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Cow Manure and Gandasil B Fertilizer Effects on Purple Eggplant (*Solanum melongena* L.) Growth and Yield

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Abstract
The productivity of purple eggplant (*Solanum melongena* L.) depends on the availability of essential plant nutrients. This research investigated the combined effects of cow manure and Gandasil B fertiliser on the growth and yield of Mustang F1 purple eggplant and identified the most effective treatment combination. The study was conducted from March to June 2026 in Nanggela Village, Kuningan Regency, West Java, using a Randomised Block Design (RBD) with nine treatments and three replications. The data were analysed using ANOVA, followed by the Scott-Knott test at the 5% significance level. The results showed that the combination of cow manure and Gandasil b had a significant effect on all parameters. Treatment F (20 tons ha?¹ of cow manure + Gandasil b at 6 g.L?¹) yielded the best results with a plant height of 41,79 cm, 8,87 leaves, a flowering period of 43 days after sowing, a fruit diameter of 5,77 cm, a fruit length of 25,33 cm, number of fruits of 3,00 fruits/plant and 34 fruits/plot, as well as fruit weight of 371,21 g/plant and 5,568 kg/plot. This combination represents the optimal dose for enhancing the growth and yield of the Mustang F1 purple eggplant variety.

Keywords—Cow Manure; Gandasil B; Growht; *Solanum Melongena* L; Yield

Introduction

Eggplant (*Solanum melongena* L.) is one of the horticultural vegetable commodities widely cultivated in Indonesia and has significant economic value. Eggplant is widely consumed because it is relatively affordable, readily available, and can be processed into various food products. Purple eggplant, in particular, has considerable market potential in both domestic and international markets (Habibie, 2020). Asia accounts for approximately 90% of global eggplant production. In Indonesia, eggplant production increased from 676,339.2 tons in 2021 to 691,738.4 tons in 2022 and reached 699,896.3 tons in 2023. However, production declined to 676,712.3 tons in 2024, representing a decrease of approximately 3.31% compared with the previous year. In 2025, production increased slightly to 682,091.6 tons, representing an increase of approximately 0.80% compared with 2024 (BPS, 2026). These fluctuations highlight the importance of improving eggplant productivity through appropriate cultivation practices, particularly effective nutrient management to support plant growth and yield.

Improving soil fertility is essential to support optimal plant growth and yield. Declining soil fertility, coupled with inefficient fertilizer application practices, is a major factor contributing to reduced eggplant productivity. Climate change, characterized by extreme weather conditions, also affects plant growth and crop quality. Fertilization with organic or inorganic fertilizers to meet plant nutrient requirements is one of the most important cultivation practices for increasing crop productivity (Utami & Laude 2022).

Organic fertilizers, particularly cow manure, are a source of organic matter that helps improve the physical, chemical, and biological properties of the soil and contain essential macronutrients such as

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nitrogen (N), phosphorus (P), and potassium (K) to support plant growth and development. Due to the gradual release of nutrients, cow manure can provide sustained nutrition over a longer period, which can improve the efficiency of nutrient utilization by plants (Stefanus *et al*., 2023). Additionally, cow manure is readily available, particularly in livestock-producing regions, and can be utilized as a source of organic matter and nutrients at a relatively low cost to support sustainable agriculture (Suhaeni *et al*., 2024). Several studies have shown that cow manure at a rate of 20 t ha^{-1} effectively enhances the growth and yield of horticultural crops, including purple eggplant and tomatoes (Ansar *et al*., 2025; Hernawan *et al*., 2023; Putri *et al*., 2024).

In addition to soil fertilization, plant nutrients can also be supplied through foliar application. Gandasil B is a foliar fertilizer commonly used to support plant growth and development, particularly during the generative phase, when plants begin to flower and produce fruit. Gandasil B fertilizer contains a combination of macronutrients and micronutrients. Its macronutrient composition includes nitrogen (N) at 6%, phosphorus (P) at 20%, potassium (K) at 30%, and magnesium (Mg) at 3%. It also contains micronutrients, including manganese (Mn), boron (B), copper (Cu), cobalt (Co), molybdenum (Mo), and zinc (Zn), as well as vitamins such as aneurine, lactoflavin, and nicotinic acid amide, which support plant growth and development (Astutik *et al*., 2022). The high phosphorus and potassium contents in Gandasil B play important roles in flower formation and fruit development, thereby contributing to crop productivity (Bulan *et al*., 2016). Previous studies have demonstrated the potential of combining Gandasil B with organic fertilizers in horticultural crop production. Bulan *et al*., (2016) investigated the combination of chicken manure and Gandasil B in long bean cultivation, while Kuddi (2023) examined the combination of rice husk charcoal and Gandasil B in purple eggplant. Similarly, Yanti *et al*. (2024) studied the combination of Petroganik fertilizer and Gandasil B in chili pepper.

