yield of chili plants at different doses of NPK and compost. Providing 10 ml L⁻¹ of eco-enzyme with an NPK dose of 600 kg ha⁻¹ and 10 t ha⁻¹ of compost can increase the yield of chili plants. Dini et al. (2024) a synergistic combination of eco-enzyme, NPK and compost can increase chili yields higher than single treatments. The study emphasizes the significance of eco-enzyme and compost application in mitigating soil fertility degradation resulting from increased inorganic fertilizer use, which negatively impacts soil physical properties, restricts root development and ultimately leads to reduced yields (Santolin et al., 2024; Ichsan et al., 2024b; 2025; Kamel et al., 2025).

Correlation of Soil Fertility and Morphoagronomic Parameters

Correlation between soil parameters (soil pH, soil penetration resistance, root colonization) on the morphoagronomy of chili plants (plant height, number of leaves, SPAD value, number of fruits per plant, weight of fruit per plant, weight of biomass dry weight) the effects of providing compost, NPK and eco-enzyme are shown in Table 2.

In Table 2 soil penetration resistance is closely correlated with fruit weight per plant which has a value of $r = 0.602$. Soil with low penetration resistance makes it easier for chili plant roots to penetrate deeper and wider. So that the roots able to reach further water and nutrients needed for the plant's physiological processes in forming chili fruit. This is in line with the results of this research. Organic materials influence soil penetration resistance and plant root development. Chili roots in low soil penetration resistance show faster growth with more efficient nutrient uptake, thereby contributing to increased fruit yield (Pandey and Bennett. 2024; Kamel et al., 2025; Kumar et al., 2022; Lalrinmawia et al., 2024).

Mycorrhiza colonization is closely correlated with soil pH which has $r = 0.590$. Mycorrhiza

colonization shows the intensity of mycorrhizae per unit angle of view on the microscope which shows the mycorrhiza population. An increasing mycorrhiza population causes a large amount of exudate to be produced and a large number of hyphae which affect soil moisture. Soil moisture affects the solubility of natural mineral salts and fertilization which affects soil pH. Providing compost, NPK and eco-enzyme affects soil pH which influences soil reactions in ion exchange from soil to plants. In line with the results of research by (Fasusi et al., 2023, Basir et al., 2024; Ichsan et al., 2025) which shows that mycorrhiza inoculation on chili plants will cause the increase in relative leaf water content and tolerance to drought, which in turn plays an important role in increasing plant resilience and productivity under water stress conditions.

EC is closely negative correlated to the number of fruits per plant $r = -0.658$, fruit weight per plant $r = -0.617$ and biomass wet weight $r = -0.685$. This shows that the higher the EC of the soil, the fewer the number of fruits and the lower the dry weight and biomass wet weight. In line with research (Ichsan et al. 2022; Choudhary et al., 2024; Ichsan et al., 2025) environmental stress affects carbon accumulation in plants. This is also supported by research (Su et al., 2022; Ichsan et al., 2023c; Khan and Muhammad, 2024) which states that compost can stabilize soil EC which affects nutrient availability for plants. This has an impact on plant metabolism, such as photosynthesis which affects carbon accumulation. This can be seen in the decrease in biomass wet weight. Providing compost, NPK and eco-enzyme affects the EC value. Optimal EC can be achieved by providing the optimal dose of compost fertilizer, eco-enzyme with the appropriate concentration. Compost can affect EC because of its ability to chelate base cations. In line with research (Caetano-Anollés, 2022; Goldan et al., 2023; Nunes et al. 2023; Ichsan et al., 2025) shows that compost can influence the electrical conductivity in the soil to bind cations which are important in supporting plant growth.

Table 2. Correlation between soil and morpho agronomy parameters of chili plant

Pearson Correlations										
	PH	NL	SPAD	SpH	SPR	NF	WF	BDW	RC	EC
PH	1	.837**	0.133	-0.092	0.179	.585*	.582*	0.532	0.305	-0.472
NL		1	0.198	0.040	0.469	.602*	0.509	.628*	0.193	-0.547
SPAD			1	0.126	0.261	0.243	0.208	-0.038	0.268	-0.016
SpH				1	-0.396	-0.375	-0.471	-0.319	.590*	0.095
SPR					1	0.496	0.451	.602*	-0.326	-0.374
NF						1	.973**	.863**	-0.031	-.658*
WF							1	.823**	-0.105	-.617*
BDW								1	-0.104	-.685*
RC									1	-0.367
EC										1

Description: *. Correlation is significant at the 0.05 level (2-tailed), **. Correlation is significant at the 0.01 level (2-tailed), PH = plant height, NL = number of leaves, SPAD = SPAD value, SpH= soil pH, SPR= soil penetration resistance, NF = number of fruits per plant, WF = fruit weight per plant, BDW = biomass dry weight, RC = root colonization, EC= Soil Electrical Conductivity.

Conclusion

This research finds that application of compost, NPK fertilizer and eco-enzyme affects soil fertility physically on SPR values; chemically on soil pH and ECE parameters; and biologically on the percentage of mycorrhizal colonization. The highest increase in fruit weight was in the treatment of 10 t ha⁻¹ compost, 600 kg ha⁻¹ NPK and 10 ml L⁻¹ eco-enzyme. NPK and eco-enzyme treatment increase the SPAD value of plants. The application of these three components increases the soil's physical, chemical and biological fertility, which in the end increases chili production. The EC value is negatively correlated with the number of fruits, fruit weight and biomass wet weight (agronomic yield); therefore, soil EC, pH and SPR need to be observed before treatment with compost, NPK and eco-enzyme. The utilization of compost, NPK and eco-enzyme is an alternative treatment to increase soil fertility in conditions of low fertility and limited water availability.

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Authors contribution

Trisda Kurniawan: Research concept, research design, analysis, methodology, writing original draft. Ainun Marliah: Data collection. Tarisa Syahrani: Editing and review discussion. Mutiah Hasibuan: Data collection and writing. Aisyah Fitri: Data collection. Cut Nur Ichsan: Writing, review and data analysis.

Conflict of interest

The authors declare that no conflict of interest regarding the publication of this paper.

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