Although previous studies have examined combinations of organic fertilizers and Gandasil B, differences in organic fertilizer types and crop commodities indicate the need for further investigation of other combinations. Therefore, the present study investigated the combination of cow manure and Gandasil B fertilizer at different application rates and concentrations to evaluate their effects on the growth and yield of purple eggplant (*Solanum melongena* L.) variety Mustang F1. Specifically, this study evaluated three rates of cow manure (10, 20, and 30 t ha^{-1}) combined with three concentrations of Gandasil B (0, 3, and 6 g L^{-1}).

Literature Review

Effects of Cow manure on Purple Eggplant Growth and Yield

The application of cow manure can contribute to better soil conditions while supplying nutrients needed by plants. However, its effectiveness in enhancing plant growth and productivity depends on the application rate, soil characteristics, manure quality, and the specific nutritional requirements of the plants.

Hernawan *et al*. (2023) examined the growth and productivity of Mustang F1 purple eggplant cultivated under different fertilization treatments involving cow manure combined with NPK fertilizer. The manure was applied to the soil at three dosage levels: 10, 15, and 20 t ha^{-1}. The findings revealed that none of the fertilizer treatments caused significant differences in the measured growth and yield characteristics, such as plant height, fruit production, fruit dimensions, and fruit mass. The findings suggest that higher application rates of organic and inorganic fertilizers may not necessarily improve crop performance, as plant responses can vary depending on the environmental and experimental conditions under which the study is carried out.

In comparison, Badaria & Aldin, (2024) investigated the influence of different growing substrates and cow manure dosages on eggplant productivity. Four manure application levels were tested, namely 0,

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50, 75, and 100 g polybag^{-1}. The statistical analysis indicated that manure application had a significant effect on several plant parameters, particularly height, leaf production, flower formation, and fruit weight. Among the treatments, the highest manure dosage (100 g polybag^{-1}) resulted in the greatest plant height. A related investigation by Rahmayuni *et al*., (2026) assessed the response of purple eggplant to five levels of cow manure, ranging from 0 to 125 g polybag^{-1}. The results indicated that flowering occurred earlier at the 100 g polybag^{-1} dosage. Furthermore, the greatest cumulative fruit weights per plant were obtained from the 50 and 100 g polybag^{-1} treatments, with respective values of 411.07 and 409.18 g. In addition, Akinyemi *et al*. (2024) identified cow dung as a more effective organic fertilizer for enhancing eggplant performance than the other manure sources included in their evaluation.

The differences in these findings indicate that the response of eggplant to cow manure application may vary depending on the application rate, growing media, soil conditions, and other cultivation factors. Therefore, further research is needed to evaluate different cow manure application rates in combination with foliar fertilizers, particularly Gandasil B, to determine an appropriate fertilization strategy for improving the growth and yield of purple eggplant.

Gandasil B Fertilizer and Crop Yield Formation

Foliar fertilization is an important approach to supplementing plant nutrient requirements, particularly when nutrient uptake through the roots is limited. Gandasil B is a foliar fertilizer commonly used to support plant growth and development during the reproductive stage. It contains phosphorus (P) and potassium (K), which play important roles in flower formation and fruit development. Phosphorus is involved in energy transfer through adenosine triphosphate (ATP), which supports metabolic processes and reproductive development. Meanwhile, potassium contributes to enzyme activation, water regulation, and the translocation of photosynthetic products from leaves to developing fruits, thereby supporting fruit growth and filling. Therefore, an appropriate concentration of Gandasil B is important to ensure adequate nutrient availability during the reproductive stage.

Hidayat *et al*. (2025) investigated the effects of different combinations of growing medium composition and Gandasil B concentrations on the yield and quality of purple eggplant. The study evaluated Gandasil B concentrations of 0, 2, 4, and 6 g L^{-1}. The results showed that growing medium composition affected several yield parameters, while regression analysis estimated that the maximum number of fruits could be obtained at a Gandasil B concentration of 5.78 g L^{-1}. These findings indicate that the response of purple eggplant to foliar fertilizer concentrations may depend on growing medium conditions.

Similarly, Thu *et al*. (2024) reported that plant growth and yield responses to combined soil and foliar fertilization varied depending on the type of fertilizer applied. These findings highlight the importance of considering the interaction between nutrients supplied through the soil and foliar application. However, the appropriate concentration of Gandasil B may vary depending on the availability of nutrients from the growing medium and the plant's developmental stage. Therefore, evaluating different Gandasil B concentrations in combination with cow manure is necessary to determine an appropriate fertilization strategy for supporting flower formation and fruit development in purple eggplant.

Combination of Organic Fertilizers and Foliar Fertilization

Combining soil applied organic fertilizers with foliar fertilizers provides complementary approaches to meeting plant nutrient requirements. Cow manure supplies organic matter and nutrients while improving soil physical, chemical, and biological properties. Meanwhile, foliar fertilizers supplement plant nutrient requirements through direct application to leaf surfaces, supporting plant growth and development.

Furqan *et al*. (2025) examined the combined use of cow manure and urea in purple eggplant. Their results showed that the interaction between the two nutrient sources did not significantly influence any

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of the measured variables. By contrast, Thu *et al*. (2024) reported that plant responses to combined soil and foliar fertilization were influenced by the types of fertilizers applied. These findings indicate that the effectiveness of fertilizer combinations is influenced by the characteristics of the nutrient sources and their application methods.

Despite previous findings, the combined use of cow manure and Gandasil B in affecting the growth and productivity of Mustang F1 purple eggplant still warrants further investigation. Accordingly, this research examines three cow manure application rates, specifically 10, 20, and 30 t ha^{-1}, combined with Gandasil B concentrations of 0, 3, and 6 g L^{-1}. The study is intended to determine the effectiveness of the proposed fertilizer combinations in enhancing plant growth and yield under the experimental conditions.

Research Method

Location and Time

This study was conducted in Nanggela Village, Mandirancan District, Kuningan Regency, West Java, from March to June 2026. Climate information was obtained using the NASA Prediction of Worldwide Energy Resources (POWER) data platform, based on the coordinates corresponding to the research location (latitude: −6.80°; longitude: 108.47°). Daily data were retrieved from March 1 to June 30, 2026, using the Agroclimatology community dataset. The parameters included 2-meter air temperature (T2M, °C) and corrected precipitation (PRECTOTCORR, mm day^{-1}). The daily data were processed to calculate monthly mean air temperature and monthly mean daily precipitation. Throughout the experimental period, the monthly average air temperature varied between 24.62 and 25.75 °C, while monthly mean daily precipitation ranged from 0.27 to 8.43 mm day^{-1}. The study area was situated at an altitude of 200–400 m above sea level (NASA, 2026).

Materials and Equipment

The materials used in this study consisted of Mustang F1 purple eggplant seeds (Cap Panah Merah), cow manure, Gandasil B fertilizer (PT Kalatham), soil, rice husk charcoal, water, and an insecticide with an active ingredient concentration of 25% imidacloprid.

The equipment employed in this study comprised a hoe for land preparation, a 72-cell seedling tray, an analytical scale for weighing fertilizer and harvest, a measuring cup and a bucket for preparing fertilizer solutions, a hand sprayer for applying Gandasil B, a backpack sprayer for applying insecticide, writing utensils, a laptop, treatment labels, a camera, a vernier caliper, and a ruler or measuring tape for measuring plant height.

Experimental Design

The experiment was arranged in a Randomized Block Design (RBD) with a 3 × 3 factorial treatment structure consisting of two factors. The first factor was the application rate of cow manure (A), comprising three levels: 10, 20, and 30 t ha^{-1}. The second factor was the concentration of Gandasil B foliar fertilizer (B), comprising three levels: 0, 3, and 6 g L^{-1}. These two factors resulted in nine treatment combinations, as follows: A = Pukan 10 t ha^{-1} and Gandasil 0 g L^{-1}; B = Pukan 10 t ha^{-1} and Gandasil 3 g L^{-1}; C = Pukan 10 t ha^{-1} and Gandasil 6 g L^{-1}; D = Pukan 20 t ha^{-1} and Gandasil 0 g L^{-1}; E = Pukan 20 t ha^{-1} and Gandasil 3 g L^{-1}; F = Pukan 20 t ha^{-1} and Gandasil 6 g L^{-1}; G = Pukan 30 t ha^{-1} and Gandasil 0 g L^{-1}; H = Pukan 30 t ha^{-1} and Gandasil 3 g L^{-1}; and treatment I = Pukan 30 t ha^{-1} and Gandasil 6 g L^{-1}. Each treatment combination was replicated three times, resulting in a total of 27 experimental plots.

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Experimental Procedure

Seed Preparation and Sowing

Mustang F1 purple eggplant seeds produced by East West Seed Indonesia, with a minimum germination rate of 85%, were selected for planting. Before sowing, the seeds were immersed in warm water for approximately 30 minutes. They were then sown in seedling trays filled with a growing medium comprising soil, cow manure, and rice husk charcoal mixed in equal proportions (1:1:1). The trays were maintained in a shaded area throughout the germination period. Seed emergence was observed 5-7 days after sowing (DAS), and the seedlings reached transplanting age at 21 DAS.

Land Preparation and Planting

Prior to planting, field preparation involved tilling the ground to a depth of 20-30 cm using a hoe. Subsequently, 27 experimental plots, each measuring 2.5 × 1.8 m, were constructed. Planting was conducted at intervals of 50 × 60 cm, while adjacent plots were separated by 30 cm. Identification tags indicating the respective treatments were attached to each plot. Healthy, uniformly developed Mustang F1 purple eggplant seedlings, which had reached 21 days after sowing (DAS), were transplanted into the field during the morning. Each plot contained 15 plants, including five sample plants, resulting in a total of 405 plants, of which 135 were designated as sample plants.

Basal Fertilization

Cow manure was applied as a base fertilizer by mixing it evenly into the topsoil according to the treatment doses, after which the field was left to rest for 1 week before planting. The doses used were 10, 20, and 30 t ha^{-1}, each applied to 9 plots. The fertilizer requirements per plot are presented in **Table 1.**

Table 1. Fertilizer Dosage Requirements

Fertilizer	Rate (t·ha^{-1})	per Plot (kg)	9 Plots (kg)	Application Time
Cow manure	10 t ha^{-1}	4.5 kg	40.5 kg	−7 days after sowing
	20 t ha^{-1}	9.0 kg	81.0 kg	
	30 t ha^{-1}	13.5 kg	121.5 kg	

Gandasil b fertilizer was applied by foliar spraying after first dissolving it in water according to the treatment dosage. Applications were made three times in the morning, specifically when the plants were 28, 35, and 42 days after planting (DAP), with the solution sprayed evenly over the leaf surfaces. The spray volume used was 500 L ha^{-1} or 225 mL per plot (area of 4.5 m^2). For the 9 treatments, a total of 2,025 mL of solution was required, rounded up to 2.5 L to account for solution loss during mixing and spraying. The concentrations of Gandasil b used were 0, 3, and 6 g L^{-1}. The 0 g L^{-1} treatment used only water, while the 3 g L^{-1} and 6 g L^{-1} concentrations required 7.5 g and 15 g of Gandasil b respectively, dissolved in 2.5 L of water before application. The Gandasil b requirements per plot are presented in **Table 2.**

Table 1 . Gandasil b Fertilizer Requirements

Description	per hectare (L)	per Plot (mL)	9 plots
Spray Volume	500	225	2,025 ≈ 2,500
0 g/l→ Gandasil (g)			0
3 g/l→ Gandasil (g)			7.5 g/l
6 g/l→ Gandasil (g)			15 g/l

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Maintenance

Plant maintenance includes watering, thinning, weeding, and pest control. Watering was carried out daily, either in the morning or in the evening, only when it was not raining, because the experiment was conducted during the rainy season. Thinning was performed at 5–7 days after sowing (DAS) using reserve seedlings (equivalent to 20% of the total plant population, amounting to 81 seedlings) that were of the same age and variety as the main crop.

Weeding was performed manually using a hoe from 14 days after sowing (DAS) until just before harvest. Weeds found included barnyard grass, *Cleome rutidosperma*, *Basilicum polystachyon*, and *Ludwigia hyssopifolia*. Pests identified included grasshoppers and armyworms *(Spodoptera litura)* that attacked the leaves; these were chemically controlled using an insecticide containing 25% imidacloprid as the active ingredient.

Harvest

Harvesting began at 62 days after sowing (DAS) and was conducted five times at 8-day intervals. The fruits were harvested when they reached a stage suitable for consumption, characterized by a glossy purple skin, a length of 20–25 cm, and a texture that was still relatively firm. Harvesting continued until 94 DAS and was carried out during the cooler hours of the day, either in the morning or late afternoon, to maintain the quality and weight of the harvested produce.

Observation Parameters

The observed parameters comprised plant height and leaf number, recorded at 35, 42, and 49 days after planting (DAP); flowering age, determined by the emergence of the first flower bud; fruit diameter and length; fruit number per plant and per plot, recorded throughout the harvesting period; and fruit weight per plant and per plot, measured at each harvest.

Data Analysis

The research data were analyzed using ANOVA (F-test). If the analysis results indicated a significant effect, post-hoc tests were conducted using the Scott-Knott cluster test at a 5% significance level.

Results and Discussion

Soil Analysis and Analysis of Cow manure

The results of soil analysis prior to the study showed that the soil pH (H_2O) was 6.04 (slightly acidic), pH (KCl) was 5.01 (acidic), organic carbon was 1.32% (low), total nitrogen was 0.19% (low), available phosphorus was 71.4 ppm P_2O_5 (very high), CEC 19.0 cmol/kg (moderate), available K 113 ppm K_2O (moderate), sand 16.60%, silt 6.65%, and clay 46.75%. Meanwhile, the cow manure used in the study was of good quality, with a neutral pH (6.95), an organic carbon content of 19.85%, total nitrogen of 1.23%, total P_2O_5 of 2.31%, and total K_2O of 0.76%. A C/N ratio of 16.1 indicates that the manure has decomposed well and is ready for application to the field (IPB Department of Agronomy and Horticulture Testing Laboratory, 2026).

Plant Height (cm)

The analysis of variance revealed that the combined application of cow manure and Gandasil B fertilizer had a significant effect on purple eggplant height at 35, 42, and 49 days after planting (DAP), with p-values of 0.013, 0.029, and 0.000, respectively. The average plant height under each treatment is presented in **Table 3.** According to the Scott–Knott test, treatment F, consisting of 20 t ha^{-1} cow manure combined with 6 g L^{-1} Gandasil B, produced the greatest plant height numerically at each assessment

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time, reaching 22.95 cm at 35 DAP, 29.57 cm at 42 DAP, and 41.79 cm at 49 DAP. However, at 35 and 42 DAP, treatment F was not significantly different from treatment E (20 t ha^{-1} cow manure + 3 g L^{-1} Gandasil B), as both were classified in the same statistical group. At 49 DAP, treatment F showed a significantly greater plant height than the remaining treatments, suggesting that its growth advantage was more evident during the later vegetative growth stage.

Table 3. Effect of Cow manure and Gandasil B on the Plant Height of Purple Eggplant at 35, 42, and 49 Days After Planting (DAP).

Treatment	Average Plant Height (cm)		
	35 DAP	42 DAP	49 DAP
A (PK = 10 ton ha^{-1} dan G = 0 g L^{-1})	18.19 a	24.34 a	32.33 a
B (PK = 10 ton ha^{-1} dan G = 3 g L^{-1})	18.77 a	24.78 a	30.99 a
C (PK = 10 ton ha^{-1} dan G = 6 g L^{-1})	18.07 a	22.17 a	29.09 a
D (PK = 20 ton ha^{-1} dan G = 0 g L^{-1})	17.37 a	21.05 a	33.99 a
E (PK = 20 ton ha^{-1} dan G = 3 g L^{-1})	22.23 b	28.67 b	29.17 a
F (PK = 20 ton ha^{-1} dan G = 6 g L^{-1})	22.95 b	29.57 b	41.79 b
G (PK = 30 ton ha^{-1} dan G = 0 g L^{-1})	17.43 a	20.90 a	25.54 a
H (PK = 30 ton ha^{-1} dan G = 3 g L^{-1})	17.99 a	24.17 a	30.36 a
I (PK = 30 ton ha^{-1} dan G = 6 g L^{-1})	18.51 a	23.73 a	29.95 a
p-value	0.013	0.029	0.000

Description: Mean values accompanied by the same letter in the same column indicate no significant difference based on the Scott-Knott cluster test at the 5% level.

The superior plant height observed in treatment F may be attributed to the complementary roles of cow manure and Gandasil B in supplying nutrients to plants. Cow manure provides organic matter and essential nutrients, particularly nitrogen (N), phosphorus (P), and potassium (K), while improving soil physical, chemical, and biological properties. Its gradual decomposition allows nutrients to be released progressively, thereby supporting nutrient availability and root uptake over time. Meanwhile, Gandasil B supplements plant nutrient requirements through foliar application, allowing nutrients to be absorbed directly through the leaves. Nitrogen contributes to protein synthesis and vegetative growth, phosphorus plays an important role in energy transfer and plant metabolism, while potassium supports enzyme activation, water regulation, and the translocation of photosynthetic products. In addition, magnesium is an essential component of chlorophyll and plays an important role in photosynthesis. The combined supply of nutrients through the soil and leaves may therefore provide more favorable conditions for plant growth, particularly stem elongation, resulting in greater plant height in treatment (Prastya & Puspitorini, 2017; Siagian *et al*., 2026). In the study, Krishnamurti *et al*. (2021) who reported that the integrated application of organic and inorganic fertilizers can improve soil fertility, plant growth, and productivity.

The results also indicate that increasing the cow manure application rate did not necessarily result in greater plant height. Within the rates evaluated in this study, the application of 20 t ha^{-1} of cow manure combined with 6 g L^{-1} of Gandasil B produced the greatest plant height. However, increasing the cow manure rate to 30 t ha^{-1} did not further improve plant height. This suggests that nutrient availability alone does not determine plant growth, as excessive nutrient supply or an imbalance in nutrient availability may also affect nutrient uptake and plant development. Therefore, the effectiveness of fertilization depends not only on the amount of fertilizer applied but also on the balance between nutrient supply and plant requirements (Lee *et al*., 2023).

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Number of Leaves (sheets)

The analysis of variance (ANOVA) showed that the application of cow manure and Gandasil B fertilizer had a significant effect on the number of leaves in purple eggplant. The mean leaf counts under the respective treatments are shown in **Table 4.** According to the Scott–Knott test, treatment F (20 t ha^{-1} cow manure + 6 g L^{-1} Gandasil B) recorded the highest average leaf number at 35, 42, and 49 days after planting (DAP), with averages of 6.47, 8.27, and 8.87 leaves, respectively. The differences in statistical groupings across observation periods indicate variations in plant responses to the fertilizer treatments during vegetative growth. At 35 DAP, treatment F belonged to a different statistical group from all other treatments, indicating a distinct response to this fertilizer combination during the early observation period. At 42 DAP, treatment F was classified in a different statistical group from treatment C, indicating a difference in their effects on leaf development at this observation stage. Meanwhile, at 49 DAP, treatments E and F belonged to the same statistical group, indicating that treatment E was likewise capable of producing a comparable number of leaves to treatment F at the final observation. Overall, leaf numbers increased as the plants grew older, reflecting continued vegetative development during the successive observation stages.

Table 4. Effect of Cow Manure and Gandasil-B Foliar Fertilizer on the Number of Purple Eggplant Leaves at 35, 42, and 49 Days After Planting.

Treatment	Average Number of Leaves (leaves)		
	35 DAP	42 DAP	49 DAP
A (PK = 10 ton ha^{-1} dan G = 0 g L^{-1})	4.27 a	3.73 a	3.93 a
B (PK = 10 ton ha^{-1} dan G = 3 g L^{-1})	4.60 a	4.87 a	4.07 a
C (PK = 10 ton ha^{-1} dan G = 6 g L^{-1})	5.33 a	5.40 a	5.60 b
D (PK = 20 ton ha^{-1} dan G = 0 g L^{-1})	4.93 a	5.67 a	5.87 b
E (PK = 20 ton ha^{-1} dan G = 3 g L^{-1})	5.13 a	5.60 a	6.80 c
F (PK = 20 ton ha^{-1} dan G = 6 g L^{-1})	6.47 b	8.27 b	8.87 c
G (PK = 30 ton ha^{-1} dan G = 0 g L^{-1})	4.33 a	4.20 a	5.73 b
H (PK = 30 ton ha^{-1} dan G = 3 g L^{-1})	5.13 a	5.20 a	6.13 b
I (PK = 30 ton ha^{-1} dan G = 6 g L^{-1})	4.67 a	5.00 a	5.07 b
p-value	0.017	0.000	0.000

Description: Mean values accompanied by the same letter in the same column indicate no significant difference based on the Scott-Knott cluster test at the 5% level.

The analysis showed that the cow manure used in this study contained 1.23% nitrogen (N), indicating its potential to contribute to nitrogen availability in the soil. Nitrogen plays an important role in vegetative growth, particularly in leaf development, chlorophyll synthesis, and photosynthetic activity. Adequate nitrogen availability supports leaf formation and promotes vegetative growth in eggplant (Abdul *et al*., 2023; Badaria & Aldin, 2024). Therefore, the application of cow manure may have contributed to nitrogen supply in the soil, thereby supporting vegetative growth, particularly leaf development in eggplant.

Furthermore, the 6% nitrogen (N) concentration present in Gandasil B fertilizer also influenced the number of leaves on purple eggplants. This result aligns with the research conducted by Astutik & Sumiati, (2018), who found that applying Gandasil B at a concentration of 3 g L^{-1} promoted leaf production in tomato plants. In the present experiment, the most favorable response was obtained under treatment F (20 t ha^{-1} cow manure combined with 6 g L^{-1} Gandasil B), suggesting that the fertilizer levels associated with optimum growth responses differ depending on the plant species.

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Time to Flowering (DAP)

The analysis of variance (ANOVA) indicated that cow manure and Gandasil B fertilizer application significantly influenced the flowering time of purple eggplant. The average flowering time recorded under each treatment is provided in **Table 5.** The mean flowering periods ranged from 43.00 to 63.67 days after planting (DAP). Treatment F (cow manure at 20 t ha^{-1} + Gandasil b at 6 g L^{-1}) resulted in the earliest flowering time compared to the other treatments, at 43.00 days after planting.

Table 5. Effect of Cow manure and Gandasil b on the Flowering Period of Purple Eggplant.

Treatment	Flowering Time (DAP)
A (PK = 10 ton ha^{-1} dan G = 0 g L^{-1})	63.67 c
B (PK = 10 ton ha^{-1} dan G = 3 g L^{-1})	52.67 b
C (PK = 10 ton ha^{-1} dan G = 6 g L^{-1})	57.00 c
D (PK = 20 ton ha^{-1} dan G = 0 g L^{-1})	55.00 b
E (PK = 20 ton ha^{-1} dan G = 3 g L^{-1})	49.67 b
F (PK = 20 ton ha^{-1} dan G = 6 g L^{-1})	43.00 a
G (PK = 30 ton ha^{-1} dan G = 0 g L^{-1})	62.00 c
H (PK = 30 ton ha^{-1} dan G = 3 g L^{-1})	53.67 b
I (PK = 30 ton ha^{-1} dan G = 6 g L^{-1})	50.33 b
p-value	**0.000**

Description: Mean values with the same letter in the same column indicate no significant difference based on the Scott-Knott cluster test at the 5% level.

The flowering age of plants is closely related to phosphorus (P). In the study, Fitrianti *et al*., (2018) explained that flowering represent the transition from vegetative growth to the generative stage, which is characterized by the formation of flower buds. The timing of this transition is influenced by several factors, including nutrient availability, duration of sunlight exposure, and ambient temperature conditions (Rizkyma *et al*., 2023).

The phosphorus (P) content in cow manure (2.31%) and Gandasil b fertilizer (20%) is considered sufficient to support the nutritional needs of purple eggplant plants during the flowering phase. Therefore, the combined application of cow manure and Gandasil B fertilizer in Treatment F provides optimal nutrient conditions, thereby supporting flower organ formation and accelerating the plant's transition from the vegetative to the generative phase.

This finding is in agreement with the research conducted by Kuddi (2023), who reported that the application of Gandasil B fertilizer and rice husk charcoal significantly increased yields during the generative phase of purple eggplant plants. Regarding the flowering time parameter, application using a concentration of 5 g L^{-1} in water resulted in the fastest flowering time of 28.58 days. This study indicates that applying Gandasil B at the appropriate concentration can accelerate flowering because its phosphorus and potassium content supports the formation of the plant's reproductive organs.

Fruit Diameter and Length (cm)

The analysis of variance revealed that the application of cow manure and Gandasil B significantly affected fruit diameter and length in purple eggplant plants. The mean values for fruit diameter and length across the treatments are presented in Table 6. The highest fruit diameter was obtained in treatment F (20 t ha^{-1} of cow manure + 6 g L^{-1} of Gandasil B), reaching 5.77 cm. A comparable trend was found in fruit length, where treatment F was not significantly different from treatment H but produced the longest fruit, measuring 25.33 cm.

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Table 6. Effect of Cow manure and Gandasil b Foliar Fertilizer on the Diameter and Length of Purple Eggplant Fruits.

Treatment	Fruit Diameter (cm)	Fruit Length (cm)
A (PK = 10 ton ha^{-1} dan G = 0 g L^{-1})	4.00 a	16.08 a
B (PK = 10 ton ha^{-1} dan G = 3 g L^{-1})	4.47 a	16.17 a
C (PK = 10 ton ha^{-1} dan G = 6 g L^{-1})	4.87 a	18.64 a
D (PK = 20 ton ha^{-1} dan G = 0 g L^{-1})	4.60 a	22.70 b
E (PK = 20 ton ha^{-1} dan G = 3 g L^{-1})	4.90 a	22.34 b
F (PK = 20 ton ha^{-1} dan G = 6 g L^{-1})	5.77 c	25.33 b
G (PK = 30 ton ha^{-1} dan G = 0 g L^{-1})	5.47 b	24.13 b
H (PK = 30 ton ha^{-1} dan G = 3 g L^{-1})	5.57 b	24.54 b
I (PK = 30 ton ha^{-1} dan G = 6 g L^{-1})	4.57 b	17.24 a
p-value	0.0001	0.0010

Description: Average values accompanied by the same letter in the same column indicate no significant difference based on the Scott-Knott cluster test at the 5% level.

During the generative phase, cow manure provides nutrients particularly potassium gradually, thereby supporting optimal fruit formation and development. Potassium supports the translocation of photosynthetic products to the fruit, cell division and enlargement, and fruit filling, thereby contributing to increased fruit size and diameter (Ayuningtyas *et al*., 2020). Additionally, the application of Gandasil b fertilizer, which contains phosphorus (P), potassium (K), magnesium (Mg), and micronutrients, can supplement the plant's nutrient requirements through foliar uptake (Saputra & Sutriana, 2022). The combination of cow manure and Gandasil b provides balanced nutrients, allowing for more optimal photosynthesis and the translocation of assimilates to the fruit, which increases the length and diameter of purple eggplants (Ramadhan *et al*., 2025; Sari *et al*., 2021).

Number of Fruits per Plant and per Plot (fruits)

The analysis of variance showed that the application of cow manure in combination with Gandasil B fertilizer significantly influenced the mean fruit number per plant and per plot in purple eggplant. The mean fruit numbers per plant and per plot across all treatments are shown in **Table 7.**

Table 7. Effect of Cow manure and Gandasil b Foliar Fertilizer on the Number of Fruits per Plant and Per Plot of Purple Eggplant.

Treatment	Average Number of Fruits (Fruits)	
	per Plant	per Plot
A (PK = 10 ton ha^{-1} dan G = 0 g L^{-1})	1.27 a	18.33 a
B (PK = 10 ton ha^{-1} dan G = 3 g L^{-1})	1.53 a	21.67 a
C (PK = 10 ton ha^{-1} dan G = 6 g L^{-1})	1.87 a	19.67 a
D (PK = 20 ton ha^{-1} dan G = 0 g L^{-1})	2.07 a	23.00 b
E (PK = 20 ton ha^{-1} dan G = 3 g L^{-1})	1.93 a	25.67 b
F (PK = 20 ton ha^{-1} dan G = 6 g L^{-1})	3.00 b	34.00 c
G (PK = 30 ton ha^{-1} dan G = 0 g L^{-1})	1.27 a	22.33 b
H (PK = 30 ton ha^{-1} dan G = 3 g L^{-1})	2.07 a	24.67 b
I (PK = 30 ton ha^{-1} dan G = 6 g L^{-1})	1.93 a	24.67 b
p-value	0.003	0.000

Description: Mean values accompanied by the same letter in the same column indicate no significant difference based on the Scott-Knott cluster test at the 5% level.

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The findings of this research indicate that treatment F (20 t ha^{-1} of cow manure and 6 g L^{-1} of Gandasil b) produced the highest fruit yield, whereas increasing the cow manure application rate to 30 t ha^{-1} caused both the number of fruits per plant and per plot to decrease, even when Gandasil b was still applied. Fruit set is influenced by the availability of plant nutrients, particularly nitrogen (N), phosphorus (P), and potassium (K). Potassium plays a role in the translocation of photosynthetic products to generative organs, while phosphorus functions in flower formation and fruit filling (Nariswari *et al*., 2024; Savitri *et al*., 2017).

The findings of the present study agree with those reported by Gulo *et al*. (2023), who reported that the application of cow manure enhanced the number, length, and weight of fruits produced by purple eggplant plants. Astutik & Sumiati, (2018) also emphasized that applying Gandasil B fertilizer at an appropriate rate can increase fruit yield because its phosphorus and potassium content supports fruit formation and development. The greater fruit production in treatment F may be associated with improved vegetative growth, particularly an increased leaf number. An increase in leaf number enhances photosynthetic capacity, thereby producing photosynthates that are subsequently translocated to reproductive organs to support fruit formation and development.

Conversely, increasing the application rate of cow manure to 30 t ha^{-1} and applying Gandasil B at concentrations of 0, 3, and 6 g L^{-1} is believed to have caused nutrient availability, particularly phosphorus and potassium, to exceed the plants' optimal requirements. Given that the soil phosphorus availability was already very high, the addition of phosphorus from cow manure and Gandasil B is thought to have caused a nutrient imbalance. This condition can reduce nutrient uptake efficiency due to nutrient antagonism, meaning that additional fertilizer no longer enhances fruit (Rietra *et al*., 2017).

Fruit Weight per Plant (g) and per Plot (kg)

The analysis of variance showed that the application of cow manure in combination with Gandasil B foliar fertilizer had a significant effect on the average fruit weight parameters, measured on both a per-plant and per-plot basis, in purple eggplant. The mean fruit weights recorded for individual plants and plots under each treatment are presented in **Table 8.** Treatment F (20 t ha^{-1} of cow manure + 6 g L^{-1} of Gandasil B) resulted in the highest mean fruit weight per plant, reaching 371.21 g. A comparable pattern was found in fruit weight per plot, where treatment F produced the highest fruit weight of 5.568 kg.

Table 8. Effect of Cow manure and Gandasil B Foliar Fertilizer on Fruit Weight per Plant and per Plot of Purple Eggplant.

Treatment	Average Fruit Weight	
	per Plant (g)	per Plot (kg)
A (PK = 10 ton ha^{-1} dan G = 0 g L^{-1})	94.34 a	1.415 a
B (PK = 10 ton ha^{-1} dan G = 3 g L^{-1})	111.82 a	1.677 a
C (PK = 10 ton ha^{-1} dan G = 6 g L^{-1})	125.47 a	1.881 a
D (PK = 20 ton ha^{-1} dan G = 0 g L^{-1})	228.64 b	3.429 a
E (PK = 20 ton ha^{-1} dan G = 3 g L^{-1})	248.00 b	3.721 a
F (PK = 20 ton ha^{-1} dan G = 6 g L^{-1})	371.21 c	5,568 a
G (PK = 30 ton ha^{-1} dan G = 0 g L^{-1})	151.71 a	2.275 a
H (PK = 30 ton ha^{-1} dan G = 3 g L^{-1})	183.56 a	2.753 a
I (PK = 30 ton ha^{-1} dan G = 6 g L^{-1})	138.39 a	2,076 a
p-value	0.000	0.000

Description: Average values accompanied by the same letter in the same column indicate no significant difference based on the Scott-Knott cluster test at the 5% level.

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Fruit weight per plant is determined by the amount of biomass accumulated in the fruit. The products of photosynthesis are then transferred to storage organs, primarily the fruit, to produce this biomass. The more efficient the photosynthesis process, the more photosynthates or assimilates are produced, thereby supporting increased biomass and fruit weight. By stimulating leaf growth and chlorophyll formation, the element nitrogen (N) enhances the plant's photosynthetic capacity. Additionally, the element phosphorus (P) plays a crucial role in energy transfer via ATP, carbohydrate formation, and the translocation of photosynthetic products to generative organs. Potassium (K) also helps regulate water balance, activates various enzymes, and enhances the effectiveness of assimilate transfer from leaves to fruit. The combined contribution of these nutrients promotes fruit biomass accumulation, thereby contributing to greater fruit weight per plant (Mauro *et al*., 2022; Sardans & Peñuelas, 2021; Yulianto *et al*., 2021).

Conclusion

The application of cow manure and Gandasil B foliar fertilization significantly influenced the growth and productivity of purple eggplant (Solanum melongena L.). The findings demonstrated that the combined application of cow manure and Gandasil B foliar fertilizer significantly influenced all measured parameters, as confirmed by the F-test. Treatment F, consisting of 20 t ha^{-1} of cow manure combined with Gandasil B at a concentration of 6 g L^{-1}, produced the best result among the tested treatments, with plant height of 41,79 cm, 8,87 leaves, stem diameter of 7,25 mm, flowering at 43 days after planting, fruit diameter of 5,77 cm, and fruit length of 27,33 cm. These findings indicate that the combination of soil-applied cow manure and foliar-applied Gandasil B can support the growth and productivity of purple eggplant under the experimental conditions.

Further research should investigate different application dosages of cow manure and varying concentrations of Gandasil B, particularly around the application rates used in this study, to identify more precise fertilizer combinations. Trials conducted in diverse growing environments and at different locations are necessary to assess the reproducibility of these findings.

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